RECORD OF TECHNICAL CHANGE

Technical Change No. CADD-1 Page 1 of 2

Project/Job No. IS05 Date APR 13 2005

Project/Job Name Corrective Action Decision Document for Corrective Action Unit 204 : Storage Bunkers, Nevada Test Site, Nevada, Revision 0, April 2004

The following technical changes (including justification) are requested by:

Alfred Wickline (Name) Task Manager (Title)

Description of Change:

1. Page ES-3 6th Bullet, Replace 1st and 2nd sentences with the following:

CAS 05-33-01, Kay Blockhouse – Because of the historical significance of the Kay Blockhouse, the existing doorway to this bunker should be repaired and secured to prevent unauthorized access. Because of beryllium at the entrance to the bunker a small amount of soil should be relocated to reduce the potential health effects to workers.

2. Page ES-4, Replace 1st full sentence with the following:

Stabilize the asbestos and attach steel plates over the top of the asbestos and steel-lined pits.

3. Section 4.0 5th bullet, replace with the following:

CAS 05-33-01, Kay Blockhouse – Secure the blockhouse by repairing the doorway and installing a lock, remove organic and inorganic contaminants, fix the asbestos in the steel-lined pits and cover with steel plates to prevent access, and expand the RMA to include radioactively contaminated areas (Figure 4-1). A small amount of berylliums contaminated soil may have to be relocated within the CAS to accomplish the repair of the doorway.

Justification:
Desert Research Institute (DRI) has determined that CAS 05-33-01, Kay Blockhouse is of historical significance so the original corrective action of demolishing the entrance is no longer acceptable and required changing to protect the historical significance of the structure. Because of the difficulty in excavating the soil from the two asbestos and steel-lined pits and the large quantity of clean soil that would be required to fill them, an alternate approach has been proposed. This approach includes the stabilization of the asbestos, as originally recommended, but affixing steel plats over the two pits to seal and prevent access.

The project time will be (Increased) (Decreased) (Unchanged) by approximately 0 days.

Applicable Project-Specific Document(s): *Corrective Action Decision Document for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada, DOE/NV--959* and *Corrective Action Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada, DOE/NV—1003*

Approved By: [signature] Date 4/7/05
NNSA/NSO Project Manager

[signature] Date 4/7/05
NNSA/NSO Environmental Restoration Division Director

Date
NDEP

RECORD OF TECHNICAL CHANGE

Technical Change No. CADD-1 Page 1 of 2

Project/Job No. IS05 Date

Project/Job Name Corrective Action Decision Document for Corrective Action Unit 204 : Storage Bunkers, Nevada Test Site, Nevada, Revision 0, April 2004

The following technical changes (including justification) are requested by:

Alfred Wickline (Name) Task Manager (Title)

Description of Change:

1. Page ES-3 6th Bullet, Replace 1st and 2nd sentences with the following:

CAS 05-33-01, Kay Blockhouse – Because of the historical significance of the Kay Blockhouse, the existing doorway to this bunker should be repaired and secured to prevent unauthorized access. Because of beryllium at the entrance to the bunker a small amount of soil should be relocated to reduce the potential health effects to workers.

2. Page ES-4, Replace 1st full sentence with the following:

Stabilize the asbestos and attach steel plates over the top of the asbestos and steel-lined pits.

3. Section 4.0 5th bullet, replace with the following:

CAS 05-33-01, Kay Blockhouse – Secure the blockhouse by repairing the doorway and installing a lock, remove organic and inorganic contaminants, fix the asbestos in the steel-lined pits and cover with steel plates to prevent access, and expand the RMA to include radioactively contaminated areas (Figure 4-1). A small amount of beryllium contaminated soil may have to be relocated within the CAS to accomplish the repair of the doorway.

Justification:
Desert Research Institute (DRI) has determined that CAS 05-33-01, Kay Blockhouse is of historical significance so the original corrective action of demolishing the entrance is no longer acceptable and required changing to protect the historical significance of the structure. Because of the difficulty in excavating the soil from the two asbestos and steel-lined pits and the large quantity of clean soil that would be required to fill them, an alternate approach has been proposed. This approach includes the stabilization of the asbestos, as originally recommended, but affixing steel plats over the two pits to seal and prevent access.

The project time will be (Increased) (Decreased) (Unchanged) by approximately 0 days.

Applicable Project-Specific Document(s): *Corrective Action Decision Document for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada, DOE/NV–959* and *Corrective Action Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada, DOE/NV–1003*

Approved By: [signature] Date 4/7/05
NNSA/NSO Project Manager

[signature] Date 4/7/05
NNSA/NSO Environmental Restoration Division Director

[signature] Date 4/11/05
NDEP

UNCONTROLLED

ERRATA SHEET

The Following Corrections and Clarifications Apply to: Corrective Action Decision Document (CADD) for Corrective Action Unit (CAU) 204, Storage Bunkers

DOE Document Number: DOE/NV--959

Revision: 0

Original Document Issuance Date: April 2004

This errata sheet was issued under cover letter from DOE on: May 21, 2004

The last line of Page 5 in Section 1.3 Corrective Action Decision Document should state, "Appendix F – NDEP Comments: NDEP had no comments on the draft version of this CADD."

Nevada
Environmental
Restoration
Project

DOE/NV--959

National Nuclear Security Administration

Corrective Action Decision Document for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

April 2004

Approved for public release; further dissemination unlimited.

Environmental Restoration
Division

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

Available for public sale, in paper, from:

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800.553.6847
Fax: 703.605.6900
Email: *orders@ntis.gov*
Online ordering: *http://www.ntis.gov/ordering.htm*

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*

DOE/NV--959

CORRECTIVE ACTION DECISION DOCUMENT FOR CORRECTIVE ACTION UNIT 204: STORAGE BUNKERS, 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

April 2004

CORRECTIVE ACTION DECISION DOCUMENT
FOR CORRECTIVE ACTION UNIT 204:
STORAGE BUNKERS,
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 3/30/04

Kevin Cabble, Acting Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 3/30/04

Janet Appenzeller-Wing, Acting Division Director
Environmental Restoration Division

Table of Contents

Table of Contents *(Continued)*

Table of Contents *(Continued)*

Table of Contents *(Continued)*

Table of Contents *(Continued)*

Table of Contents *(Continued)*

Table of Contents *(Continued)*

List of Figures

List of Tables

List of Tables *(Continued)*

List of Tables *(Continued)*

List of Tables *(Continued)*

List of Acronyms and Abbreviations

Ac	Actinium
ACM	Asbestos-containing material
Al	Aluminum
Am	Americium
AR/COC	Analysis request/chain-of-custody
bgs	Below ground surface
Bi	Bismuth
BN	Bechtel Nevada
CAA	Corrective Action Alternative
CADD	Corrective Action Decision Document
CAI	Corrective Action Investigation
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	*Code of Federal Regulations*
CLP	Contract Laboratory Program
cm	Centimeter
Co	Cobalt
COC	Contaminants of concern
COPC	Contaminants of potential concern
cpm	Counts per minute
CPT	Cone penetrometer technology
CSM	Conceptual Site Model
DOE	U.S. Department of Energy
dpm	Disintegrations per minute
DQI	Data quality indicator

List of Acronyms and Abbreviations *(Continued)*

DQO	Data quality objective
DRO	Diesel-range organics
DU	Depleted uranium
EERF	Eastern Environmental Radiation Facility
EPA	U.S. Environmental Protection Agency
FADL	Field activity daily log
FD	Field duplicate
FI	Field Instruction
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field-screening level
FSR	Field-screen result
ft	Foot (feet)
ft^2	Square feet
ft^3	Cubic feet
GPS	Global positioning system
GRO	Gasoline-range organics
HWAA	Hazardous Waste Accumulation Area
IDW	Investigation-derived waste
in.	Inch
LCS	Laboratory control spike
LCSD	Laboratory control sample duplicate
LD	Laboratory duplicate
LLW	Low-level radioactive waste
MDC	Minimum detectable concentration
MDL	Minimum detection limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter

List of Acronyms and Abbreviations *(Continued)*

mi	Mile
mrem	Millirem
mrem/yr	Millirem per year
MRL	Minimum reporting limit
MS	Matrix spike
MSD	Matrix spike duplicate
NAC	*Nevada Administrative Code*
NCRP	National Council of Radiation Protection and Measurement
ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NIST	National Institute for Standards and Technology
NEPA	*National Environmental Policy Act*
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRS	*Nevada Revised Statutes*
NTS	Nevada Test Site
PAL	Preliminary action level
Pb	Lead
PCB	Polychlorinated biphenyls
pCi/g	Picocuries per gram
POC	Performance objective criteria
PPE	Personal protection equipment
ppm	Parts per million
PRG	Preliminary Remediation Goal
psi	Pounds per square inch
Pu	Plutonium
QA	Quality assurance

List of Acronyms and Abbreviations *(Continued)*

QAPP	Quality Assurance Project Plan
QC	Quality control
Ra	Radium
RadCon	Radiological control
RCRA	*Resource Conservation and Recovery Act*
RDX	Royal Demolition Explosive
RMA	Radioactive Materials Area
ROTC	Record of Technical Change
RPD	Relative percent difference
RWMF	Radiological Waste Management Facility
SAA	Satellite Accumulation Area
SAIC	Science Applications International Corporation
SCL	Sample Collection Log
SDG	Sample delivery group
Shaw	Shaw Environmental, Inc.
SNJV	Stoller-Navarro Joint Venture
SQP	Standard Quality Practice
Sr	Strontium
SSHASP	Site-specific health and safety plan
SVOC	Semivolatile organic compounds
TCLP	Toxicity characteristic leaching procedure
Th	Thorium
Tl	Thallium
TPH	Total petroleum hydrocarbons
TPU	Total propagated uncertainty
TSDF	Treatment, storage, and disposal facility

List of Acronyms and Abbreviations *(Continued)*

VOC	Volatile organic compounds
U	Uranium
yd^3	Cubic yards
$\mu g/m^3$	Micrograms per cubic meter
%R	Percent recovery

Executive Summary

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 204, Storage Bunkers. The purpose of this CADD is to develop and evaluate corrective action alternatives arising as a result of the corrective action investigation and provide a rationale for the selection of the preferred alternative for each Corrective Action Site (CAS) within CAU 204. The corrective action investigation was conducted in accordance with the *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada* (NNSA/NV, 2002a), as developed under the *Federal Facility Agreement and Consent Order* (1996). Corrective Action Unit 204 is comprised of the following six CASs:

- CAS 01-34-01 – Underground Inst. House Bunker
- CAS 02-34-01 – Instrument Bunker
- CAS 03-34-01 – Underground Bunker
- CAS 05-18-02 – Chemical Explosives Storage
- CAS 05-33-01 – Kay Blockhouse
- CAS 05-99-02 – Explosive Storage Bunker

The objective of the investigation and resulting decision document is to establish the activities necessary to either restrict future activities at the CASs or remove the contaminants to concentrations below preliminary action levels (PALs) thus making the facilities and/or areas available for unrestricted future use as identified in the *Nevada Test Site Resource Management Plan* (DOE/NV, 1998).

Corrective action investigation activities were performed from May 21 through June 30, 2003, with additional sampling conducted from November 10 through November 17, 2003, as set forth in the Corrective Action Investigation Plan (NNSA/NV, 2002a).

Analytes detected during the corrective action investigation of surface and subsurface soils were evaluated against appropriate PALs to identify contaminants of concern for each CAS. Subsequent sampling was conducted to define the horizontal and vertical extent of the contaminants of concern. Radiological measurements of bunker interiors, equipment, and on-site debris were compared to unrestricted and/or controlled release criteria. Assessment of the data generated from investigation activities revealed the following:

- CAS 01-34-01 - The paint inside the bunker is lead-based and organic contaminants (polychlorinated biphenyls [PCBs] and total petroleum hydrocarbons - diesel-range organics [TPH-DRO]) were identified in a stain on the floor. No radiological contaminants were identified inside or outside the bunker in concentrations exceeding unrestricted release criteria. No organic or inorganic contamination exceeding PALs was identified outside the bunker.

- CAS 02-34-01 - The paint inside the bunker is lead-based and organic contaminants (TPH, semivolatile organic compounds [SVOCs], volatile organic compounds [VOCs], and pesticides) were identified in a stain on the floor. No organic, inorganic, or radiological contaminants were identified outside the bunker in concentrations exceeding PALs or the unrestricted release criteria.

- CAS 03-34-01 - The paint inside the bunker is lead-based and some organic contaminants (TPH, VOCs, SVOCs, and PCBs) were identified in a stain on the floor. No radiological contaminants were identified inside or outside in concentrations exceeding unrestricted release levels. In addition, no organic or inorganic contaminants were identified outside the bunker.

- CAS 05-18-02 (Sugar Bunker) - The paint inside the bunker is lead-based and organic contaminants (VOCs, SVOCs, PCBs, TPH, and pesticides) were identified in two stains on the floor. No removable radiological contaminants were identified inside the bunker in concentrations exceeding uncontrolled release criteria. The soils surrounding the bunker are contaminated with depleted uranium in concentrations greater than PALs thus restricting use until further action is taken. Approximately 1,360 cubic yards (yd^3) of soil are affected by the radiological contamination.

- CAS 05-33-01 (Kay Blockhouse) - Soil inside the bunker contains plutonium at concentrations exceeding the PALs. Radiological and hazardous contaminants were found in the various features outside the bunker, but within the CAS boundary. Approximately 600 yd^3 of soil, 155 yd^3 of concrete, and 2,500 square feet (ft^2) of ¼-inch plate steel are impacted by the identified contaminants. Furthermore, friable asbestos was located in four locations within the CAS. Housekeeping measures could be taken to remove concrete, steel debris, and wires and cables throughout the CAS.

- CAS 05-99-02 contained no contaminants of concern.

Based on the evaluation of analytical data from the corrective action investigation, review of future and current operations of the Storage Bunkers at the Nevada Test Site, and the detailed and comparative analysis of the potential corrective action alternatives, the following corrective actions were selected for CAU 204 CASs.

No Further Action is the preferred corrective action for the following CASs:

- CAS 05-99-02, Explosive Storage Bunker – No contaminants of concern were identified at the CAS. It is recommended that the bunker be dismantled and the land returned to its natural state as a best management practice.

Closure in Place with Administrative Controls is the preferred corrective action for the following CASs:

- CAS 01-34-01, Underground Inst. House Bunker – Lead-based paint on the walls and a contaminated stain on the floor needs to be addressed prior to any further use of the interior of the bunker. The bunker should be closed and locked to prevent unauthorized entry. Signage should be installed warning of potential hazards.

- CAS 02-34-01, Instrument Bunker – Lead-based paint on the walls and a contaminated stain on the floor need to be addressed prior to any further use of the interior of the bunker. The bunker should be closed and locked to prevent unauthorized entry. Signage should be installed warning of potential hazards.

- CAS 03-34-01, Underground Bunker – Lead-based paint on the walls and a contaminated stain on the floor need to be addressed prior to any further use of the interior of the bunker. The bunker should be closed and locked to prevent unauthorized entry. Signage should be installed warning of potential hazards.

- CAS 05-18-02, Chemical Explosive Storage – Lead-based paint on the walls and contaminated stains on the floor need to be addressed prior to further use of the interior of the bunker. The bunker should be closed and locked and appropriate signage installed to prevent unauthorized entry. The area surrounding the bunker included in the CAS as well as the exterior of the bunker contains radioactive contamination and needs to be addressed prior to any further use of the area. Excavation and removal of the contaminated materials is not feasible at this time. The selected alternative includes expanding an adjacent Radioactive Materials Area to include the area surrounding the bunker and installation of the appropriate signage.

- CAS 05-33-01, Kay Blockhouse – Safety concerns regarding the stability of the bunker and its associated entryway have resulted in a recommendation to collapse the entryway to the bunker thus preventing access and exposure to the contaminants in the bunker interior. Because of the presence of beryllium at the entrance to the bunker, the collection of the soil in the immediate area is necessary prior to destruction of the entryway. Radiological contaminants are located throughout the immediate vicinity of the bunker so extending the boundaries of the existing Radioactive Materials Area to include some of the contaminated areas as well as the bunker entrance is the proposed corrective action. In addition, two cement-lined pits within the CAS boundary contain small quantities of contaminated material

and are insulated with asbestos-containing materials. Stabilization of the asbestos, removal of the contaminated material, and backfilling pits with clean soil creating a mound is included in this closure alternative. Two other small areas within the CAS boundary are contaminated with hazardous organic and inorganic constituents. Removal of the identified contaminated soils and disposal at an appropriate landfill is also included in the selected alternative for closure in place with administrative controls. Removal of various debris (e.g., cables, wires, piping, etc.) from within the CAS boundary has been deemed a useful site management activity helping to ensure worker safety.

The clean closure alternative is not recommended for any of the CASs within CAU 204.

The preferred corrective action alternatives were evaluated on technical merit focusing on performance, reliability, feasibility, and safety. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable state and federal regulations for closure of the site and will eliminate potential future exposure pathways to the contaminated media at CAU 204.

1.0 Introduction

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 204 Storage Bunkers, Nevada Test Site (NTS), Nevada, 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); and the U.S. Department of Defense (FFACO, 1996). The NTS is approximately 65 miles (mi) north of Las Vegas, Nevada (Figure 1-1). The Corrective Action Sites (CASs) within CAU 204 are located in Areas 1, 2, 3, and 5 of the NTS, in Nye County, Nevada (Figure 1-2). Corrective Action Unit 204 is comprised of the six CASs identified in Table 1-1. As shown in Table 1-1, the FFACO describes four of these CASs as bunkers one as chemical exchange storage and one as a blockhouse. Subsequent investigations have identified four of these structures as instrumentation bunkers (CASs 01-34-01, 02-34-01, 03-34-01, 05-33-01), one as an explosives storage bunker (CAS 05-99-02), and one as both (CAS 05-18-02).

Table 1-1
Corrective Action Unit 204 Corrective Action Sites

Nevada Test Site Area	Corrective Action Site	CAS Description[a]	General Location[b]
Area 1	01-34-01	Underground Instr. House Bunker	Building 1-300
Area 2	02-34-01	Instrument Bunker	Building 2-300
Area 3	03-34-01	Underground Bunker	Building 3-300
Area 5	05-18-02	Chemical Explosives Storage	Sugar Bunker near 5-03 Road
	05-33-01	Kay Blockhouse	5-07 Road near 5-03 Road
	05-99-02	Explosive Storage Bunker	Bunker 803

[a]CAS description from the FFACO (1996)
[b]General location from the FFACO (1996)

1.1 Purpose

The six bunkers included in CAU 204 were primarily used to monitor atmospheric testing or store munitions. The *Corrective Action Investigation Plan (CAIP) for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada* (NNSA/NV, 2002a) provides information relating to the history, planning, and scope of the investigation; therefore, it will not be repeated in this CADD.

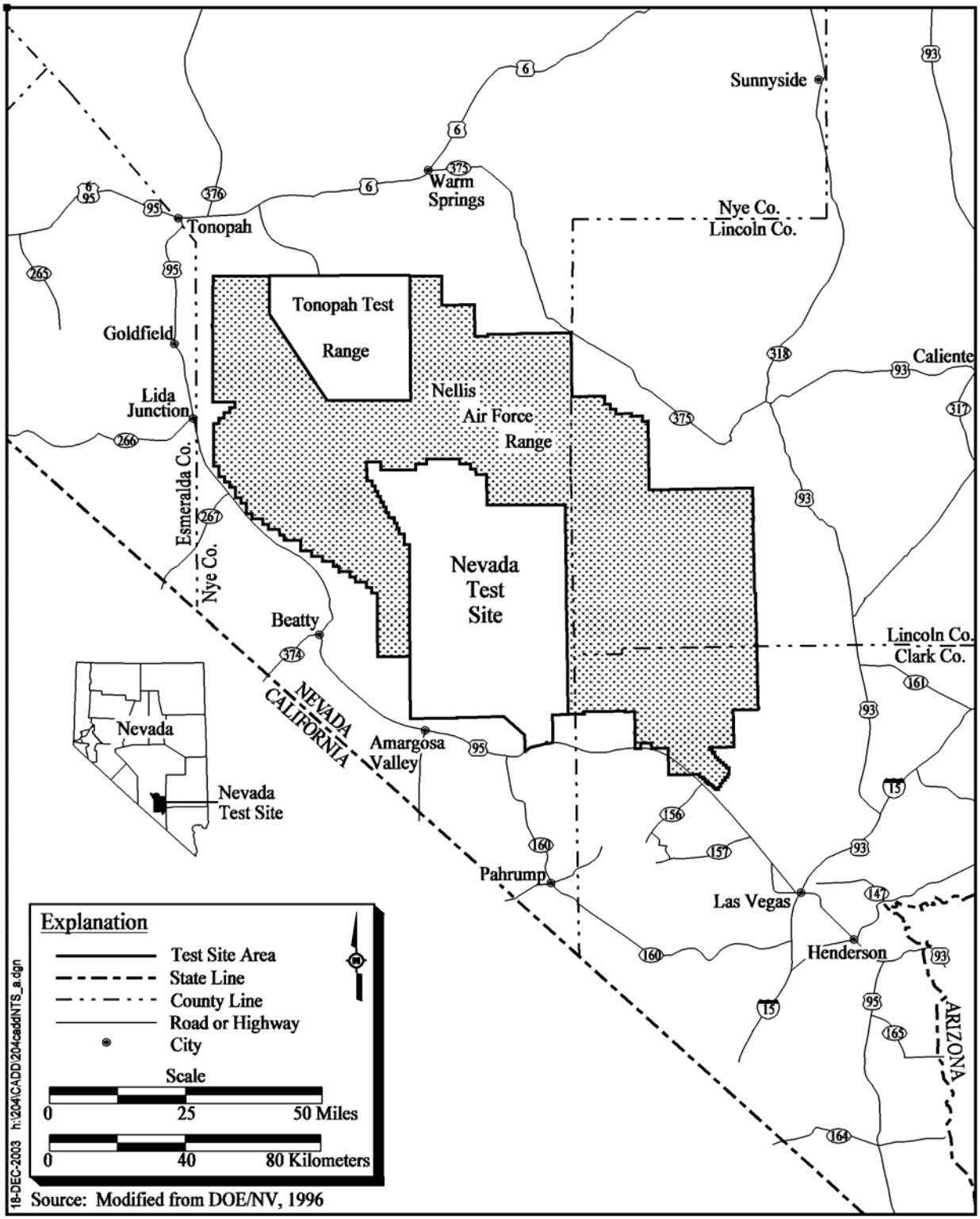

Figure 1-1
Nevada Test Site Location Map

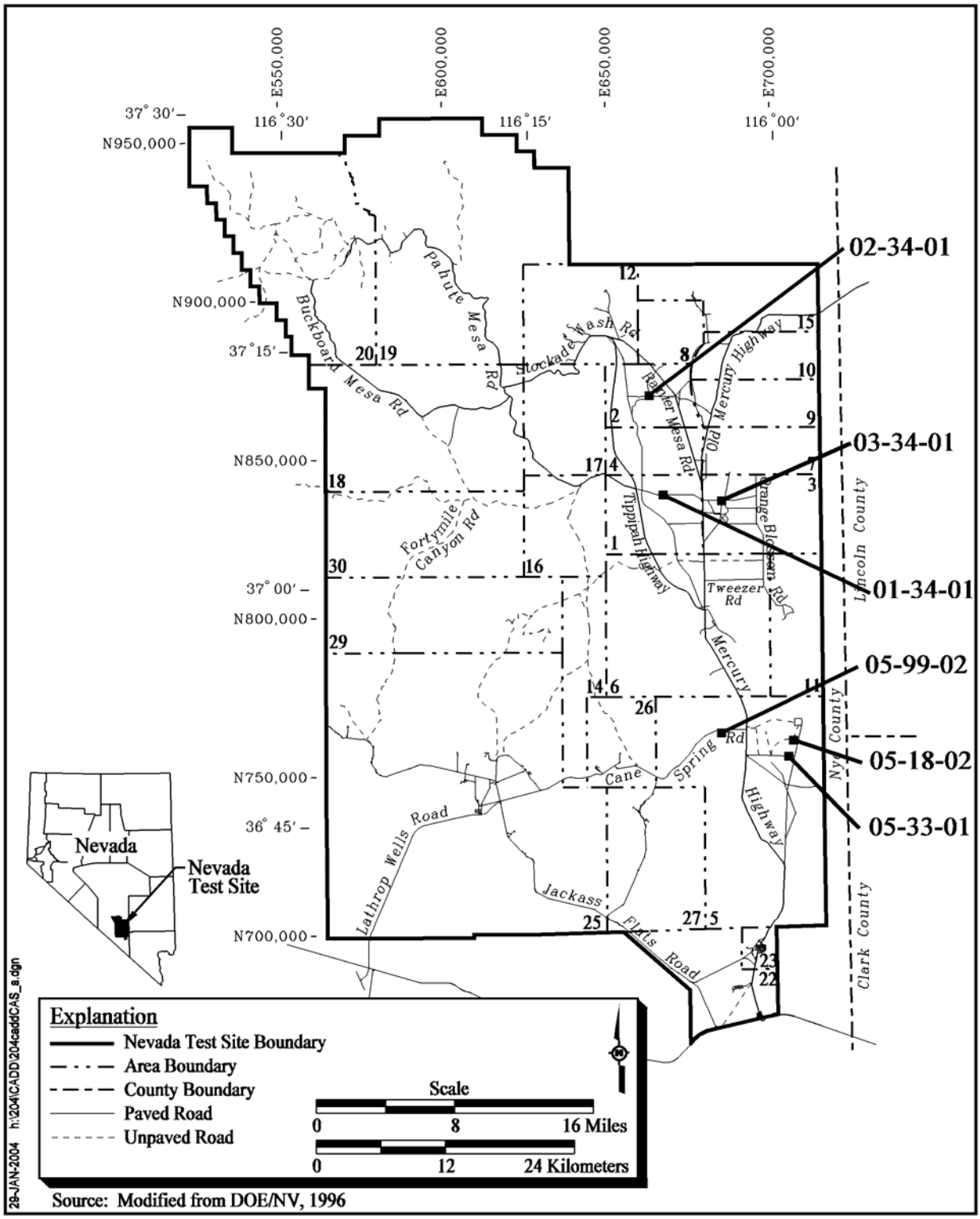

Figure 1-2
CAU 204, Storage Bunkers CAS Location Map

This CADD identifies potential corrective action alternatives and provides a rationale for the selection of a recommended corrective action alternative for each CAS within CAU 204. The evaluation of corrective action alternatives is based on process knowledge and the results of investigative activities conducted in accordance with the CAIP (NNSA/NV, 2002a) that was approved prior to the start of the Corrective Action Investigation (CAI).

Record of Technical Change (ROTC) No. 1 to the CAIP (approval pending) documents changes to the preliminary action levels (PALs) agreed to by the Nevada Division of Environmental Protection (NDEP) and DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO). This ROTC specifically discusses the radiological PALs and their application to the findings of the CAU 204 corrective action investigation.

1.2 Scope

The scope of this CADD consists of the following:

- Develop corrective action objectives.
- Identify corrective action alternative screening criteria.
- Develop corrective action alternatives.
- Perform detailed and comparative evaluations of corrective action alternatives in relation to corrective action objectives and screening criteria.
- Recommend and justify a preferred corrective action alternative for each CAS within CAU 204.

1.3 Corrective Action Decision Document Contents

This CADD is divided into the following sections:

Section 1.0 - Introduction: summarizes the purpose, scope, and contents of this CADD.

Section 2.0 - Corrective Action Investigation Summary: summarizes the investigation field activities, the results of the investigation, and the need for corrective action.

Section 3.0 - Evaluation of Alternatives: documents the steps taken to determine a preferred corrective action alternative.

Section 4.0 - Recommended Alternatives: presents the preferred corrective action alternative and the rationale for its selection based on the corrective action objectives and screening criteria.

Section 5.0 - References: provides a list of all referenced documents.

Appendix A - *Corrective Action Investigation Results for CAU 204, Storage Bunkers, Nevada Test Site, Nevada*: provides a description of the project objectives, field investigation and sampling activities, investigation results, waste management, and quality assurance. Section A.3.0 through Section A.8.0 provide CAS-specific information regarding field activities, sampling methods, and laboratory analytical results from the investigation.

Appendix B - *Data Assessment of Sample Results for CAU 204: Storage Bunkers, Nevada Test Site, Nevada*: summarizes the investigation results and compares them to the requirements set forth during the data quality objective (DQO) process.

Appendix C - *Cost Estimates for CAU 204: Storage Bunkers, Nevada Test Site, Nevada*: provides an estimate of the costs to be incurred during the closure activities at each CAS.

Appendix D - *Sample Location Coordinates for CAU 204: Storage Bunkers, Nevada Test Site, Nevada*: provides coordinates for investigation sample locations.

Appendix E - Project Organization for CAU 204: Storage Bunkers, Nevada Test Site, Nevada: identifies the NNSA/NSO Project Manager and other appropriate personnel involved with the CAU 204 characterization and closure activities.

Appendix F - NDEP Comments: NDEP had no comments on this CADD.

2.0 Corrective Action Investigation Summary

Corrective action investigation activities were performed as set forth in the CAU 204 CAIP (NNSA/NV, 2002a) from May 21 through June 30, 2003. Further investigation activities were performed from November 10 through November 17, 2003. To ensure all project objectives, health and safety requirements, and quality control procedures were adhered to, all investigation activities were performed in accordance with the following documents:

- *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada* (NNSA/NV, 2002a)
- *Field Instruction for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada* (Shaw, 2003).
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002b)
- *Federal Facility Agreement and Consent Order* (1996)
- *Project Management Plan* (DOE/NV, 1994)

The following sections describe and summarize these activities, provide the investigation results, and identify the need for corrective action at the CAS level. For detailed investigation results, refer to Appendix A.

2.1 Investigation Activities

The primary purpose of the CAU 204 CAI was to:

- Determine if contaminants of potential concern (COPCs) are present within the soils associated with the bunkers.
- Determine whether the COPCs, if present, exceed PALs thereby becoming contaminants of concern [COCs]).
- Define the lateral and vertical extent of identified COCs.
- Generate information and data to satisfy DQO data needs and evaluate corrective action alternatives for each CAS.

- Ensure adequate data have been collected to close the site under the *National Environmental Policy Act* (NEPA), *Resource Conservation and Recovery Act* (RCRA), and DOE requirements.

The scope of the CAI for CAU 204 included:

- Inspect bunker interiors for physical hazards and evidence of spills.
- Perform minor housekeeping activities, remove potential hazards from bunkers and access areas, and treat bunker interior for hantavirus.
- Collect biased waste characterization samples (e.g., paint chips, concrete chips, swipe samples) from suspect areas within the bunkers.
- Conduct radiological surveys and collect swipe samples within the bunkers.
- Conduct exploratory excavations to confirm contents of soil piles and geophysical anomalies.
- Conduct discrete field screening.
- Collect soil samples from biased locations within the CAS boundaries.
- Collect soil samples at step-out locations, as necessary, to further define the extent of contamination.
- Submit select soil samples for off-site laboratory analyses of COPCs.
- Collect a geotechnical/hydrological sample of native soil at select CASs for possible future analysis. These samples are to be archived until the final Corrective Action Alternative (CAA) is selected.

Field Screening

Field screening was conducted on soil samples using handheld instrument surveys for alpha and beta/gamma radiation, and gas chromatography for total petroleum hydrocarbons (TPH), when process knowledge, visible evidence, or site history indicated the presence of these types of contaminants. A photoionization detector was used for volatile organic compound (VOC) field screening and an NE Technology Electra survey instrument was used to identify alpha and beta/gamma radioactivity. On a selective basis, samples suspected of containing explosives were field screened using immunoassay methods.

Intrusive Investigation

Subsurface soil samples were collected by means of excavation with a backhoe and/or use of a sonic drill. Subsurface soil samples were collected from the backhoe bucket or from the drill barrel. Soil samples were placed into a stainless-steel bowl using a disposable scoop and mixed in an effort to homogenize the sample. After being homogenized, the material was screened for radiation, placed into the proper sample containers, and then submitted to an off-site laboratory for analysis to determine the presence and concentrations of COPCs. Samples for VOC and TPH (gasoline-range organics [GRO] and diesel-range organics [DRO]) analyses were collected and placed directly into containers without homogenization in an effort to minimize volatilization.

Surface soil samples were collected at CASs 02-34-01, 05-18-02, 05-33-01, and 05-99-02. In accordance with the CAIP (NNSA/NV, 2002a), surface samples were collected at biased locations. Surface soil samples were collected in the same manner as subsurface samples, except that samples were collected directly from the ground surface, not from a backhoe bucket or drill barrel.

The number of samples collected and submitted to the laboratory depended on field-screening results (FSRs). At each location, all samples were field screened and a minimum of one sample from each sampling location was submitted for off-site analysis. Field screening and step-out sampling was used to establish vertical and lateral contamination boundaries determined by two successive measurements below field-screening levels (FSLs). When field screening indicated that two consecutive soil sampling intervals were below FSLs, the sample closest to the original contamination was submitted for laboratory analysis. The further sample collected with screening results below FSLs was returned to the sampling location and not submitted for off-site analysis. Samples with screening results above FSLs were generally submitted for laboratory analysis.

A backhoe was utilized to collect subsurface soil samples at select locations. The purpose of this activity was to determine the vertical extent of potential contamination based on FSRs. Additionally, a subsurface geophysical anomaly that was identified at CAS 05-33-01 was investigated by excavating shallow trenches perpendicular to the geophysical anomaly.

Samples collected for geotechnical analyses were not analyzed since the results would not impact corrective action decisions; however, the samples were archived for possible future geotechnical

analysis. Several samples were collected for waste management purposes and are discussed in Appendix A.

Ventilation ductwork, corridors, electrical boxes and fixtures, piping, and furniture (e.g., chairs, tables) were inspected for the presence of potential contamination and sampled, when appropriate. All samples were submitted to an off-site laboratory for analysis. Material that was clearly not representative of system operation was not collected (e.g., gravel, plant and animal matter).

At all CASs that included a ramp to the bunker entrance, the ramps and all attached piping and conduits were inspected for contamination, both radioactive and hazardous. All bunkers were approached cautiously and inspected for structural integrity as the investigation proceeded. In some cases, Bechtel Nevada (BN) engineers were utilized to evaluate structures to ensure safe entry for all investigative personnel.

The interior of all CASs were screened and swiped for radiological characterization. Some of the surfaces included structure walls, racks, lighting fixtures, electrical cables, electrical boxes, and piping. Observations made during the excavation, sampling, and collection activities were recorded in field activity daily logs (FADLs) and are maintained in the project file.

Waste Characterization

Waste characterization activities include usual inspection and photodocumentation. Samples of suspected contaminated items (i.e., paint chips, concrete chips) were collected and analyzed. Analytical results are reported for future use in determining the CAA for each site.

Laboratory Analysis

Laboratory analysis of soil samples provides a means for quantitative measurement of COPCs. Based on process knowledge and the results of previous sampling efforts, an analytical assessment program was established in the CAIP to determine the nature of potential contamination at each CAS.

Laboratory analyses for soil samples typically included total VOCs, total semivolatile organic compounds (SVOCs), total RCRA metals including beryllium and asbestos, and total TPH (DRO and GRO). Other analyses performed on select soil samples include polychlorinated biphenyls (PCBs), gamma-emitting radionuclides, isotopic uranium (U), isotopic plutonium (Pu), strontium(Sr)-90,

explosives, zinc, and pesticides. The soil sample analytical program followed during the investigation is presented in Table 2-1.

Table 2-1
Soil Sample Analyses Conducted at CAU 204

Corrective Action Site	Analysis							
	Total VOCs, Total SVOCs Total RCRA Metals	Total Beryllium	Rodenticide, (Warfarin, Zinc)	Explosives	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90
CAS 01-34-01	X	X	X		X	X	X	X
CAS 02-34-01	X	X	X		X	X	X	X
CAS 03-04-01	X	X	X		X	X	X	X
CAS 05-18-02	X	X	X	X	X	X	X	X
CAS 05-33-01	X	X	X	X	X	X	X	X
CAS 05-99-02	X[a]	X	X	X				

[a]Excluding TPH at CAS 05-99-02

Analyses were also performed on cement and paint chip samples to support waste characterization. As appropriate, analyses for waste determination typically included total SVOCs, toxicity characteristic leaching procedure (TCLP) RCRA metals, PCBs, total pesticides and U, Pu, Sr-90, and gamma-emitting radionuclides. The waste characterization analytical program is presented in Table 2-2.

Conceptual Site Models

Conceptual site models (CSMs) were developed that represented the release mechanisms and potential migration pathways for each CAS. These CSMs along with a detailed discussion are provided in the CAIP. The migration pathways and release mechanisms identified during the CAI were consistent with the CSMs provided in the CAIP. The CSMs included soil potentially impacted by surface and/or subsurface disposal/release (e.g., burn pits, spills, and leaks). The models assumed that any contamination would be concentrated in the soil immediately beneath and adjacent to the potential point of release (bunker doorways, in and near burn/test pits). The extent of impacts to

Table 2-2
Waste Characterization Sample Analyses Conducted at CAU 204

Corrective Action Site	Analyses			
	Total VOCs, Total SVOCs, Total RCRA Metals, TPH(DRO,GRO)	Lead (Paint Chip samples)	Asbestos	PCB
CAS 01-34-01	X	X		X
CAS 02-34-01	X	X		X
CAS 03-34-01	X	X		X
CAS 05-18-02	X	X		X
CAS 05-33-01			X	
CAS 05-99-02	Not Sampled			

underlying soil is expected to be variable and dependent upon the volume and frequency of release, physical and chemical properties of the surrounding media, geological conditions, and physical and chemical properties of the COPCs.

Sections 2.1.1 through 2.1.6 discuss the investigative activities conducted at each of the CAU 204 CASs. Results of the investigation validate the CSMs outlined above and presented in the CAIP for CAU 204 (NNSA/NV, 2002a). Refer to Appendix B for a discussion of the CSMs.

2.1.1 Underground Inst. House Bunker (CAS 01-34-01)

The Underground Inst. House Bunker consists of an underground 1,920 square feet (ft^2) concrete structure with a 1.7-foot (ft) thick concrete floor. The bunker has an equipment room, coax room, and instrumentation room; it also houses an air conditioning system, dehydrator, telephone and signal facilities, electric heating system, and a hoist. A ventilation system leads to the outside of the bunker. Most of the instrumentation used during previous projects has been removed.

Land Area Radiological Survey

A land area radiological walk-over survey of the surface soil within the CAS boundary was conducted. None of the readings recorded exceeded the FSLs. An interior radiological swipe survey was conducted to determine the removable radioactivity within the bunker. None of these samples showed radioactivity that exceeded the unrestricted release criteria per Table 4-2 of the *NV/YMP Radiological Control (RadCon) Manual* (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.3-1 and Table A.3-2, respectively.

Field Screening and Intrusive Investigation Activities

The results of the land area walk-over and swipe radiological surveys and site inspection did not identify any contamination. Therefore, no field screening or intrusive activities were conducted. Based on the results of the CAI, the DQOs for CAS 01-34-01 were met. Further discussion of the DQOs are included in Appendix B.

Investigation activities associated with CAS 01-34-01 are further detailed in Section A.3.2 of Appendix A.

Waste Characterization

Waste characterization activities conducted at CAS 01-34-01 included visual inspection, photodocumentation, and collection of concrete and paint chip samples.

A visual inspection of the interior of the bunker showed some stains on the floor, but no obvious release of contaminants to the exterior environment of the bunker. The inspection also identified the presence of potential lead-based paint. Chip samples of the concrete floor where the stain was located and the paint, suspected of being lead-based, were collected and analyzed. Analytical results showed that the concrete stain contained five metals, three VOCs, DRO, two SVOCs, one PCB (aroclor), and five pesticides except heptachlor (0.008 milligrams per liter [mg/L] maximum concentration) for the toxicity characteristic which carries a D031 hazardous waste code. The results also showed that the paint is lead-based. None of the concentrations exceeded the hazardous waste disposal criteria above the reporting level (Table A.3-3).

2.1.2 Instrument Bunker (CAS 02-34-01)

The Instrument Bunker consists of an underground 1,920 ft^2 concrete structure with a 1.7-ft thick concrete floor with the exception of one room that has a wooden floor. The bunker is made up of the equipment room, coax room, instrumentation room, and photoprocessing room. The facility houses an air conditioning system, dehydrator, telephone and signal facilities, electric heating system, and a hoist. A ventilation system leads to the outside of the bunker. Most of the instrumentation used for the tests have been removed. This CAS also includes a small building adjacent to the main bunker referred to as Station 2-63.

Land Area Radiological Survey

A land area radiological walk-over survey of the surface soil within the CAS boundary was conducted. None of the readings recorded exceeded the FSLs. An interior radiological swipe survey was conducted to determine the removable radioactivity within the bunker. A total of 119 swipe samples were collected from the interior of the bunker and Station 2-63. None of these samples showed removable radioactivity that exceeded the unrestricted release criteria per Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.4-2, Figure A.4-3, and Table A.4-2, respectively.

Field Screening

Screening for VOCs and alpha and beta/gamma radioactivity was conducted on waste characterization samples collected from the stained area and from soils beneath where lead shot was found outside the bunker. Neither sample location showed VOCs in concentration or radioactivity greater than the FSLs. The data were used to determine if subsurface soil samples needed to be collected. Since the FSRs were less than the FSLs, no additional sampling was conducted.

Intrusive Investigation Activities

During the visual inspection of the exterior of the bunker, a small stained area and a small quantity of lead shot were identified. The lead shot was removed as investigation-derived waste (IDW) and two soil samples were collected, one from where the shot was located and one from the center of the stained area. The analytical results did not identify any contamination at these two locations that exceeded the PALs; therefore, no COCs were identified and no further intrusive sampling was conducted. The result of the analyses are shown in Table A.4-3 and Table A.4-4 in Section A.4.2 of

Appendix A. Based on the results of the radiological surveys and the results of the two environmental samples collected outside the bunker, the DQOs for CAS 02-34-01 were met.

Investigation activities associated with CAS 02-34-01 are further detailed in Section A.4.2 of Appendix A.

Waste Characterization

Waste characterization activities conducted at CAS 02-34-01 included visual inspection, photodocumentation, and collection of concrete and paint chip samples.

A visual inspection of the interior of the bunker identified a stained area on the floor of the bunker and the presence of lead-based paint. Chip samples of the stain on the concrete floor and the paint, suspected of being lead-based, were collected and analyzed. Analytical results showed that the concrete stain contained TPH, four metals, six VOCs, one SVOC, three pesticides and showed that the paint is lead-based (Table A.4-3). There was no evidence that the contaminants in the stain had migrated outside the bunker.

2.1.3 Underground Bunker (CAS 03-34-01)

The Underground Bunker consists of an underground 1,160 ft^2 concrete structure with a 1.7-ft thick concrete floor. The bunker is composed of an equipment room, coax room, and instrumentation room; it also houses an air conditioning system, sump pump, two compressors, signal facilities, and a hoist on the exterior. A ventilation system leads to the outside of the bunker. Most of the instrumentation previously used for testing has been removed.

Land Area Radiological Survey

A land area radiological walk-over survey of the surface soil within the CAS boundary was conducted. None of the readings recorded exceeded the FSLs. An interior radiological swipe survey was conducted to determine the removable radioactivity within the bunker. A total of 73 swipe samples were collected from the interior of the bunker. None of these samples showed radioactivity that exceeded the unrestricted release criteria per Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.5-2 and Table A.5-2, respectively.

Field Screening

Screening for VOCs and alpha and beta/gamma radioactivity was conducted on waste characterization samples collected from the stained area inside the bunker. The samples did not show VOCs in concentration or radioactivity greater than the FSLs. Since the FSRs were less than the FSLs, no additional sampling was conducted. There was no evidence that contamination identified inside the bunker has migrated to the surrounding soil. Therefore, the scope of the field screening was used to conclude characterization is adequate and the contaminants have not migrated to the soil or beyond the bunker, thus the DQOs for CAS 03-34-01 were met.

Investigation activities associated with CAS 03-34-01 are further detailed in Section A.5.2 of Appendix A.

Waste Characterization

Waste characterization activities conducted at CAS 03-34-01 included visual inspection, photodocumentation, and collection of concrete and paint chip samples.

A visual inspection of the interior of the bunker identified a stained area on the floor of the bunker and the presence of suspected lead-based paint. Chip samples of the concrete floor where the stains were located and paint, suspected of being lead-based, were collected and analyzed. Analytical results showed that the concrete stains contained two TPHs, one PCB (aroclor), and two pesticides, and the paint is lead-based (Table A.5-3). There was no evidence that any of these contaminants have migrated to the soil or environment outside the bunker.

2.1.4 Chemical Explosives Storage (CAS 05-18-02)

The Chemical Explosives Storage consists of the Sugar Bunker, a smaller adjacent bunker, and two cellar units that are adjacent to the south end of the Sugar Bunker. The Sugar Bunker is constructed of concrete and steel. There is a large ventilation system on the north end outside of the entrance to the bunker. Inside the bunker the floor is concrete. Steel beams are visible in the ceiling. Two cellar units, located to the south of the bunker, are constructed of steel coverings that are accessible from the southern exterior. The area surrounding the bunker is included in this CAS and comprises approximately 2 acres.

Land Area Radiological Survey

A land area radiological walk-over survey of the surface soil within the CAS boundary was conducted. A number of locations surveyed registered readings exceeding the FSLs. As a result of the walk-over survey, samples were taken from biased locations having the highest readings. Samples were collected from the various sample locations ranging in depth from the surface to 24 ft below ground surface (bgs). Step-out samples were also collected in an effort to bound the contamination.

An interior radiological swipe survey was conducted to determine the removable and fixed radioactivity within the bunker. A total of 107 swipe samples were collected from the interior of the bunker. None of the interior swipe samples showed removable radioactivity that exceeded the controlled release criteria per Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.6-2, Figure A.6-3, and Table A.6-2, respectively.

Field Screening

Screening for VOCs and alpha and beta/gamma radioactivity was conducted on characterization samples collected from the stained area inside the main bunker. The sample location did not show VOC concentration or radioactivity greater than the FSLs. Since the FSRs were less than the FSLs, no additional sampling was conducted. Screening of soil from the area surrounding the bunker was used to establish bias when determining which soils should be sampled and analyzed for radioactivity. Field screening was also used to establish the depth of contamination. As dictated by FSRs, samples were collected from increasing depth until two samples from the same location at increasing depths screened negative for radioactivity. The shallower of the two samples was collected and sent for analysis.

Investigation activities associated with CAS 05-18-02 also resulted in the collection of two geotechnical samples. Further details are found in Section A.6.2 of Appendix A.

Waste Characterization

Waste characterization activities conducted at CAS 05-18-02 included visual inspection, photodocumentation, and collection of concrete and paint chip samples.

A visual inspection of the interior of the main bunker identified a stained area on the floor of the bunker and paint suspected of being lead-based. Chip samples of the stains on the concrete floor and the potential lead-based paint were collected and analyzed. Analytical results showed that the concrete stains contained TPH, six metals, four pesticides, one PCB, eight VOCs, two SVOCs, and the paint is lead-based (Table A.6-3).

2.1.5 Kay Blockhouse (CAS 05-33-01)

The Kay Blockhouse site consists of the Kay Blockhouse, two burn pits with steel frames, one burn pit with a soil berm, two open pits, two steel-lined subsurface pits, one berm with embedded piping, one berm with piping debris, a burn area with a large concrete block with an embedded steel prong, and one open pit with a concrete foundation at the north end. The Kay Blockhouse is constructed of concrete with a wooden door. The details of the construction of the floor are unknown. The entire area included in the CAS is approximately 11 acres.

Radiological Survey

A radiological walk-over survey of the surface soil within the CAS boundary was conducted. Multiple areas surveyed within the CAS registered readings exceeding the FSLs. As a result of the walk-over survey, samples were taken from biased locations registering the highest readings. Samples were collected from sample locations ranging in depth from the surface to 30 ft bgs. Step-out samples were also collected in an effort to bound the contamination. An interior radiological swipe survey was conducted to determine the removable radioactivity within the bunker. A total of 55 swipe samples were collected from the interior of the bunker. None of the swipe samples showed removable radioactivity that exceeded the unrestricted release criteria per Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.7-3 and Table A.7-2, respectively.

Field Screening

Screening for VOCs and alpha and beta/gamma radioactivity was conducted on characterization samples collected from biased locations throughout the CAS. Samples collected from the CAS were analyzed for metals, VOCs, SVOCs, TPH, and PCBs. A few of the locations sampled had positive results for these contaminants. Results of these analyses are presented in Section A.7.0 of Appendix A.

Screening of soil from the area surrounding the bunker was used to establish bias when determining which soils should be sampled and analyzed for radioactivity. Field screening was also used to establish the depth of contamination. As dictated by FSRs, samples were collected from increasing depth until two samples from the same location at increasing depths screened negative for radioactivity. Then the shallower of the two samples was collected and sent for analysis.

Waste Characterization

Waste characterization activities conducted at CAS 05-33-01 included visual inspection, photodocumentation, and the collection of fiber samples thought to be asbestos.

A visual inspection of the interior of the bunker revealed that the floor of the bunker was covered with 3 to 6 inches (in.) of soil. Because of the questionable stability of the bunker, only 5 soil samples from inside the bunker and 55 swipe samples were collected. Four locations throughout the CAS contained fibers used to insulate various pits and frames. A total of 37 samples were collected and analyzed for asbestos. Analytical results showed that the fibers are asbestos.

Field-screening readings were compared to FSLs to guide sampling decisions and determine which samples were to be submitted for laboratory analysis. As a result of field screening, 3 geotechnical samples and 156 site characterization soil samples from approximately 39 excavations were collected. Further details are found in Section A.7.2 of Appendix A.

2.1.6 Explosive Storage Bunker (CAS 05-99-02)

The Explosive Storage Bunker is a wooden storage shed (approximately 25 ft^2) with a dirt floor. The bunker was built into the side of the Cane Springs Wash and was reportedly used to store conventional explosives.

Land Area Radiological Survey

A land area radiological walk-over survey of the surface soil within the CAS boundary was conducted. None of the recorded readings exceeded the FSLs. An interior radiological swipe survey was conducted to determine the removable radioactivity within the bunker. None of these samples showed radioactivity activity that exceeded the unrestricted release criteria per Table 4-2 of the

NV/YMP RadCon Manual (DOE/NV, 2000). The location of the swipe samples and results of the screening are presented in Figure A.8-2 and Table A.8-2, respectively.

Field Screening and Intrusive Investigation Activities

The results of the land area walk-over and swipe radiological surveys and site inspection did not identify any potential contamination, although three soil samples were collected for analysis.

Waste Characterization

Waste characterization activities conducted at CAS 05-99-02 included visual inspection and photodocumentation.

During field screening, readings were compared to FSLs to guide sampling decisions and determine which samples were to be submitted for laboratory analysis. As a result of field screening, no excavation was necessary. Two site characterization samples and one duplicate as well as six swipe samples were collected from the interior of the bunker. The analyses conducted on the samples are listed in Table A.8-1.

2.2 Results

A summary of characterization data from the corrective action investigation are provided in Section 2.2.1. This information illustrates the degree of characterization accomplished through the field effort and identifies those COPCs that exceeded PALs for soil. Section 2.2.2 summarizes the data assessment provided in Appendix B, which demonstrates that the investigation results satisfy the DQO data requirements.

2.2.1 Summary of Characterization Data

Chemical and radiological results for characterization sample concentrations exceeding PALs (NNSA/NV, 2002a) in each of the CASs are presented in Section 2.2.1.1 through Section 2.2.1.6. The PALs for the CAU 204 investigation were determined during the DQO process. For chemical COPCs, PALs are based on U.S. Environmental Protection Agency (EPA) *Region 9 Industrial Preliminary Remediation Goals* (PRGs) (EPA, 2002) and 100 milligrams per kilogram (mg/kg) for TPH per *Nevada Administrative Code* (NAC) 445A (NAC, 2003). For radiological COPCs, PALs

are listed in the ROTC No. 1 to the CAIP (NNSA/NV, 2002a). To document subsequent agreements between NDEP and NNSA/NSO regarding the reference source and values for radiological PALs and the application of those PALs to the finding of the CAU 204 corrective action investigation, ROTC No. 1 to the CAIP was completed.

Background concentrations for metals were used instead of PRGs when the natural background concentration exceeded the PRG, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999).

Radionuclide concentrations measured in CAU 204 environmental samples were compared to isotope-specific PALs.

The corrective action investigation analytical results are organized by CAS and are summarized in the following sections. Details of the methods used during the investigation and a comparison of environmental sample results to the PALs are presented in Appendix A. Based on these results, the nature and extent of COCs at CAU 204 have been adequately identified to develop and evaluate corrective action alternatives. Both chemical and radioanalytical result summaries specific to each CAS are presented in the following subsections. All rejected data are addressed in Appendix B.

2.2.1.1 Underground Inst. House Bunker (CAS 01-34-01)

Swipe samples were gathered and analyses showed no fixed or removable alpha or beta/gamma activity exceeding the unrestricted release criteria in Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). Visual inspection of the interior of the bunker resulted in the collection of two waste characterization samples (one paint and one cement). Analyses of these samples revealed the paint sample to be lead-based and the stain on the concrete contains five RCRA metals, three VOCs, two SVOCs, one PCB, and five pesticides. The analysis results are presented in Table A.3-3. Because there were no radiological results that exceeded the FSLs and no obvious signs of contamination migration to the soil outside the bunker, site characterization samples were not considered necessary nor were any collected.

2.2.1.2 Instrument Bunker (CAS 02-34-01)

Swipe samples were collected and analyses revealed that no fixed or removable alpha or beta/gamma radioactivity exceeded the unrestricted release criteria in Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). Visual inspection of the interior of this bunker resulted in the collection of two waste characterization samples (one paint/concrete and one concrete). Analyses of these samples revealed that the paint is lead-based and the stain on the concrete contains metals, TPH, VOCs, SVOCs, and pesticides (Table A.4-3). The pesticides found were commonly used in the 1950s and 1960s to control rodent and insect populations and PCBs were common constituents in dielectric, hydraulic, and motor oils. Two surface soil samples were collected from the accumulated soil on the cement ramp leading down to the bunker entrance. The soil samples analyzed for total VOCs, total SVOCs, total RCRA metals, TPH, gamma spectroscopy, isotopic Pu, isotopic U, and Sr-90 were found to contain no contaminants in concentrations exceeding PALs. Analyses results are presented in Table A.4-4.

2.2.1.3 Underground Bunker (CAS 03-34-01)

Swipe samples were gathered and analyses revealed that the fixed or removable alpha and beta/gamma activity does not exceed the unrestricted release criteria specified in Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). Visual inspection of the interior of this bunker resulted in the gathering of three waste characterization samples (i.e., one paint, one concrete, and one concrete duplicate). Analyses of these samples revealed that the paint is lead-based and the stain on the concrete contains some organic contaminants. Analytical results for the waste characterization samples are presented in Table A.5-3. Visual inspections and radioactivity surveys identified no potential releases of contaminants to the environments. Therefore, in accordance with the CAIP, no site characterization samples were collected.

2.2.1.4 Chemical Explosives Storage (CAS 05-18-02)

Swipe samples of the interior of the bunker were collected and analyses revealed that no fixed or removable alpha or beta/gamma radioactivity exceeded the controlled release criteria in Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). Visual inspection of the interior of this bunker resulted in the collection of three waste characterization samples (two concrete and one paint).

Analysis of these samples revealed that the paint is lead-based and the stain on the concrete contains metals, TPH, VOCs, SVOCs, and pesticides.

Analysis of the soil samples revealed the presence of 5 VOCs, 1 SVOC, 7 metals, and TPH. Further sample analysis of the soil samples revealed radioactive contamination greater than PALs in 11 of 31 sample locations. All contamination was found to exist in the top one-foot of soil, although samples were taken from depths up to 15 ft bgs. Analytical results are listed in Tables A.6-3 through A.6-9.

2.2.1.5 Kay Blockhouse (CAS 05-33-01)

Sample investigation and analysis revealed contamination in a number of locations. Results show beryllium to be present in the soil sample at location E29 in a concentration greater than the administrative screening guideline for beryllium in soil, but less than the PAL (1,900 mg/kg). The administrative screening guideline for beryllium in soil is a conservative health and safety screening level established to maintain compliance with the DOE chronic beryllium disease prevention program as required by DOE Order 440.1 (DOE, 1998). The screening guidance is based on a soil resuspension model conservatively applied to the airborne action level. There are multiple possibilities on how the Be may have reached this location. Two possibilities are explosives or windblown.

Analytical results show radioactivity contamination at sample location E27, E161, E163, E34, and E157 (Figure A.7-1). As the sample analyses were gathered, it became apparent that a contamination plume developed with the suspected origin being the pipe and valve (sample location E27) protruding from the blockhouse. The contamination above PALs is confined to soils from the surface to a depth of one foot.

The analytical results showed that radioactive contamination is present at concentrations greater than PALs at sample location E23. The analytical results from step-out samples show the contamination above PALs was restricted to the steel-lined pit. In addition, lead was identified to be a COC at this location. This sample location is confined to the westernmost steel-lined pit. Waste characterization samples gathered from the lining of the perimeter of this pit also revealed the presence of asbestos.

Waste characterization samples from the lining of the easternmost steel-lined pit also show the presence of asbestos. Waste characterization samples gathered from the piping in the burn-pit with soil berm located in the northeast corner of the CAS contain asbestos as well as the insulation of the steel framing in the western burn pit with steel frame also located in the northeast corner of the CAS. Analytical results are listed in Tables A.7-3 through A.7-12.

2.2.1.6 Explosive Storage Bunker (CAS 05-99-02)

Swipe samples were gathered from within the bunker and analyses showed the fixed and removable alpha and beta/gamma radioactivity to be less than the unrestricted release criteria in Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000). Two soil samples were gathered and analyzed for total VOCs, total SVOCs, total RCRA metals, TPH, beryllium, PCBs, explosives, zinc, and warfarin. The analytical results showed no COCs. Analytical results are listed in Tables A.8-1 and A.8-3.

2.2.2 Data Assessment Summary

An assessment of CAU 204 investigation results determined that the data collected met the DQOs and support their intended use in the decision-making process. The assessment, provided in Appendix B, includes an evaluation of the data quality indicators (DQIs) to determine the degree of acceptability and usability of the reported data in the decision-making process. Additionally, a reconciliation of the data to the CSM established for this project was conducted. Conclusions were based on the results of the quality control measurements and are discussed in Section A.10.0 of Appendix A and in Appendix B.

The overall results of the assessment indicate that the DQI goals for precision, accuracy, completeness, representativeness, and comparability have been achieved. Precision and accuracy of the datasets were demonstrated to be within acceptable limits for a high percentage of the data. Completeness objectives for CAU 204 have been achieved. Rejected data were thoroughly reviewed and questions concerning these data are addressed in Appendix B.

Representativeness of site characteristics was demonstrated with the CAU 204 data. The data was evaluated to ensure that project data are comparable to PALs and regulatory disposal limits. Data were analyzed utilizing analytical methods and laboratory requirements as specified in the CAIP

(NNSA/NV, 2002a). Achieving all of the DQI goals supports acceptance of the CAU 204 datasets, thereby meeting the DQOs established for this project and the subsequent use of these data in the decision-making process.

2.3 Need for Corrective Action

Analytes detected during the corrective action investigation were evaluated against PALs to determine COCs for each CAS in CAU 204. These CAS-specific COCs are provided in the following subsections. The impacted volume/characteristics and site-specific constraints are provided in each CAS-specific subsection. The corrective action alternatives are identified in Section 3.0 and evaluated for their ability to ensure protection of the public and the environment in accordance with NAC 445A (NAC, 2003), feasibility, and cost effectiveness.

2.3.1 Underground Inst. House Bunker (CAS 01-34-01)

Contaminants of concern were not detected at concentrations greater than PALs outside of the Underground Inst. House Bunker (CAS 01-34-01). The interior of the bunker has been painted with lead-based paint and a stain on the cement floor contains a number of organic contaminants. Prior to resuming use of this facility, the paint on the walls needs to be either removed or affixed, but until the bunker is identified for a future use, no further action is necessary for this CAS other than to close and secure the door to prevent unauthorized entry. There are no site-specific constraints that would limit the affixing of the lead-based paint and cleaning the stained areas.

2.3.2 Instrument Bunker (CAS 02-34-01)

Contaminants of concern were not detected at concentrations greater than PALs outside of the Underground Instrument House Bunker (CAS 02-34-01). The interior of the bunker has been painted with lead-based paint and a stain on the cement floor contains a number of organic contaminants. Prior to resuming use of this facility, the paint on the walls needs to be either removed or affixed, but until the bunker is identified for a future use, no further action is necessary for this CAS other than to close and secure the door to prevent unauthorized entry. There are no site-specific constraints that would limit the affixing of the lead-based paint and cleaning the stained areas.

2.3.3 Underground Bunker (CAS 03-34-01)

Contaminants of concern were not detected at concentrations greater than PALs outside of the Underground Inst. Bunker (CAS 03-34-01). The interior of the bunker has been painted with lead-based paint and a stain on the cement floor contains a number of organic contaminants. Prior to resuming use of this facility, the paint on the walls needs to be either removed or affixed, but until the bunker is identified for a future use, no further action is necessary for this CAS other than to close and secure the door to prevent unauthorized entry. There are no site-specific constraints that would limit the affixing of the lead-based paint and cleaning the stained areas.

2.3.4 Chemical Explosives Storage (CAS 05-18-02)

The Chemical Explosives Storage (CAS 05-18-02), also referred to as Sugar Bunker, consists of an underground bunker, an attached underground bunker, two underground vaults, and the surrounding area (approximately two acres). The interior of the bunker has been painted with lead-based paint and stains on the cement floor contain organic contaminants. Prior to resuming use of this facility, the paint on the walls needs to be either removed or affixed, but until the bunker is identified for a future use, no further action is necessary for this bunker other than to close and secure the door to prevent unauthorized entry. There are no site-specific constraints that would limit the affixing of the lead-based paint and cleaning the stained areas.

Soil samples from the exterior of the bunker were collected and analytical results were positive for radioactive contamination at concentrations greater than PALs. Eleven exterior site characterization samples had analytical results that exceeded the radiological PALs. In all contaminated sample locations the contamination was confined to the top one foot of soil. There appears to be no obvious plume characteristics because a clear pattern of vertical and horizontal contamination is not apparent. The identified radioactive contamination extends to the edge of the CAS boundary and into an area to the west of the CAS that is currently posted as a Radioactive Materials Area (RMA).

Cleaning the soils in the area surrounding the bunker to free release criteria will involve the excavation of approximately 1,360 cubic yards (yd^3) of soil and the landscaping and possible backfilling of the affected area. Prior to resuming use of this facility, the environs will need to be

remediated of contaminants, but until the area is identified for a future use, fencing and posting the area as containing radioactive contamination is necessary.

2.3.5 Kay Blockhouse (CAS 05-33-01)

Kay Blockhouse (CAS 05-33-01) includes an underground bunker and an area of approximately 11 acres surrounding the bunker. Over time, 2 to 4 in. of soil has blown or washed into the bunker and been deposited on the floor. Five soil samples from the interior of the bunker were collected and two of the samples had positive results for Pu-239 contamination at concentrations below PALs (Table A.7-11). The entry into the bunker is constructed of timbers and plywood and is deemed unsafe by BN engineers. Prior to collecting the soil from inside the bunker, the structure needs to be made safe for entry. Collapsing the entrance and leaving the current RMA in place to restrict access is a course of action that would ensure containment of the contamination.

Samples collected from steel frames in burn pits in the northeast corner of the CAS had positive analytical results for asbestos. Clean closure of this area would necessitate the removal of the asbestos from the frames. The frames themselves are not contaminated and the surrounding soils are not contaminated above PALs.

Two steel-lined pits are located in the central area of the CAS. These pits are constructed of concrete and lined with steel. Samples collected from the westernmost pit had positive results for radioactive, organic, and inorganic contaminants (explosives Royal Demolition Explosive [RDX], thorium [Th]-234, thallium [Tl], lead [Pb]-212, bismuth [Bi]-212, actinium [Ac]-228, and lead) in concentrations greater than PALs. The space between the concrete and the steel is insulated with asbestos, which was identified by sample analysis. The clean closure alternative will involve the removal and disposal of the contaminated soils from the bottom of the pits (approximately 8 yd^3 per pit), the removal and disposal of the asbestos, and either the cleaning or the removal and disposal of the concrete and appropriate landscaping. A modified clean closure alternative will involve the removal and disposal of the contaminated soils from the bottom of the pits, the affixing of the asbestos by pouring epoxy into the gap containing the asbestos, and filling the pit with soil and creating a berm over the aboveground part of the pit completely covering and isolating the pits. This will involve backfilling the pits with approximately 100 yd^3 of soil for each pit.

Sample location E21 (Figure A.7-1) is contaminated with metallic lead and TCLP lead. The clean closure alternative of this sample location will involve the excavation, confirmation sampling, and disposal of approximately 4 yd^3 of soil in an appropriate facility. The close in place with administrative controls alternative involves leaving the current RMA in place.

On the southern edge of the CAS is a large area involving five sample locations that had analytical results for radioactive contaminants (U-238 and Ac-228) in concentrations greater than PALs. The clean closure alternative will involve the excavation and disposal of approximately 560 yd^3 of soil. The close in place with administrative controls will involve extending the current RMA to include the sample locations at the CAS boundary.

The entrance to the Kay Blockhouse (sample location E29) had positive analytical results for beryllium in concentrations greater than 40 mg/kg. This is the soil concentration that has been calculated to be necessary to equal the DOE respirable air concentration of 0.2 micrograms per cubic meter ($\mu g/m^3$) (per 10 CFR 850, "Chronic Beryllium Disease Prevention Program"). This area already lies within the boundaries of the existing RMA and will come into play if the entrance to the blockhouse is collapsed. The amount of soil affected is approximately 20 yd^3.

2.3.6 Explosive Storage Bunker (CAS 05-99-02)

No contaminants of concern were detected in concentrations greater than PALS at the Explosive Storage Bunker (CAS 05-99-02). No further action is necessary for this CAS.

3.0 Evaluation of Alternatives

The purpose of this section is to present the corrective action objectives for CAU 204, describe the general standards and decision factors used to screen the corrective action alternatives, and develop and evaluate a set of corrective action alternatives that could be used to meet the corrective action objectives.

3.1 Corrective Action Objectives

The corrective action objectives are media-specific goals for protecting human health and the environment. Based on the potential exposure pathways, the following corrective action objectives have been identified for CAU 204:

- Prevent or mitigate exposure to media containing COCs at concentrations exceeding PALs as defined in the CAIP (NNSA/NV, 2002a) and ROTC #1.
- Prevent the spread of COCs beyond the boundaries of each CAS.

As identified in the CAIP, the future use for CAU 204 will be industrial, similar to current use (DOE/NV, 1998). A CSM was developed as part of the CAIP (NNSA/NV, 2002a). The model identified the potential exposure mechanism as disturbance (excavation) of contaminated soil by site workers. This implies a potential exposure pathway through ingestion, inhalation, and/or dermal contact with contaminated media under industrial scenarios.

Depth to groundwater data were obtained for water wells located in the vicinity of the CASs in Yucca Flat. At Well UE-1b, located 0.75 mi southwest of CAS 01-23-01, the depth to groundwater was 645 ft bgs as measured on September 17, 1991. At Well UE-2ce, located 1.8 mi west of CAS 02-34-01, the depth to groundwater was 1,447 ft bgs as measured on December 4, 1991. At Water Well A, located 0.75 mi from CAS 03-34-01, the depth to groundwater was 1,604 ft bgs as measured on August 28, 1960 (Hale et al., 1995). The depth to groundwater in the Frenchman Flat area, the area in which CASs 05-18-02, 05-33-01, and 05-99-02 are located are 710 ft bgs at Water Well WW-5a as measured on September 20, 2002 (USGS, 2002); 723 ft bgs at Water Well RNM-2S as measured on September 10, 2002 (USGS, 2002); 719 ft bgs at Water Well WW-5c as measured on

August 31, 1993 (USGS, 2002); 689 ft bgs at Water Well WW-5b as measured on May 6, 1991 (USGS, 2002); and 811 ft bgs at UE-5c as measured on August 11, 1987 (USGS, 2002).

The rate of potential lateral migration of contaminants is unknown, but if migration has occurred it is limited to the shallow subsurface and is confined within the boundaries of each CAS. Of the six CASs addressed in CAU 204, only CAS 05-18-02 (Sugar Bunker) and CAS 05-33-01 (Kay Blockhouse) have been found to contain contamination with the potential to migrate. The primary pathways of potential migration for CAU 204 is wind and water. With this in mind, the amount of rainfall can play a significant role in the migration of contaminants. The vertical and horizontal extent of potential contamination has been established through soil sampling. These factors, along with others presented in Section 3.3, support the determination that contaminant migration to groundwater is not considered to be an exposure pathway.

3.2 Screening Criteria

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

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

The general corrective action standards are as follows:

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

The remedy selection decision factors are as follows:

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

- Feasibility
- Cost

3.2.1 Corrective Action Standards

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

Protection of Human Health and the Environment

Protection of human health and the environment is a general mandate of the RCRA statute (EPA, 1994). This mandate requires that the corrective action include any necessary protective measures. These measures may or may not be directly related to media cleanup, source control, or management of wastes. The corrective action alternatives are evaluated for the ability to meet corrective action objectives as defined in Section 3.1.

Compliance with Media Cleanup Standards

Each corrective action alternative must have the ability to meet the proposed media cleanup standards as set forth in applicable state and federal regulations, and as specified in the CAIP (NNSA/NV, 2002a). For this CAU, EPA Region 9 PRGs (EPA, 2002), which are derived from the Integrated Risk Information System, are the basis for establishing the PALs for chemical contaminants under NAC 445A (NAC, 2003). The PAL for petroleum substances in soil is 100 mg/kg in accordance with NAC 445A (NAC, 2003). The PALs for radioactive contaminants are based on the National Council of Radiation Protection and Measurement (NCRP) recommended screening limits for construction, commercial, industrial land-use scenario (NCRP, 1999) scaled to 15 millirem (mrem) per year dose and the generic guidelines for residual concentrations of radionuclides in DOE Order 5400.5 (DOE, 1993). Laboratory results above PALs indicate the presence of COCs at levels that may require corrective action.

Control the Source(s) of the Release

An objective of a corrective action remedy is to stop further environmental degradation by controlling or eliminating additional releases that may pose a threat to human health and the environment. Unless source control measures are taken, efforts to clean up releases may be ineffective or, at best, will essentially involve a perpetual cleanup. Therefore, each corrective action alternative must use an

effective source control program to ensure the long-term effectiveness and protectiveness of the corrective action.

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

During implementation of any corrective action alternative, all waste management activities must be conducted in accordance with applicable state and federal regulations (e.g., *Nevada Revised Statutes* [NRS] 459.400-459.600, "Disposal of Hazardous Waste" [NRS, 1998]; 40 *Code of Federal Regulation*s [CFR] 260-282, "Hazardous Waste Management" [CFR, 2003a]; 40 CFR 761.61, "Polychlorinated Biphenyls (PCBs) Manufacturing Processing, Distribution in Commerce and Prohibition" [CFR, 2003b]; and NAC 444.842 to 444.9809, "Management of Hazardous Waste" [NAC, 2002]). The requirements for management of the waste, if any, derived from the corrective action will be determined based on applicable state and federal regulations, field observations, process knowledge, characterization data, and data collected and analyzed during corrective action implementation. Administrative controls (e.g., decontamination procedures and corrective action strategies) will minimize waste generated during site corrective action activities. Decontamination activities will be performed in accordance with approved procedures and will be designated according to the COCs present at the site.

3.2.2 Remedy Selection Decision Factors

The following text describes the remedy selection decision factors used to evaluate the corrective action alternatives.

Short-Term Reliability and Effectiveness

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

- Protection of the community from potential risks associated with implementation, such as fugitive dusts, transportation of hazardous materials, and explosion
- Protection of workers during implementation

- Environmental impacts that may result from implementation
- The amount of time until the corrective action objectives are achieved

Reduction of Toxicity, Mobility, and/or Volume

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

Long-Term Reliability and Effectiveness

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

Feasibility

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

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

Cost

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

- Capital Costs. These costs include both direct and indirect costs. Direct costs may consist of materials, labor, mobilization, demobilization, site preparation, construction materials, equipment purchase and rental, sampling and analysis, waste disposal, and health and safety measures. Indirect costs include such items as engineering design, permits and/or fees, start-up costs, and any contingency allowances.

- Operation and Maintenance. These costs include labor, training, sampling and analysis, maintenance materials, utilities, and health and safety measures.

Cost estimates for the corrective action alternatives for each CAS are provided in Appendix C.

3.3 Development of Corrective Action Alternatives

This section identifies and briefly describes the viable corrective action technologies and the corrective action alternatives considered for the affected medium. Based on the review of existing data, future use, and current operations at the NTS, the following alternatives have been developed for consideration at CAU 204:

- Alternative 1 - No Further Action
- Alternative 2 - Clean Closure
- Alternative 3 - Closure in Place with Administrative Controls

Other technologies, such as bioremediation and wet chemistry (*in situ* and *ex situ* processes), were considered. After technology research and evaluation, it was determined that these technologies are not effective because of the limited volume and concentrations of contaminated material. These alternatives will not receive further consideration in this CADD. Table 3-1 lists the corrective action alternatives evaluated for each CAS.

Table 3-1
Corrective Action Alternatives

Corrective Action Site	Alternative 1	Alternative 2	Alternative 3
CAS 01-34-01		X	X
CAS 02-34-01		X	X
CAS 03-34-01		X	X
CAS 05-18-02		X	X
CAS 05-33-01		X	X
CAS 05-99-02	X		

3.3.1 Alternative 1 - No Further Action

Under the No Further Action Alternative, no corrective action activities will be implemented. This alternative is a baseline case with which to compare and assess the other corrective action alternatives and their ability to meet the corrective action standards.

3.3.1.1 Explosive Storage Bunker (CAS 05-99-02)

All samples were returned from analyses with no readings above PALs. No further action is the recommended alternative at this CAS. As a matter of housekeeping, the entire bunker could be removed inasmuch as there are no footings or concrete floor and the site could be returned to its natural state.

3.3.2 Alternative 2 - Clean Closure

For underground bunkers and the surrounding affected environs, Alternative 2 includes removal and proper disposal of the contaminated soils and/or media. The details regarding the presence of stained concrete, lead in paint, or friable asbestos are provided as a waste characterization issue. Details for remedial activities are discussed in Appendix C (Cost Estimates).

For contaminated surface and subsurface soil, Alternative 2 includes excavating and disposing of soil and debris with COC concentrations greater than PALs (NNSA/NV, 2002a). All soils with contamination concentration levels above PALs will be removed. If visible indications of contamination are present, an inspection will be conducted to ensure that debris and visible contamination have been removed. Verification soil samples will also be collected and analyzed for the presence of COCs exceeding PALs. This will verify that the removal of contaminated soil has successfully remediated the site contamination.

Any contaminated material that is removed will be disposed of at an appropriate disposal facility. All excavated areas will be returned to surface conditions compatible with the intended future use of the site. It is assumed that clean fill will be used to backfill excavations after removal of the contaminated soil. Clean borrow soil will be removed from a nearby location for placement in voids, as feasible. The following subsections discuss Alternative 2 - Clean Closure for each CAS evaluated.

3.3.2.1 Underground Inst. House Bunker (CAS 01-34-01)

All identified contaminants in the bunker are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 2 would require the remediation and housekeeping activities necessary to remove all existing contaminants and make the building ready for any and all potential industrial activities.

3.3.2.2 Instrument Bunker (CAS 02-34-01)

All identified contaminants in the bunker are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 2 would require the remediation and housekeeping activities necessary to remove all existing contaminants and make the building ready for any and all potential industrial activities.

3.3.2.3 Instrument Bunker (CAS 03-34-01)

All identified contaminants in the bunker are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 2 would require the remediation and housekeeping activities necessary to remove all existing contaminants and make the building ready for any and all potential industrial activities.

3.3.2.4 Chemical Explosives Storage (CAS 05-18-02)

All identified contaminants in the bunker are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 2 would require the remediation and housekeeping activities necessary to remove all existing contaminants and make the site ready for any and all potential industrial activities.

Radioactive contamination in concentrations exceeding PALs was found throughout the area of the CAS in the top one to two ft of soil. Remediation of the surrounding environs included in

CAS 05-18-02 would involve the excavation of 1,360 yd^3 of contaminated soil and transportation and disposal of the soil at the appropriate landfill and the backfilling of the excavated area with clean fill.

3.3.2.5 Kay Blockhouse (CAS 05-33-01)

The Alternative 2 remediation of Kay Blockhouse and the surrounding environs (CAS 05-33-01) includes the removal and proper disposal of approximately 5,000 cubic feet (ft^3) of friable asbestos from four different locations around this CAS, about 300 ft^3 of mixed waste contaminated soil, approximately 4,200 ft^3 of concrete rubble, about 2,500 ft^2 of 1/4-in. steel plate, about 20 yd^3 of soil removed from the interior of the bunker and the cleaning of the interior surfaces, and about 560 yd^3 of radioactively contaminated soil. Remediation will also include the replacement of the excavated soils and the filling of the pits that remain from the extraction of the steel-lined pits. This is estimated to require 600 yd^3 of clean backfill.

As a matter of housekeeping and an effort to make the bunker safe for future use, the entryway needs to be excavated, torn down, and/or rebuilt. The entryway appears to have been constructed of timbers and plywood that are beginning to give way under the weight of the soils used to cover it and possibly from past activities in and around the area of the CAS. As a matter of caution, the presence of Be will need to be taken into account during the demolition of the entrance.

3.3.3 Alternative 3 - Close in Place with Administrative Controls

Alternative 3 will use administrative controls to prevent inadvertent contact with COCs and contaminated media with activity exceeding the unrestricted release criteria. These controls would consist of use restrictions to minimize access and prevent unauthorized intrusive activities (e.g., fencing, signage). The future use of the CAS would be restricted from any activity that would alter or modify the containment control unless appropriate concurrence was obtained from the NDEP.

3.3.3.1 Underground Inst. House Bunker (CAS 01-34-01)

All identified contaminants in this CAS are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 3 requires no remediation or housekeeping activities except to close and secure the door of the bunker to restrict unauthorized access and post appropriately.

3.3.3.2 Instrument Bunker (CAS 02-34-01)

All identified contaminants in this CAS are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 3 requires no remediation or housekeeping activities except to close and secure the door of the bunker to restrict unauthorized access and post appropriately.

3.3.3.3 Underground Bunker (CAS 03-23-01)

All identified contaminants in this CAS are confined to the interior of the bunker and have not migrated to the exterior. These contaminants will not migrate to the exterior without external influence. Alternative 3 requires no remediation or housekeeping activities except to close and secure the door of the bunker to restrict unauthorized access and post appropriately.

3.3.3.4 Chemical Explosives Storage (CAS 05-18-02)

The Chemical Explosives Storage CAS and surrounding environs have been the site of many experiments involving both radioactive and nonradioactive constituents. Based on the best available information, the last tests conducted at this location were in the 1960s and possibly 1970s implying that the contaminants have not been released or become mobile over the subsequent time period. It is unlikely that future circumstances will change the mobility of the contaminants. The following is information regarding the area supporting the concept of closure of the CAS with administrative controls.

a. Depth to groundwater at the shallowest well (WW-5b) in the area is approximately 689 ft bgs (USGS, 2002). Analytical data indicate that COCs are located in the soils at a maximum depth of approximately 20 ft bgs. This demonstrates minimal vertical migration has occurred in the past approximately 35 years, and vertical migration will be minimal in the future.

b. The soil is alluvial underlain with carbonate rocks. Geotechnical and hydrogeological tests were not considered necessary to defend the proposed closure alternative.

c. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

d. The types of regulated substances found during site investigation include limited radionuclides. Downward migration of COCs is slowed by the following parameters:

   - Soil saturation – the soil tends to be very dry, especially near the surface and shallow subsurface where the COCs are concentrated.

   - Soil particle adsorption/desorption – radionuclides tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs.

e. The lateral extent of contamination is defined by analytical data demonstrating minimal lateral mobility. The vertical extent of contamination is confined to 20 ft bgs based on analytical data. Much of the vertical extend of the identified contamination is suspected to be from mechanical mixing during various activities conducted at the CAS during testing or maintenance activities (e.g., utility maintenance, trenching).

f. Presently, CAS 05-18-02 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365-day per year basis; unauthorized personnel are not admitted to the facility.

g. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable.

h. See Section 2.3.4 for site-specific considerations.

i. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

j. No other site-specific factors are known at this time.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of this alternative.

3.3.3.5 Kay Blockhouse (CAS 05-33-01)

The Kay Blockhouse and surrounding environs have been the site from where many experiments involving both radioactive and nonradioactive constituents have been both monitored and/or conducted. Based on the best available information, the last tests conducted at this location were in about 1965, implying that the contaminants have not been released over the subsequent time period. It is unlikely that future circumstances will change the mobility of the contaminants. Information regarding the area supporting the concept of closure of the CAS with administrative controls is as follows:

a. Depth to groundwater at the shallowest well (WW-5b) in the area is approximately 689 ft bgs (USGS, 2002). Analytical data indicate that COCs are located in the soils at a maximum depth of approximately 15 ft bgs. This demonstrates minimal vertical migration has occurred in the past approximately 35 years, and vertical migration will be minimal in the future.

b. The soil is alluvial underlain with carbonate rocks. Geotechnical and hydrological tests were not considered necessary to support the proposed closure alternative.

c. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

d. The types of regulated substances found during site investigation include limited radionuclides. Downward migration of COCs is slowed by the following parameters:

   - Soil saturation – the soil tends to be very dry, especially near the surface and shallow subsurface where the COCs are concentrated.

   - Soil particle adsorption/desorption – radionuclides tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs.

e. The lateral extent of contamination is defined by analytical data demonstrating minimal lateral mobility. The vertical extent of contamination is confined to approximately 15 ft bgs at one location based on analytical data.

f. Presently, CAS 05-33-01 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365 day-per-year basis; unauthorized personnel are not admitted to the facility.

g. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable. The pipe extending from the bunker, which is a suspected conduit for releasing contaminants, is no longer connected to any suspected source.

h. See Section 2.3.4 for site-specific considerations.

i. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

j. No other site-specific factors are known at this time.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of this alternative.

3.4 Evaluation and Comparison of Alternatives

The general corrective action standards and remedy selection decision factors described in Section 3.2 were used to conduct detailed and comparative analyses of each corrective action alternative presented in Section 3.3.3. The advantages and disadvantages of each alternative were assessed to select preferred alternatives for CAU 204. Table 3-2 and Table 3-3 present the detailed and comparative evaluation of closure alternatives for each CAS except CAS 05-99-01.

No COCs were identified at CAS 05-99-01, indicating that no further action is the preferred closure recommendation. As a best management practice, it is recommended that the Explosive Storage Bunker be dismantled. The cost estimates are listed in Table 3-2 and Table 3-3 and are detailed in Appendix C.

Table 3-2
Detailed Evaluation of Alternatives for Corrective Action Unit 204
(Page 1 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Closure Standards			
Protection of Human Health and the Environment	• Does not meet corrective action objective of preventing or mitigating exposure to surface and subsurface soil containing COCs at concentrations exceeding PALs. • Does not meet corrective action objective of preventing or mitigating exposure to contaminated soil, lead-based paint, asbestos, or other contaminants with concentrations exceeding unrestricted release criteria. • Does not prevent potential spread of COCs. • No worker exposure associated with implementation.	• Meets corrective action objectives. • Low to moderate risk to workers associated with heavy equipment and potential contact with impacted media during excavation, transportation, and closure activities. • Low risk to public due to remote location and controlled access to NTS. Low to moderate risk to public during transportation off NTS. • Moving contaminated media to an appropriate disposal facility mitigates exposure to impacted media after closure.	• Meets corrective action objectives. • Prevents inadvertent intrusion into the contaminated media. • Low risk to workers associated with heavy equipment and potential contact with impacted media during closure activities. • Low risk to public because of remote location and controlled access to the NTS. • NAC 445.227 (2) (a-k) analysis shows the contaminants are not expected to impact groundwater.
Compliance with Media Cleanup Standards	• Does not comply with media cleanup standards because COCs at levels above PALs and media exceeding unrestricted release criteria remain.	• Complies with media cleanup standards because media containing COCs at concentrations exceeding PALs will be excavated and disposed of at an appropriate facility. • Removal of COC concentrations exceeding PALs will be verified with confirmation sampling.	• Complies with media cleanup standards by controlling exposure pathways. • NAC 445.227 (2) (a-k) analysis shows the contaminants are not expected to impact groundwater.
Control the Source(s) of Release	• The original nuclear testing and site activities that caused the release of COCs have been discontinued.	• The original nuclear testing and site activities that caused the release of COCs have been discontinued.	• The original nuclear testing and site activities that caused the release of COCs have been discontinued.

Table 3-2
Detailed Evaluation of Alternatives for
Corrective Action Unit 204
(Page 2 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Comply with Applicable Federal, State, and Local Standards for Waste Management	• No waste generated.	• All waste (primarily sludge, liquid, sediment, contaminated soil, and disposable personal protective equipment) will be handled and disposed of in accordance with applicable standards.	• All waste (primarily disposable personal protective equipment) will be handled and disposed of in accordance with applicable standards.
Remedy Selection Decision Factors			
Short-Term Reliability and Effectiveness	Not evaluated	• Low risk to workers associated with heavy equipment and potential contact with impacted media during excavation, transportation, and closure activities. • Public protected during removal by remote location and NTS site access controls. • Low to moderate risk to public during transportation off NTS. • Environmental impacts are not anticipated due to implementation. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.	• Low risk to workers associated with heavy equipment and potential contact with impacted media during closure activities. • Public protected by remote location and NTS site access controls. • Environmental impacts are not anticipated due to implementation. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.
Reduction of Toxicity, Mobility, and/or Volume	Not evaluated	• Clean closure would effectively eliminate associated toxicity, mobility, and volume of wastes at each CAS. • Proper disposal of the waste will result in an ultimate reduction of mobility.	• Toxicity and volume of the soil contamination are effectively unchanged. • The mobility of the remaining subsurface soil contamination is significantly reduced by administrative controls and lack of viable driving forces.

Table 3-2
Detailed Evaluation of Alternatives for
Corrective Action Unit 204
(Page 3 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Long-Term Reliability and Effectiveness	Not evaluated	• All risk will be eliminated on site upon completion. • No maintenance required. • Moving contaminated media to an appropriate disposal media facility addresses the persistent adsorption of contaminants.	• Controls inadvertent intrusion to remaining contaminated media. • Administrative controls must be maintained.
Feasibility	Not evaluated	• Depth of contaminated soils may require excavation or shoring to protect workers. • Removal of contaminated soils from contaminated areas may require controls to protect workers. • Options for disposal of contaminated media is limited and require coordination with multiple entities.	• Easily implemented. • Coordination of all entities is necessary to ensure compliance with administrative controls to prevent intrusion into contaminated zones.
Cost	CAS 01-34-01: $0 CAS 02-34-01: $0 CAS 03-34-01: $0 CAS 05-18-02: $0 CAS 05-33-01: $0 CAS 05-99-02: $153,692	CAS 01-34-01: $155,005 CAS 02-34-01: $155,005 CAS 03-34-01: $155,005 CAS 05-18-02: $503,680 CAS 05-33-01: $968,653 CAS 05-99-02: $0	CAS 01-34-01: $17,945 CAS 02-34-01: $17,945 CAS 03-34-01: $17,945 CAS 05-18-02: $159,631 CAS 05-33-01: $89,224 CAS 05-99-02: $0

Table 3-3
Comparative Evaluation of Alternatives for Corrective Action Unit 204

Evaluation Criteria	Comparative Evaluation		
Closure Standards			
Protection of Human Health and the Environment	Alternatives 2 and 3 meet corrective action objectives. No worker exposures to risks are associated with Alternative 1. Low risks are associated with Alternative 3 and slightly higher risks with Alternative 2. *Nevada Administrative Code* 445A.227 (2) (a-k) analysis shows the contaminants are not threatening groundwater.		
Compliance with Media Cleanup Standards	Alternative 1 does not comply with media cleanup standards. Alternative 2 meets media cleanup standards by removing contaminated soil at concentrations exceeding preliminary action levels or unrestricted release criteria and eliminating exposure pathways at the site. Alternative 3 controls access to contaminants, effectively eliminating exposure pathways.		
Control the Source(s) of Release	The sources at each CAS have been discontinued.		
Comply with Applicable Federal, State, and Local Standards for Waste Management	Alternative 1 does not generate waste. Alternatives 2 and 3 will generate waste that will be handled in accordance with applicable standards.		
Remedy Selection Decision Factors			
Short-Term Reliability and Effectiveness	Low risks are associated with Alternative 2 and slightly higher risks with Alternative 3.		
Reduction of Toxicity, Mobility, and/or Volume	Alternative 2 results in an immediate reduction of all three characteristics at each CAS. Alternative 3 results in a reduction of mobility, but does not reduce toxicity or volume.		
Long-Term Reliability and Effectiveness	Residual risk at each CAS is low for Alternative 3 and nonexistent for Alternative 2. Alternative 3 requires administrative measures to control intrusive activities.		
Feasibility	Alternatives 2 and 3 are feasible; however, Alternative 2 will be more resource intensive.		
Cost	Alternative 1: CAS 01-34-01: $0 CAS 02-34-01: $0 CAS 03-34-01: $0 CAS 05-18-02: $0 CAS 05-33-01: $0 CAS 05-99-01: $153,692	Alternative 2: CAS 01-34-01: $155,005 CAS 02-34-01: $155,005 CAS 03-34-01: $155,005 CAS 05-18-02: $503,680 CAS 05-33-01: $968,653 CAS 05-99-02: $0	Alternative 3: CAS 01-34-01: $17,945 CAS 02-34-01: $17,945 CAS 03-34-01 $17,945 CAS 05-18-02: $159,631 CAS 05-33-01: $89,224 CAS 05-99-02: $0

4.0 Recommended Alternatives

The preferred corrective action alternatives were evaluated on their technical merits, focusing on performance, reliability, feasibility, and safety. The selected alternatives were judged to meet all requirements for the technical components evaluated. The selected alternatives meet all applicable state and federal regulations for closure of the sites and will minimize potential future exposure pathways to the contaminated media at CAU 204. Cost estimates were used to support the selection of preferred corrective action alternatives.

Alternative 1, No Further Action, is the preferred corrective action for:

Corrective Action Site 05-99-02, Explosive Storage Bunker, does not require the dismantling and removal of the structure, but as a best management practice to prevent the unauthorized future use and potential for any impact to the surrounding environment it merits consideration.

Alternative 2, Clean Closure, is not the preferred alternative for any of the CASs in CAU 204.

Alternative 3, Close in Place with Administrative Controls, is the preferred corrective action for the following CASs:

- CAS 01-34-01 - Underground Inst. House Bunker - Secure entry into bunker to restrict unauthorized access.
- CAS 02-34-01 - Instrument Bunker - Secure entry into bunker to restrict unauthorized access.
- CAS 03-34-01 - Underground Bunker - Secure entry into bunker to restrict unauthorized access.
- CAS 05-18-02 - Chemical Explosives Storage - Secure entry, expand existing RMA to include the contaminated area within this CAS.
- CAS 05-33-01 - Kay Blockhouse - Secure the blockhouse by collapsing the entryway, remove organic and nonorganic contaminants, clean and backfill the two cement-lined pits, and expand RMA to include radioactively contaminated areas (see Figure 4-1). The close in place with administrative controls alternative for this CAS is, in reality, a hybrid alternative because it involves the excavation of soils even though the area will be included in an RMA. The organic and inorganic contaminants will be removed while the radioactive contamination will be left in place.

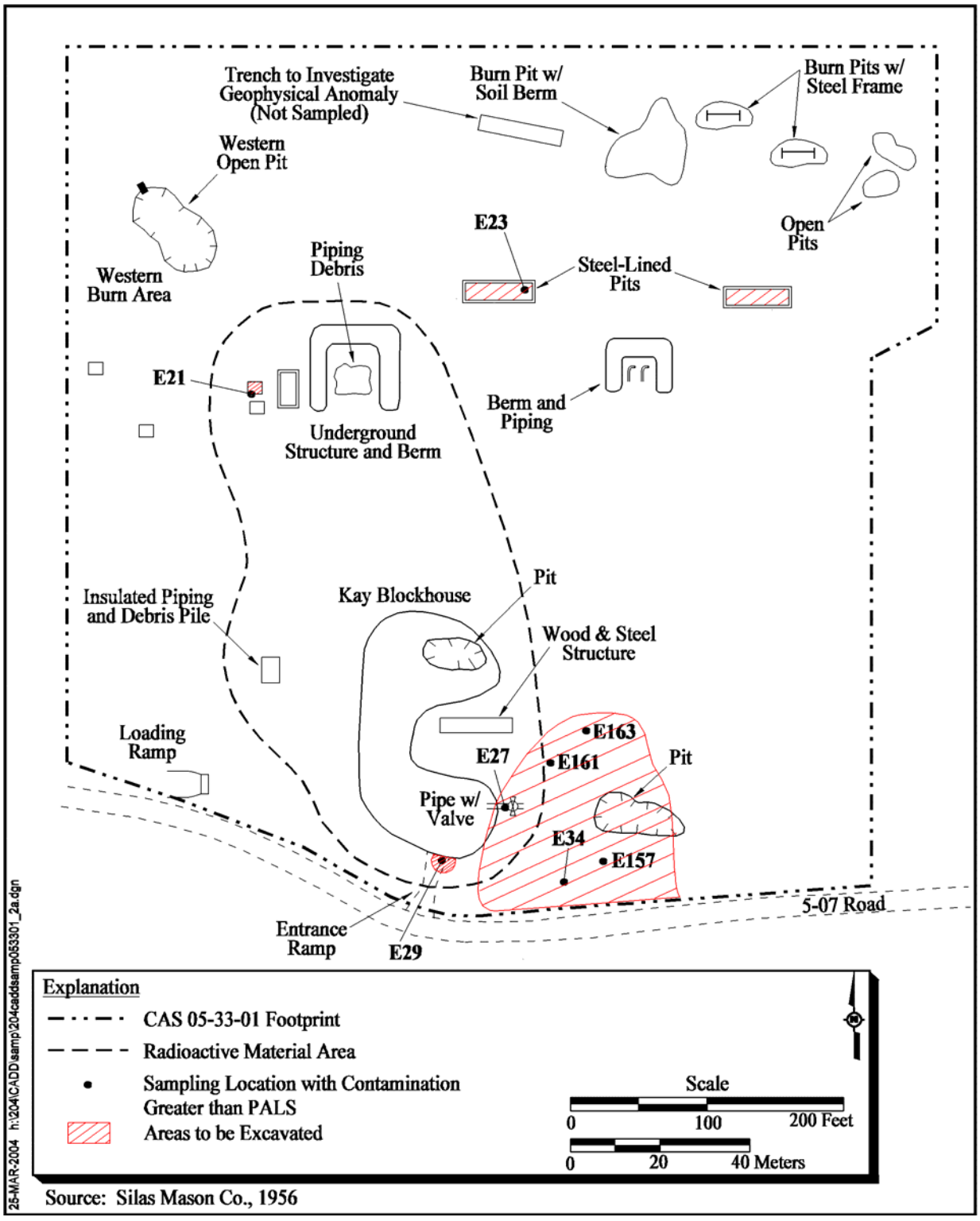

Figure 4-1
CAS 05-33-01, Kay Blockhouse Areas of Excavation

The preferred corrective action alternatives were evaluated on technical merit focusing on performance, reliability, feasibility, and safety. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all negotiated clean-up levels approved by Nevada for closure of the site and will reduce or eliminate potential future exposure pathways for the contaminants at CAU 204. Implementation of corrective actions may potentially present risk to site workers. Therefore, appropriate health and safety procedures will be developed and implemented.

5.0 References

CFR, see *Code of Federal Regulations*.

Code of Federal Regulations. 2003a. Title 40 CFR Parts 260 - 282, "Hazardous Waste Management." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2003b. Title 40 CFR 761.61, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Prohibition." Washington, DC: U.S. Government Printing Office.

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

EPA, see U.S. Environmental Protection Agency.

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

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

Hale, G.S., D.A. Trudeau, and C.S. Savard. 1995. *Water-Level Data from Wells and Test Holes Through 1991, and Potentiometric Contours as of 1991 for Yucca Flat, Nevada Test Site, Nye County, Nevada,* USGS WRIR-95-4177. Carson City, NV: U.S. Geological Survey.

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

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurement.

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

NRS, see *Nevada Revised Statutes.*

National Council on Radiation Protection and Measurement. 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. 2002. NAC 444.842 to 444.9809, "Management of Hazardous Waste." Carson City, NV.

Nevada Administrative Code. 2003. NAC 445A, "Water Controls." Carson City, NV.

Nevada Revised Statutes. 1998. NRS 459.400-459.600, "Disposal of Hazardous Waste." Carson City, NV.

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.

Shaw, see Shaw Environmental, Inc.

Shaw Environmental, Inc. 2003. *Field Instruction for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada.* Las Vegas, NV.

Silas Mason Co. 1956. Engineering drawing FRK-S2 entitled, "Structural Plan Kay Blockhouse," 5 December. Mercury, NV: Archives and Records Center.

USGS, see U.S. Geological Survey.

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

U.S. Department of Energy. 1998. DOE Guide 440.1-7, "Implementation Guide for Use with DOE Notice 440.1: Interim Chronic Beryllium DIsease Prevention Program." Washington, DC: Office of Worker Health and Safety.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002a. *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada,* DOE/NV--866. 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. 1, DOE/NV--372. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1994. *Project Management Plan*, Rev. 0. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996. *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada,* DOE/EIS 0243. 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. Department of Energy, Nevada Operations Office. 2000. *NV/YMP Radiological Control Manual,* Rev. 4, DOE/NV/11718-079. Prepared by Bechtel Nevada. Las Vegas, NV.

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

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

U.S. Environmental Protection Agency. 2002. *Region IX Preliminary Remediation Goals (PRGs)*. Prepared by S.J. Smucker. San Francisco, CA.

U.S. Geological Survey. 2002. "Ground water for Nevada: Water Levels." As accessed at http://waterdata.usgs.gov/nv/nwis/gwlevels on 9 October 2002.

Winograd, I.J., and W. Thordarson. 1975. *Hydrologic and Hydrochemical Framework South-Central Great Basin, Nevada-California, with Special Reference to the Nevada Test Site*, USGS Professional Paper 712C. Washington, DC: U.S. Government Printing Office.

Appendix A

Corrective Action Investigation Results for CAU 204, Storage Bunkers, Nevada Test Site, Nevada

A.1.0 Introduction

This appendix details CAI activities and analytical results for CAU 204. The CAI was conducted in accordance with the *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada* (NNSA/NV, 2002a), and the *Field Instruction for Corrective Action Unit 204: Storage Bunkers; Nevada Test Site, Nevada* (Shaw, 2003a), as developed under the FFACO that was agreed to by the State of Nevada, DOE, and the U.S. Department of Defense (FFACO, 1996). These documents are hereafter referred to as the CAIP, Field Instruction (FI), and FFACO, respectively.

Corrective Action Unit 204 is comprised of six CASs. These include CASs 01-34-01, 02-34-01, 03-34-01, 05-18-02, 05-33-01, and 05-99-02. Corrective Action Sites 01-34-01 and 03-34-01 are located off the Mercury Highway in Areas 1 and 3 at Yucca Flat at the NTS. Corrective Action Site 02-34-01 is located in Area 2 near Rainier Mesa Road. Each CAS consists of a bunker, its interior, and the exterior immediately surrounding the structure. These bunkers were used as instrumentation locations to measure blast, heat, and neutron and/or gamma radiation. They were also used to take photographs during the T-1, T-2, and T-3 atmospheric nuclear tests (Holmes & Narver, 1990). Each bunker is approximately 3,000 feet from the ground zero point of the respective nuclear tests that were conducted in the 1950s (LANL, 1984).

Corrective Action Sites 05-18-02, 05-33-01, and 05-99-02 are located near Frenchman Flat in Area 5, Road 5-01, and Cane Springs Road. Corrective Action Site 05-18-02, also known as Sugar Bunker, consists of the main bunker, a smaller adjacent bunker, and two cellar units that are attached to the south end of the main structure. The Sugar Bunker was used for various nonnuclear experiments conducted during the voluntary nuclear testing moratorium from 1958 to 1961. Corrective Action Site 05-33-01 consists of the Kay Blockhouse and the surrounding area. This facility was used to measure reaction history, fireball, and neutron and gamma rays associated with five airdrops over Frenchman Flats (Operation Ranger) (LANL, 1984). The surrounding area was used by various government agencies for non-nuclear testing during the nuclear testing moratorium. Little historical information was available about this testing. Corrective Action Site 05-99-02 is a small wooden explosives/magazine storage bunker located off of Cane Springs Road that was primarily used for the

storage of conventional explosives and ammunition. This CAS consists of the bunker footprint and structure.

This CAU was investigated because process knowledge indicated that many of the CASs addressed by this CAU may have used or contained hazardous or radioactive materials with the potential for release to the environment.

The COPCs for CAU 204 include radionuclides, beryllium, high explosives, lead, PCBs, TPH, silver, Warfarin (rodenticide), and zinc phosphide.

Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAIP (NNSA/NV, 2002a).

A.1.1 Project Objectives

The primary objective of the investigation was to provide sufficient information and data to develop appropriate corrective action alternatives for each CAS in CAU 204. This objective was achieved by identifying the absence or nature and extent of COCs (COPCs at concentrations above PALs).

The investigation strategy was developed during the DQO process and is presented in the CAIP (NNSA/NV, 2002a). The DQO process identified the potential sampling locations, analytical suite, and provided the logic and rationale that supported the sampling strategy. This strategy was agreed and approved by NDEP prior to initiating sampling activities.

A.1.2 Content

This appendix contains information and data in sufficient detail to support the selection of a preferred corrective action alternative in the CADD. The contents of this appendix are as follows:

- Section A.1.0 - describes the investigation background, objectives, and content.
- Section A.2.0 - provides an investigation overview.
- Section A.3.0 through Section A.8.0 - provide CAS-specific information regarding the field activities, sampling methods, and laboratory analytical results from the investigation sampling.

- Section A.9.0 - summarizes waste management activities.
- Section A.10.0 - discusses the quality assurance (QA) and quality control (QC) procedures that were followed and the results of the QA/QC activities.
- Section A.11.0 - is a summary of the investigation results.
- Section A.12.0 - lists the cited references.

The complete field documentation and laboratory data, including FADLs, sample collection logs (SCL), analysis request/chain-of-custody (AR/COC) forms, soil sample descriptions, laboratory certificates of analyses, analytical results, and surveillance results are retained in project files as hard copy files or electronic media.

A.2.0 Investigation Overview

Field investigation and sampling activities consisted of surface soil screening and sampling, housekeeping removal of debris, radiological surveys, subsurface soil sampling from backhoe excavations and boreholes, and collecting waste characterization samples and radiological swipe samples from floors, remaining equipment, and walls within the bunkers. The field investigation and sampling activities were conducted from May 21 through June 30, 2003. Step-out sampling was also conducted periodically from September through November 2003. Table A.2-1 lists the CAI activities that were conducted at each of the CASs.

Table A.2-1
Corrective Action Investigation Activities Conducted at Each Corrective Action Site to Meet Corrective Action Investigation Plan Requirements

Corrective Action Investigation Activities	Corrective Action Site					
	01-34-01	02-34-01	03-34-01	05-18-02	05-33-01	05-99-02
Perform radiological walk-over land survey	X	X	X	X	X	X
Inspect bunker interiors	X	X	X	X	X	X
Remove debris and potentially hazardous materials	X	X	X	X	X	X
Perform geophysical survey					X	
Trench selected areas and collect soil samples				X	X	
Collect and analyze surface and subsurface soils from biased locations		X		X	X	X
Conduct radiological walk-over land and survey prior to intrusive sampling activities	X	X	X		X	X
Collect Waste Characterization samples (paint chips, concrete from floors, asbestos)	X	X	X	X	X	
Perform radiological surveys and swipe sampling of bunker interiors	X	X	X	X	X	X

The investigation and sampling program was managed in accordance with the requirements set forth in the CAIP and FI. Field activities were performed in accordance with the approved CAU 204 CAIP, FI, and site-specific health and safety plan (SSHASP) (IT, 2002a), which are consistent with the DOE Integrated Safety Management System. Samples were collected and documented following approved

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

Weather conditions were extremely hot and dry with light to strong winds. Although frequent heat stress breaks were implemented, the schedule was not significantly impacted. There were some minor delays due to breakdown of the drilling equipment; however, the affected equipment was quickly replaced or repaired and drilling continued without further delay.

The CASs were characterized by collecting soil samples from the various intervals as specified in the CAIP. These soil samples were field screened for VOCs, explosives (CASs 05-33-01 and 05-99-02 only), TPH, and radioactive contaminants. Selected samples were submitted to the laboratory for analyses to guide further sampling with respect to lateral and vertical extent of contamination. Selected surface soil samples were collected by hand excavation. Subsurface soil samples were collected using backhoe excavation and sonic drilling techniques. The results were compared against screening levels to guide the investigations. Selected environmental samples were shipped to off-site laboratories to be analyzed for chemical and radiological parameters. Backhoe excavations (trenches and potholes) were also used to visually inspect geophysical anomalies and soil piles for the presence of soil contamination, buried debris, and discolored soils. A backhoe was also employed at two steel-lined burn pits at CAS 05-33-01 where the point source for contamination appeared to be at the bottoms of the pits (8 to 10 ft bgs). Auger and sonic drilling were also used during step-out sampling.

Corrective Action Unit 204 sampling locations were accessible and sampling activities at planned locations were not restricted by buildings, storage areas, active operations, or aboveground and underground utilities. Required sampling step-out locations were accessible and remained within anticipated boundaries at all of the CASs.

Section A.2.1 through Section A.2.6 provide investigation methodology, site geology and hydrology, and laboratory information. Activity-specific details for the individual CASs are presented in Section A.3.0 through Section A.8.0.

A.2.1 Preliminary Conceptual Site Model

Potential exposure pathways at CAU 204 fit three CSMs:

- CSM #1 is the release of contaminants from bunker interiors.
- CSM #2 is the release of contaminants from surface debris and burn areas.
- CSM #3 is the release of contaminants from subsurface debris and burn areas.

The three CSMs were developed to represent the release mechanisms and potential migration pathways for each CAS within CAU 204. The CSM and a detailed discussion are provided in the CAIP. The system configuration, migration pathways, and release mechanisms identified at each CAS were consistent with the CSMs provided in the CAIP. The CSMs included soil potentially impacted by surface and/or subsurface release of contaminants. The release mechanisms include both designed (e.g., burn pits) and accidental releases (e.g., migration of hazardous constituents from the bunkers). The three models assumed that any contamination would be concentrated in the soil beneath and adjacent to the system or bunker. The extent of underlying soil impact is expected to be variable and dependent upon the volume of contaminants released, physical and chemical properties of the surrounding soil, geological conditions, and physical and chemical properties of the COPCs.

Sections A.2.3.1 through A.2.3.7 discuss the investigative activities conducted at each of the CAU 204 CASs. Results of the investigation validate the CSMs outlined above and presented in the CAIP for CAU 204 (NNSA/NV, 2002a).

A.2.2 Sample Locations

The bunker investigation locations selected for sampling were based on interpretation of the preliminary assessments and information obtained during subsequent site visits. Sampling points for each site were selected based on the approach provided in the FI and CAIP. The planned sample locations are shown in the CAIP. All actual sample locations, as well as planned locations, are depicted on the figures included in Section A.3.0 through Section A.8.0. Some locations were modified slightly from planned positions due to field conditions, observations, and initial analytical results. In some cases, field-screening results and/or laboratory analytical results determined the need for step-out sampling locations. All sample locations were staked, appropriately labeled, and surveyed with a global positioning system (GPS) instrument. The actual locations have been plotted

based on the coordinates collected by the GPS instrument. The coordinates for the sampling locations are tabulated by CAS in Appendix D.

A.2.2.1 Housekeeping Removal of Debris

As part of the field activities and to prepare for entry into the bunkers by the inspection team, various housekeeping activities were performed by the BN and Shaw Environmental, Inc. (Shaw) field crew at the CASs within CAU 204. These activities include inspection for and decontamination of potential hantavirus in all of the bunkers and removing debris including scrap, rodent droppings, and bird remains from within the bunkers. Additionally, a gas cylinder and a bank of 24-volt batteries were inspected and removed from the interior of the Kay Blockhouse (CAS 05-33-01). A wooden box labelled "Explosives" was inspected and removed from the Explosive Storage Bunker (CAS-05-99-02). The box, previously inspected by an explosive ordnance technician, contained no explosives and was disposed of appropriately. To facilitate access into three of the bunkers (CASs 02-34-01, 03-34-01, and 05-33-01), tumbleweeds were removed from the entry ways.

A.2.3 Investigation Activities

The investigation activities performed at CAU 204 were based on the field investigation activities discussed in the CAIP (NNSA/NV, 2002a). The technical approach for CAU 204 consisted of the following activities:

- Bunker interior hantavirus decontamination and inspections
- Waste characterization sampling
- Interior and exterior radiological surveys
- Field screening
- Biased surface soil sampling
- Biased subsurface soil sampling (drilling)
- Biased subsurface soil sampling (excavations)

This investigation strategy allowed the nature and extent of contamination associated with each CAS to be established. The following sections describe the specific investigation activities that took place at CAU 204.

A.2.3.1 Bunker Interior Inspections

After the interior had been treated for hantavirus, the CAU 204 sampling team visually inspected all accessible spaces within each bunker. The inspections included a photo inventory of objects, material, and equipment within each bunker as well as evidence of spills, staining, and corrosion.

In conjunction with the visual inspection, specific areas such as stained areas on concrete floors and wall paint were selected for waste characterization sampling and to verify if hazardous and/or radiological releases have occurred within the bunkers.

A.2.3.2 Waste Characterization

Nine samples of paint chips and concrete were collected from the walls and floors of CASs 01-34-01, 02-34-01, 03-34-01, and 05-18-02. Corrective Action Site 05-99-02 is a small wooden shed with a dirt floor; therefore, no waste characterization samples were collected from this unit. The concrete chips were analyzed for VOCs, RCRA metals, TPH (DRO and GRO), and PCB. The paint was analyzed for lead. In addition, 37 samples of suspected asbestos-containing material (ACM) were collected from areas around the Kay Blockhouse (CAS 05-33-01) and analyzed for asbestos fibers. This material included insulation from piping, burn-pit lining, and loose debris. Results of these analyses provide criteria for the corrective action alternative for this CAS.

A.2.3.3 Radiological Surveys

Prior to the CAI, surface radiological surveys were conducted at CASs 05-33-01 and 05-99-02 using a handheld alpha beta/gamma radiological detector. A walk-over survey was also performed on CASs 01-34-01, 02-34-01, 03-34-01, and 05-99-02 as part of the investigation activities using handheld instruments. Additionally, radiological surveys of the bunker interiors using a handheld detector in concert with swipe samples were taken to identify the presence and extent of total and removable alpha and beta/gamma-emitting radiological contaminants. The results of these surveys and swipe collection samples are presented in each CAS-specific section.

A.2.3.4 Field Screening

Field screening activities for VOCs, TPH, and alpha and beta/gamma radiation were performed as specified in the CAIP. Because VOC field screening can sometimes generate anomalous readings, field screening for explosives was also conducted at CASs 05-33-01 and 05-99-02. The field-screening level for VOC headspace was established at 20 parts per million (ppm) or 2.5 times background, whichever was greater. The site-specific FSLs for alpha and beta/gamma radiation were defined as the mean background activity level plus two times the standard deviation of readings from 20 background locations. The radiation FSLs are instrument-specific and were established for each instrument and CAS on a daily basis prior to any site activities. Field screening was also conducted using a photoionization detector for VOCs and a alpha and beta/gamma radiation detector screening. The FSL for TPH was established at 75 ppm and was conducted using a gas chromatograph.

The CAS-specific sections of this document identify the CASs where field screening was conducted and how the FSLs were used to define the extent of contamination. Field-screening results are recorded on sample collection logs that are retained in project files.

A.2.3.5 Biased Surface Soil Sampling

Surface soil samples were collected at four of the CASs based on the initial bunker inspections (CASs 02-34-01, 05-18-02, 05-33-01, and 05-99-02). The surface soil samples were collected in accordance with Standard Quality Practice (SQP) ITLV-0600, "Surface Soil Sampling." Typical sampling intervals were 0 to 0.5 ft bgs. A portion of the sample was collected for headspace screening for organic volatiles and then used for field screening for TPH and explosives, when required. To minimize off-gassing, these samples were placed directly into the appropriate container at the sampling location. The remaining portion of the samples were collected and placed in a stainless-steel bowl using a stainless-steel sampling spoon and brought to a central sample preparation area to be field screened for radiological parameters. After being homogenized, the material was screened for radiation and sample containers for nonvolatile parameters were filled. Excess soil was returned to the sampling location.

A.2.3.6 Subsurface Soil Sampling

In order to meet the DQOs established in the CAIP, subsurface soil sampling was conducted at all surface soil locations and at locations where a subgrade point source of contaminant release was suspected. At the surface soils locations, samples were generally collected at the following depths:

- 0.0 to 1.0 ft bgs
- 1.0 to 2.0 ft bgs

Subsurface sampling continued until two consecutive samples with FSRs below FSLs ("clean" samples) were collected. The shallowest clean sample was submitted for laboratory analysis. Subsurface soil sampling was implemented using a backhoe according to SQP ITLV-0601, "Shallow Subsurface Sampling."

At several sample locations, sample depths necessitated that samples be collected using a sonic drilling technique following SQP ITLV-0602 "Subsurface Sampling During Drilling." Sonic drilling allows for the continuous sampling of subsurface soils. After each core run, the sample was discharged from the core barrel into a plastic sleeve. Samples were then removed from the appropriate intervals and transferred to a stainless-steel bowl (VOC and field-screening samples were collected first) homogenized, field screened, and prepared in the same manner as the surface soil samples. Generally, the sample intervals were collected from the following depth intervals below the base of the pits:

- 0 to 1 ft
- 2 to 3 ft
- 3-ft intervals thereafter. Samples were collected from the interval midpoints until two consecutive samples with FSRs below the FSLs were collected.

During the step-out sampling, sample intervals were selected based on initial sampling results and field screening of the intervals being sampled.

Excess soil was returned to the sampling location and disposal sampling was numbered as detailed in Section A.9.0.

A.2.3.7 Excavations

At CAS 05-33-01, Kay Blockhouse, trenches were excavated at several locations perpendicular to the geophysical anomaly located on the northeast edge of the site boundary and at five soil mounds within the site boundary. The purpose of these trenches was to determine if buried debris was present at these locations and to collect soil samples for analysis if there was visible evidence of contamination. There was no evidence of buried material at the geophysical anomaly; therefore, no soil samples were collected. However, soil samples were collected from other excavations within the CAS boundary.

Spoil piles were temporarily staged next to the excavations, then backfilled into their original locations when inspection and sampling were completed.

A.2.4 Geology

The physiography of the NTS is comprised of intermontane basis of alluvium and tuff surrounded by low-lying mountains of Precambrian and Paleozoic sedimentary rocks, and Cenozoic volcanic rocks. The alluvium comprises interbedded gravel, sand, and silt with varying degrees of cementation (DOE/NV, 1996).

Specifically, CASs 01-34-01, 02-34-01, 03-34-01, and 05-99-02 within CAU 204 are partially buried bunkers lying within the alluvial sediments. The CAS boundaries for these units are comprised of the bunker footprints, including the bunker interiors, and the soils covering the bunkers. The overlying soil is reworked sand and gravel. Corrective Action Sites 05-33-01 and 05-18-02 also include the area immediately surrounding the bunkers. Reworked soils are found scattered across CAS 05-33-01 in the form of soil piles and pits. Adjacent to the south side of CAS 05-18-02 is a graded area of several hundred square feet. This area appears to be part of an elevated roadbed or staging area.

The soil in CAU 204 is typically desert alluvium comprised mostly of fine soil and rock particles including unconsolidated gravel measuring up to 3-in. in diameter. Native soil is described in the sample collection logs as ranging from dark-brown to a light-yellow, gravelly, silty sand.

A field description for each sample was recorded on sample collection logs that are retained in the project file. A more detailed description of the regional geology is provided in the CAIP (NNSA/NV, 2002a).

A.2.5 Hydrology

The CASs within CAU 204 lie within two hydrographic areas: the Yucca Flat Hydrographic Area (CASs 01-34-01, 02-34-01, and 03-34-01) and the Frenchman Flat Hydrographic Area (CASs 05-18-02, 05-33-01, and 05-99-02). These hydrographic basins have topographically controlled internal drainages. In these internal drainages, no surface water leaves the basin except by evaporation (DOE/NV, 1996). The surface water within these basins results from precipitation and runoff of snow melt in the mountains. Surface water is carried down arroyos where it drains into playas. A portion of the surface water infiltrates the alluvium into the underlying aquifers.

Altered surface features from pits, soil piles, and partially buried bunkers would alter surface flow conditions locally at the CASs within CAU 204. Corrective Action Site 05-99-02 is located in a small wash near Cane Springs Road. Surface runoff at this site would be channelled into the wash. Corrective Action Sites 05-33-01 and 05-18-02 are located near Frenchman Lake and CASs 01-34-01, 02-34-01, and 03-34-01 are located within the Yucca Flat area. No pronounced surface drainages in the form of gullies or rills were observed at these locations. Surface drainage at these low gradient drainage areas would primarily be sheet flow.

As much as 1,000 ft of alluvial deposits have accumulated in the intermontane basins at the NTS. The alluvial and volcanic aquifers are underlain by a carbonate aquifer. Groundwater in the Yucca Flat Hydrographic Area ranges in depths from 645 ft bgs (September 17, 1971) to 1,447 ft bgs (December 4, 1991) (Hale et al., 1995). Groundwater in the Frenchman Flat area ranges in depth from 689 ft bgs (May 6, 1991) to 811 ft bgs (August 11, 1987) (Hale et al., 1995). Depth to perched aquifers underlying the CASs at CAU 204 are unknown. Several boreholes at CAS 05-33-01 were drilled to depths ranging from 10 to 30 ft for this investigation. No perched groundwater was encountered in these boreholes.

Potential evapotranspiration at the NTS is significantly greater than precipitation, thus limiting vertical migration of contaminants. The annual average precipitation for this region is only 3 to 6 in.

per year (USGS, 1975). The potential evapotranspiration at the Area 3 Radiological Waste Management site has been estimated at 62.6 in. per year (Shott, et al., 1997). The potential annual evaporation is the dominant factor influencing the movement of water in the upper saturated zone. Therefore, recharge to groundwater from precipitation is not significant at the NTS and does not provide a significant mechanism for vertical migration of contaminants to groundwater.

A.2.6 Comparison to Preliminary Action Levels

Chemical and radiological analyses were performed by Paragon Analytical, Inc., in Fort Collins, Colorado. The analytical parameters and laboratory analytical methods used to analyze CAU 204 investigation samples are listed in Table A.2-2.

Chemicals and radionuclides detected in samples at concentrations greater than PALs are identified as COCs. If COCs are present, corrective actions are considered for the CAS. The PALs for the CAU 204 investigation were identified and agreed to during the DQO process. For organic (except TPH) and most inorganic COPCs, the PALs are the EPA Region 9 PRGs (EPA, 2002). The PAL for TPH is 100 mg/kg per the NAC 445A.2272 (NAC, 2003).

Background concentrations for certain metals have been used instead of PRGs when the natural background concentration exceeds the PRG, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999).

Radionuclide concentrations measured in CAU 204 environmental samples were compared to isotope-specific PALs as presented in ROTC #1 to the CAIP (NNSA/NV, 2002a) and specified below:

- The PALs for all radioisotopes, except those covered by DOE Order 5400.5, were derived from the Construction, Commercial, Industrial land-use scenario in Table 3.2 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document are based on a 25-millirem per year (mrem/yr) dose, but have been scaled to a 15-mrem/yr dose for this document.

- The PALs for Radium (Ra)-226; Ra-228, Th-230, Th-232, and their progeny in secular equilibrium are the generic guidelines for residual concentrations as found in Chapter IV of

Table A.2-2
Laboratory Analytical Parameters and Methods, CAU 204 Investigation Samples

Analytical Parameter	Analytical Method
Total volatile organic compounds	SW-846 8260B[a]
Total semivolatile organic compounds	SW-846 8270C[a]
Total petroleum hydrocarbons - gasoline-range organics	SW-846 8015B (modified)[a]
Total petroleum hydrocarbons - diesel-range organics	SW-846 8015B (modified)[a]
Polychlorinated biphenyls	SW-846 8082[a]
Total RCRA metals[b]	Water - SW-846 6010B/7470A[a] Soil - SW-846 6010B/7471A
Total Beryllium	
Zinc	
Lead (In paint chips)	SW-846 6008[a]
Warfarin (Pesticides)	SW 846 8330 Modified
Explosives	SW-846 8330[a]
Asbestos (Fibers)	NIOSH 9002
Gamma-Emitting Radionuclides	Water - EPA 901.1[c, d] Soil - HASL-300[c, e]
Isotopic uranium	Water - ASTM D3972-97[e, f] Soil ASTM C1000-90[e, g]
Isotopic plutonium	Water - ASTM D3865-97[c, h] Soil - ASTMC1001-90[c, i]
Strontium 90	ASTM D5811-95[c, j]

[a]U.S. EPA *Test Methods for Evaluating Solid Waste*, *Physical/Chemical Methods*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)
[b]Arsenic, barium, cadmium, lead, mercury, selenium, silver, and chromium
[c]Or equivalent laboratory method
[d]Prescribed *Methods for Measurement of Radioactivity in Drinking Water* (EPA, 1980)
[e]*Environmental Measurements Laboratory Procedure Manual,* HASL-300 (DOE, 1997)
[f]*Standard Test Methods for Isotopic Uranium in Water by Radiochemistry* (ASTM, 1997a)
[g]*Standard Test Methods for Radiochemical Determination of Uranium in Soil by Alpha Spectroscopy* (ASTM, 2000a)
[h]*Standard Test Methods for Plutonium in Water* (ASTM, 1997b)
[i]*Standard Test Methods for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy* (ASTM, 2000b)
[j]*Standard Test Methods for Strontium-90 in Water* (ASTM, 1995)
[k]Sludge sample
[l]EERF - EPA Eastern Environmental Radiation Facility

DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993).

The PALs for the CAU 204 investigation were determined during the DQO process. For chemical COPCs, PALs are based on U.S. EPA Region 9 Industrial PRGs (EPA, 2002) and 100 mg/kg for TPH per NAC 445A (NAC, 2003). For radiological COPCs, PALs are listed in the CAIP. To document subsequent agreements between NDEP and NNSA/NSO regarding the reference source and values for radiological PALs and the application of those PALs to the finding of the CAU 204 corrective action investigation, ROTC No. 1 to the CAIP was completed.

Background concentrations for metal were used instead of PRGs when the natural background concentration exceeded the PRG, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).

The corrective action investigation analytical results are organized by CAS and are summarized in the following sections. Details of the methods used during the investigation and a comparison of environmental sample results to the PALs are presented in this Appendix. Based on these results, the nature and extent of COCs at CAU 204 have been adequately identified to develop and evaluate corrective action alternatives. Both chemical and radioanalytical result summaries specific to each CAS are presented in the following sections. All rejected data are addressed in Appendix B.

Analytical results (e.g., organic, inorganic, and radiological) that exceed Minimum Reporting Levels (MRLs) are tabulated in the CAS-specific sections that follow. Results that are greater than PALs (a subset of those that exceed MRLs) are identified in the corresponding tables and discussed in Section A.3.0 through Section A.8.0. Nondetected results and results below MRLs have been excluded to minimize the size of this document. However, the unedited data set for CAU 204 is retained in an electronic format in the project files.

A.3.0 Underground Inst. House Bunker (CAS 01-34-01)

The Underground Inst. House Bunker was used in the T-1 atmospheric nuclear tests conducted in the 1950s, and is located about 3,000 ft from ground zero of the T-1 Tests (LANL, 1984; AEC, 1953). It is a subsurface concrete structure with a footprint of approximately 1,920 ft^2 (Holmes & Narver, 1990).

The bunker is covered primarily with soil. Asphalt covers the roof near the front sloping area. The bunker consists of the equipment room, the coax room, and the instrumentation room (Holmes & Narver, 1960). More detail is provided in the CAIP (NNSA/NV, 2002a).

A.3.1 Corrective Action Investigation

Subsequent to the hantavirus cleanup and radiological survey, one concrete and one paint chip sample were collected from two separate biased locations from the interior of the bunker for waste characterization. Because there was no visible indication that contamination had been released from the bunker and no elevated readings from the radiological survey, no soil samples were collected for site characterization at CAS 01-34-01. The waste characterization samples were collected and analyzed for the parameters in Table A.3-1, and sample locations are shown in Figure A.3-1. In addition to waste characterization samples, radiological swipe samples were collected at 55 locations from the interior of the CAS 01-34-01 bunker, and radiological readings for fixed plus removable radiological contamination were obtained from the swipe sample locations (Table A.3-3 and Figure A.3-2, respectively). The specific CAI activities conducted to meet CAIP requirements at CAS 01-34-01 are described in Table A.2-1.

A.3.1.1 Deviations

There were no deviations from the investigative activities specified in the CAIP for CAS 01-34-01.

A.3.2 Investigation Activities

The following sections provide descriptions of the CAS-specific activities conducted to complete Phase I activities as outlined in the CAIP. Investigation activities included the inspection and sampling of the bunker and soil, field-screening, waste characterization, and a radiological survey.

Table A.3-1
Samples Collected at CAS 01-34-01

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses			
					Total VOCs, Total SVOCs, Total RCRA Metals,	Lead Only	PCB	Pesticides
204A501	A01	Cement	0.0 - 0.5	WM	X		X	X
204A502	A02	Paint, Concrete	0.0 - 0.5	WM		X		

ft bgs = Feet below ground surface
WM = Waste management

A.3.2.1 Bunker Interior Inspection

In order to fully assess the potential for soil contamination at CAS 01-34-01, the investigation team first inspected the bunker for possible chemical and radiological release. This evaluation included performing an inventory of equipment within the bunker, inspecting the bunker for visual evidence of releases including stains, corroded materials, or degraded containers. A radiological survey was performed at several locations within the bunker and swipe samples were collected. The bunker at CAS 01-34-01 consists of a paved access ramp leading to the bunker, a hallway, equipment room, coax room, and instrument room (Figure A.3-1). Scaffolding supports two cooling units on the loading dock at the end of the ramp, and an overhead steel beam supports a chain hoist. Additionally, miscellaneous piping and conduits are attached to the concrete walls.

Inside the hallway there is a small water tank but the associated piping is disconnected and covered with bird droppings. The equipment room contains various electrical panels, piping, a water heater, an adsorptive dryer, and a compressor. The coax room houses piping conduits, a copper mesh screen, an air conditioning unit, and a sump with a sump pump. Electrical panels, air conditioning units, and miscellaneous wiring and piping are located in the instrument room.

There was a suspected oil stain on the floor of the bunker, and lead-based paint was suspected due to the age of the bunker (Shaw, 2003b).

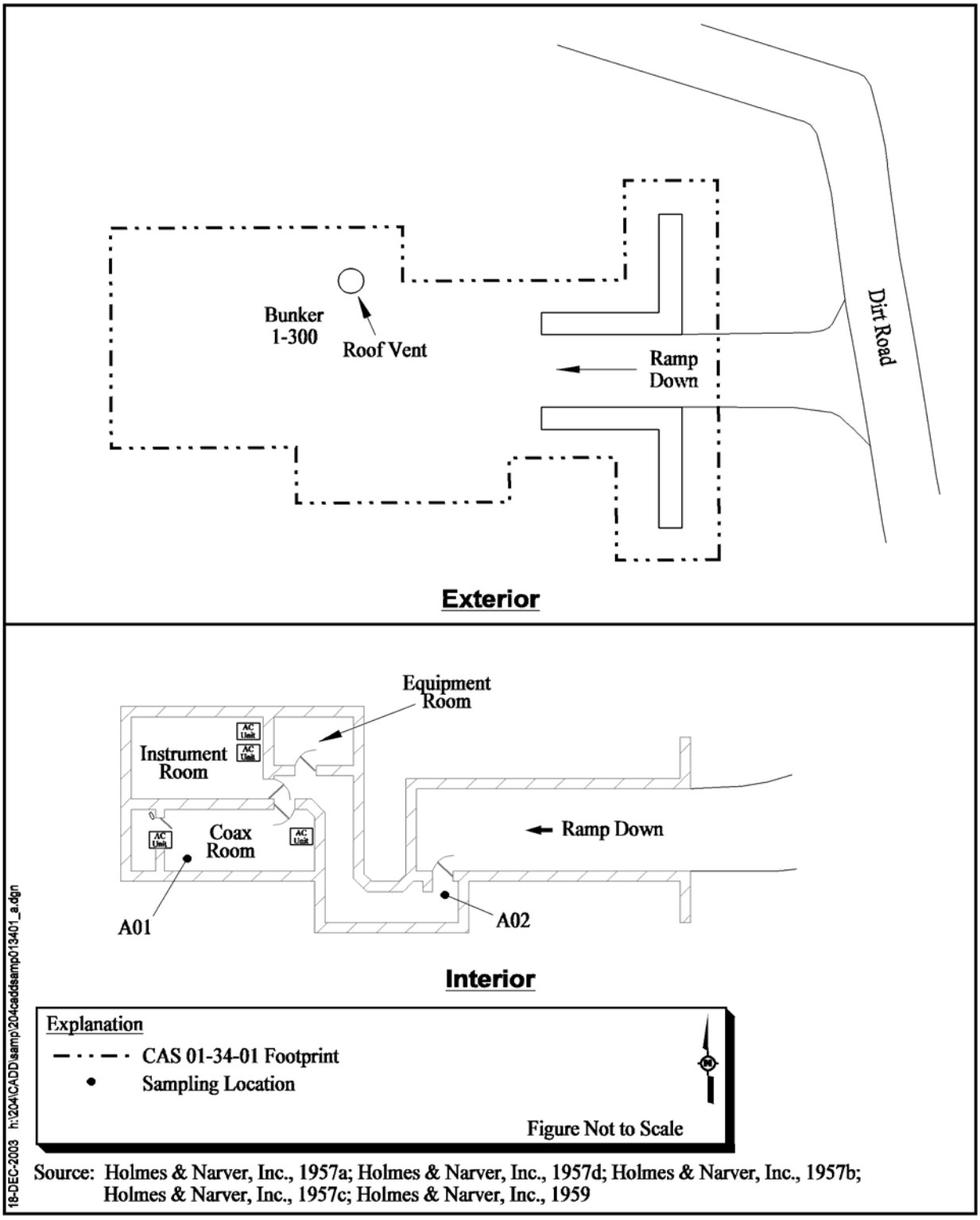

Figure A.3-1
CAS 01-34-01, Sampling Locations

Table A.3-2
Swipe Sample Results for CAS 01-34-01
(Page 1 of 2)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose Rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204A201	2.67	2.15	1-floor	1,751	26.2	15
204A202	9.36	10.40	2-floor	1,700	38.8	15
204A203	-0.67	2.53	3-floor	1,642	41.2	15
204A204	2.67	2.15	4-floor	1,833	29.9	15
204A205	-0.67	0.23	5-floor	1,681	15.5	15
204A206	6.01	6.28	6-wall	1,790	11.1	15
204A207	2.67	4.45	7-wall	1,945	29.9	15
204A208	-0.67	0.23	8-wall	1,900	33.3	15
204A209	2.67	4.45	9-wall	1,841	23.2	15
204A210	2.67	-2.24	10-wall	1,898	24.2	15
204A211	-0.67	2.53	11-door	2,090	19.8	15
204A212	2.67	6.75	12-floor	1,825	38.8	15
204A213	-0.67	0.23	13-floor	1,830	42.4	15
204A214	6.01	10.87	14-floor	2,015	40.3	15
204A215	2.67	6.75	15-floor	1,968	31.2	15
204A216	-0.67	-2.07	16-floor	1,942	29.9	15
204A217	9.36	-1.08	17-floor	1,798	41.2	15
204A218	2.67	9.04	18-equip	1,822	26.2	15
204A219	6.01	-2.91	19-equip	1,804	18.9	15
204A220	-0.67	9.42	20-wall	1,772	29.7	15
204A221	-0.67	2.53	21-wall	1,695	19.8	15
204A222	9.36	-1.08	22 wall	2,158	41.2	15
204A223	2.67	9.04	23-wall	1,934	33.3	15
204A224	6.01	-2.91	24-wall	1,492	32.1	15
204A225	-0.67	0.23	25-AC unit	1,821	33.3	15
204A226	-0.67	4.82	26-AC unit	1,762	19.8	15
204A227	-0.67	2.07	27-floor	1,770	26.2	15
204A228	-0.67	0.23	28-floor	1,663	42.3	15
204A229	-0.67	2.53	29-floor	1,994	38.5	15

Table A.3-2
Swipe Sample Results for CAS 01-34-01
(Page 2 of 2)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose Rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204A230	-0.67	9.42	30-floor	1,525	32.1	15
204A231	-0.67	0.23	31-floor	2,047	32.1	15
204A232	-0.67	7.12	32-floor	1,946	19.8	15
204A233	6.01	-2.91	33-floor	1,683	21.5	15
204A234	-0.67	0.23	34-floor	1,750	24.1	15
204A235	9.36	5.81	35-floor	1,944	26.2	15
204A236	-0.67	-2.07	36-wall	2,008	36.7	15
204A237	2.67	4.45	37-wall	1,899	40.1	15
204A238	2.67	2.15	38-wall	1,621	40.1	15
204A239	-0.67	4.82	39-wall	1,680	39.3	15
204A240	-0.67	4.82	40-wall	1,615	36.7	15
204A241	-0.67	0.23	41-AC unit	1,520	25.5	15
204A242	-0.67	7.12	42-AC unit	1,756	21.4	15
204A201A	3.01	-2.95	1A-floor	1,710	30.2	15
204A202A	3.01	8.54	2A-floor	1,742	28.4	15
204A203A	3.01	-2.95	3A-floor	1,689	29.9	15
204A204A	-0.33	4.36	4A-floor	1,723	40.1	15
204A205A	6.35	-1.12	5A-floor	1,690	37.5	15
204A206A	-0.33	-2.53	6A-floor	1,784	32.1	15
204A207A	-0.33	2.07	7A-wall	1,850	29.9	15
204A208A	-0.33	2.07	8A-electric panel	1,650	27.5	15
204A209A	-0.33	-0.23	9A-wall	1,910	19.8	15
204A2010A	-0.33	-2.53	10A-wall	1,921	33.3	15
204A211A	-0.33	-0.23	11A-wall	1,687	29.9	15
204A212A	-0.33	-0.23	12A-equip	1,745	31.2	15
204A213A	-0.33	2.07	13A-equip	1,780	32.1	15

cpm = Counters per minute
dpm = Disintegrations per minute
cm^2 = Square centimeters

Table A.3-3
Concrete and Paint Chip Samples Detected Above Minimum Reporting Limits at CAS 01-34-01

Sample Number	Sample Matrix	Parameter	Result	Units
204A501	Concrete	Arsenic	7.1	mg/kg
204A501	Concrete	Barium	94	mg/kg
204A501	Concrete	Cadmium	0.99 (J)[a]	mg/kg
204A501	Concrete	Chromium	11	mg/kg
204A501	Concrete	Lead	35 (J)[b]	mg/kg
204A502	Paint Chip	Lead	16 (J)[b]	mg/kg
204A501	Concrete	Diesel-Range Organics	97	mg/kg
204A501	Concrete	2-Butanone	30 (J)[c]	µg/kg
204A501	Concrete	Acetone	130 (J)[d]	µg/kg
204A501	Concrete	Methylene Chloride	16 (J)[c]	µg/kg
204A501	Concrete	Bis(2-Ethylhexyl)Phthalate	2,600	µg/kg
204A501	Concrete	Di-N-Butyl Phthalate	2,300	µg/kg
204A501	Concrete	Aroclor-1260	790 (J)[e]	µg/kg
204A501	Concrete	4,4'-DDE	1,900 (J)[e]	µg/kg
204A501	Concrete	4,4'-DDT	4,000 (J)[e]	µg/kg
204A501	Concrete	Alpha-Chlordane	3,400 (J)[e]	µg/kg
204A501	Concrete	Gamma-Chlordane	3,200 (J)[e]	µg/kg
204A501	Concrete	Heptachlor	250	µg/kg

[a]Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Matrix effects may exist.
[b]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits. Duplicate precision analysis (relative percent difference) outside control limits.
[c]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Surrogate recovery exceeded the lower limits.
[d]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Average relative response factor <0.05. Relative response factor <0.05. Surrogate recovery exceeded the lower limits.
[e]Qualifier added to laboratory data; record accepted. Surrogates diluted out.

mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
J = Estimated value

Waste characterization samples were collected at selected locations to verify the presence or absence of COPCs. As detailed in the CAIP (NNSA/NV, 2002a), the results of this investigation guided environmental sampling outside the bunker. There was no visible evidence that contamination had been released from the bunker. Also, the position of the potential release point (e.g., door opening onto the paved ramp) would prevent contamination from migrating to the surrounding soil. The results of the CAI are discussed in the following sections.

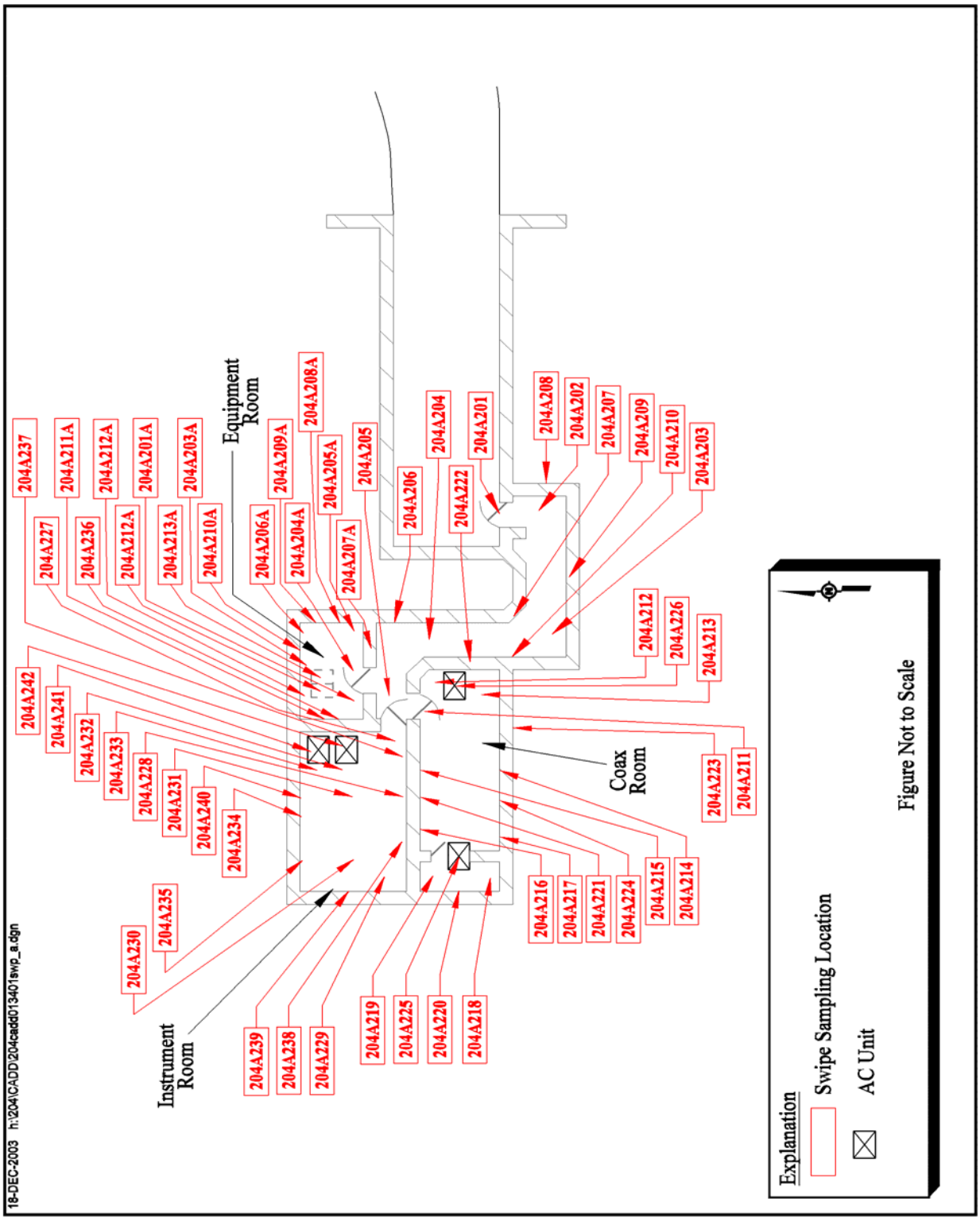

Figure A.3-2
CAS 01-34-01, Radiological Swipe Sample Locations
Bunker Interior

A.3.2.2 Radiological Survey

A radiological walk-over survey of the ground surface outside the bunker, but within the CAS 01-34-01 boundary, was conducted. In addition to the walk-over survey, a radiological survey of the interior of the bunker was conducted, which included the taking of swipe samples and direct meter readings of the swipe sample locations.

A.3.2.2.1 Radiological Survey Results

The radiological walk-over survey did not identify any areas where radioactivity exceeded the FSLs within the CAS 01-34-01 boundary.

Radiological survey measurements of the interior of the bunker at CAS 01-34-01 were taken for fixed plus removable radiological levels for comparison against unrestricted release criteria. Table A.3-3 provides the fixed plus removable radiological survey results from the interior of the bunker. The locations of the swipe samples are shown on Figure A.3-2. None of the sample locations exceeded the unrestricted release criteria per the NV/YMP RadCon Manual (DOE/NV, 2000).

A.3.2.3 Waste Characterization

Two waste characterization samples were collected from the bunker interior. Sample 204A501 was a chip sample of concrete collected from location A01 (Figure A.3-1) and sample 204A502 was paint chips collected from location A02.

The concrete sample was analyzed for metals, total VOCs, total SVOCs, TPH (GRO and DRO), pesticides, PCBs, and RCRA metals. The paint sample was analyzed for lead only. The analytical results for the waste characterization samples are shown in Table A.3-3. The waste characterization analytical data were not compared to PALs since they are intended to determine the classification of the potential waste, but are compared to regulatory limits based on disposal options.

A.3.2.3.1 Waste Characterization Results

Results of the waste characterization samples collected from the bunker interior were compared to regulatory limits based on disposal options. If waste has no hazardous component(s), the regulatory level is based on the NTS disposal options at their landfills (BN, 1995; CFR, 2003a and b; NDEP,

1997a, b, and c). If waste is hazardous, the release criteria is based on the interpretation of the guidelines presented in the performance objective criteria (POC) (BN, 1995).

The analytical results for the waste characterization samples collected that exceed the MRLs are presented in Table A.3-3. The concrete sample (204A501) exceeded the limit for heptachlor concentration for unrestricted landfill disposal. All other parameters were below the unrestricted landfill disposal criteria.

A.3.2.4 Site Characterization

The results of the initial screening and visual inspection showed no visible signs of contamination releases. All radiological swipe results were below the unrestricted release criteria and there were no elevated radiological readings that exceeded the FSLs in the radiological walk-over survey. Also, the physical location of doors and other release points reduced the potential for the release of contamination. Therefore, in accordance with the CAIP, it was considered unnecessary to collect any site characterization samples at CAS 01-34-01.

A.3.3 Contaminants of Concern

Since no site characterization samples were collected at CAS 01-34-01, no COCs were identified.

A.3.4 Nature and Extent of Contamination

Since no COCs were identified at CAS 01-34-01, nature and extent of contamination is not applicable.

A.3.5 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.4.0 Instrument Bunker (CAS 02-34-01)

Corrective Action Site 02-34-01, Instrument Bunker, located in Area 2 of the NTS was used in the T-2 atmospheric tests (Holmes & Narver, 1990; AEC, 1953) conducted in the 1950s and is located about 3,000 ft from ground zero of the test. It is similar in structure to the Underground Inst. House Bunker (CAS-01-34-01), a subsurface concrete structure with a footprint of 1,920 ft^2 (Holmes & Narver, 1958).

The bunker cover is primarily soil with asphalt near the front sloping area. This bunker consists of the equipment room, the coax room, the photo processing room, and the instrumentation room (Holmes & Narver, 1957a and 1960). There is also a small bunker attached to the main bunker. This bunker (2-300) is also constructed of concrete with a temporary wooden floor. Further detail is provided in the CAIP (NNSA/NV, 2002a).

A.4.1 Corrective Action Investigation

The specific CAI activities conducted to meet CAIP requirements at CAS 02-34-01 are described in Table A.2-1. A total of three site characterization soil samples, including one duplicate, were collected from two locations (B01 and B02) during investigation activities at CAS 02-34-01. In addition, three liquid QC and two interior waste characterization samples were collected during the field investigation. The waste site characterization samples were analyzed for the items listed in Table A.4-1. The actual sample locations are shown in Figure A.4-1. In addition to site and waste characterization samples, swipe samples were collected from 120 locations from the interior of the CAS 02-34-01 bunkers (Figure A.4-2 and A.4-3), and direct radiological readings for fixed plus removable radiological contamination were taken from the swipe samples (Table A.4-2).

A.4.1.1 Deviations

There were no deviations to the planned activities at CAS 02-34-01.

Table A.4-1
Samples Collected at CAS 02-34-01

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses						
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium, Strontium-90	Pesticides
204B001	B01	Soil	0.0 - 0.5	SC, Lab QC	X						
204B002	B02	Soil	0.0 - 0.5	SC	X						
204B003		Soil	0.0 - 0.5	SC	X						
204B301	NA	Water	NA	Trip Blank	VOCs only						
204B302	NA	Water	NA	Field Blank	X	X	X	X	X	X	
204B304	NA	Water	NA	Trip Blank	VOCs only						
204B501	B03	Cement	0.0 - 0.5	WM	X		X				X
204B502	B04	Paint, Concrete	0.0 - 0.5	WM	Lead only						

ft bgs = Feet below ground surface
QC = Quality control
SC = Site characterization
WM = Waste management

A.4.2 Investigation Activities

The following sections provide descriptions of the CAS-specific investigative activities conducted as outlined in the CAIP. Investigation activities included the inspection and sampling of the bunker and soil, field-screening, waste characterization sampling, and an exterior radiological survey.

A.4.2.1 Bunker Interior Inspection

In order to fully assess the potential for soil contamination at CAS 02-34-01, the investigation team first inspected the bunker for possible chemical and radiological release. This evaluation included performing an inventory of equipment within the bunker, inspecting the bunker for visual evidence of releases including stains, corroded materials, or degraded containers. A radiological survey was performed throughout the bunkers and swipe samples were collected.

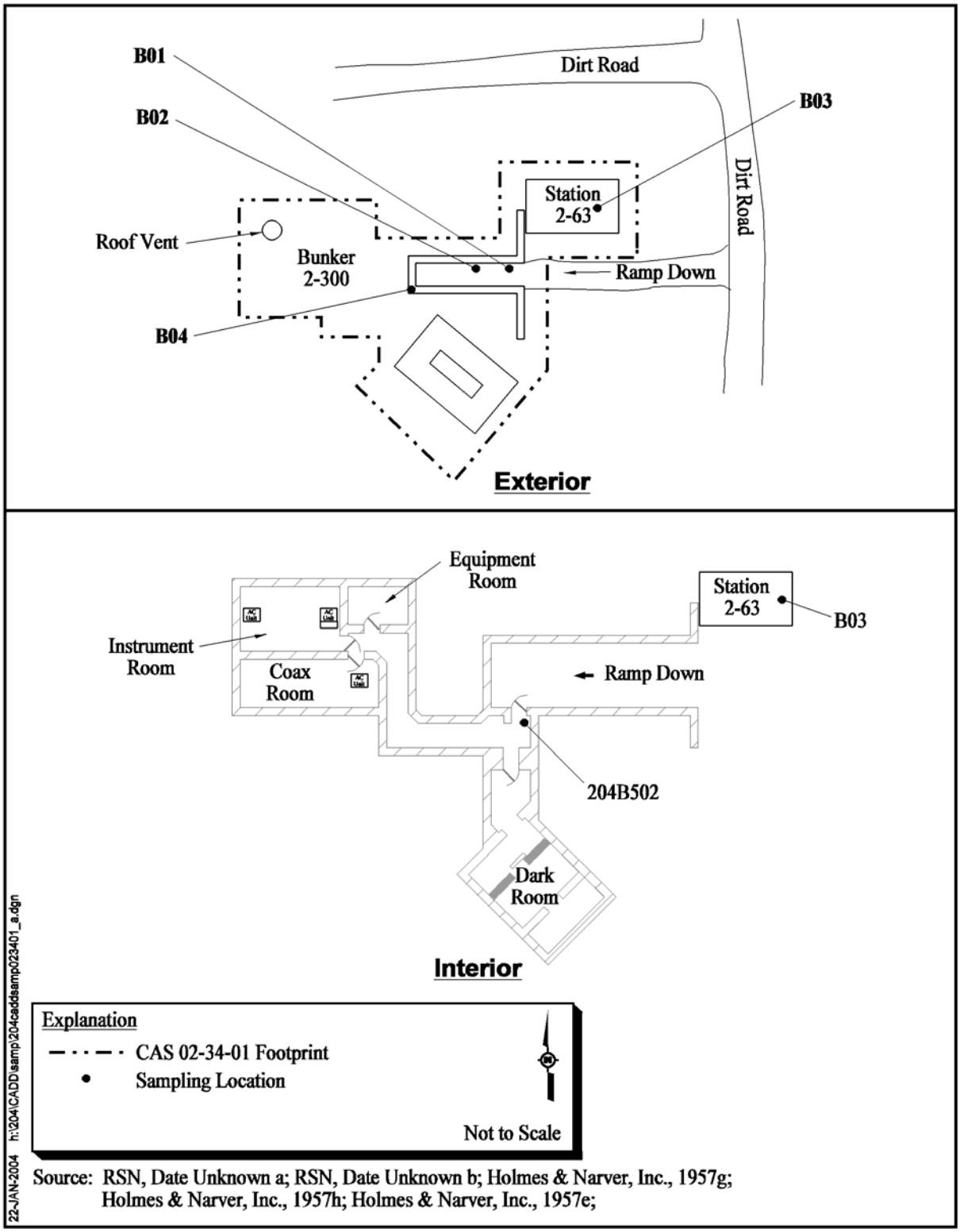

Figure A.4-1
CAS 02-34-01, Sampling Locations

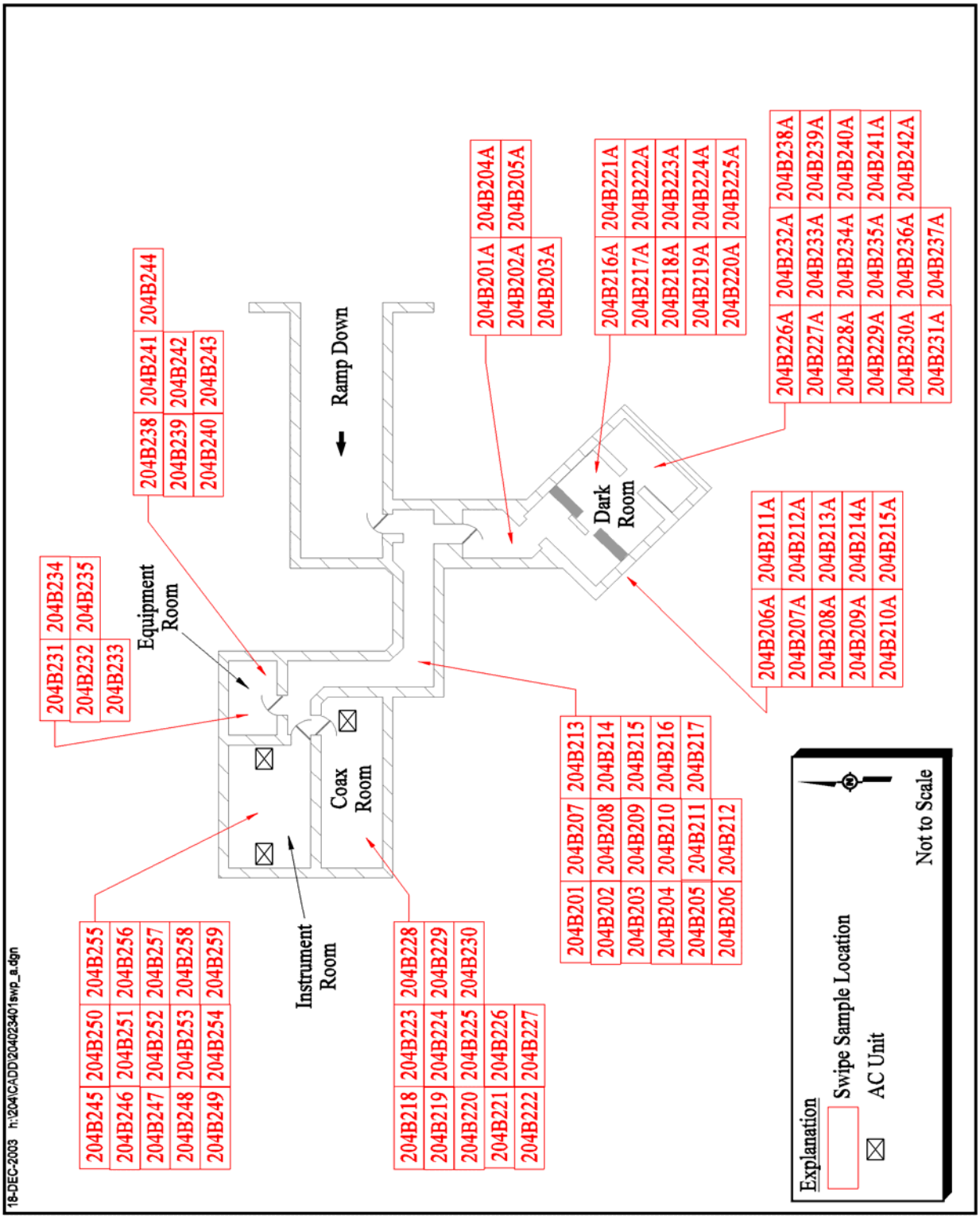

Figure A.4-2
CAS 02-34-01, Radiological Swipe Sample Locations, Bunker Interior

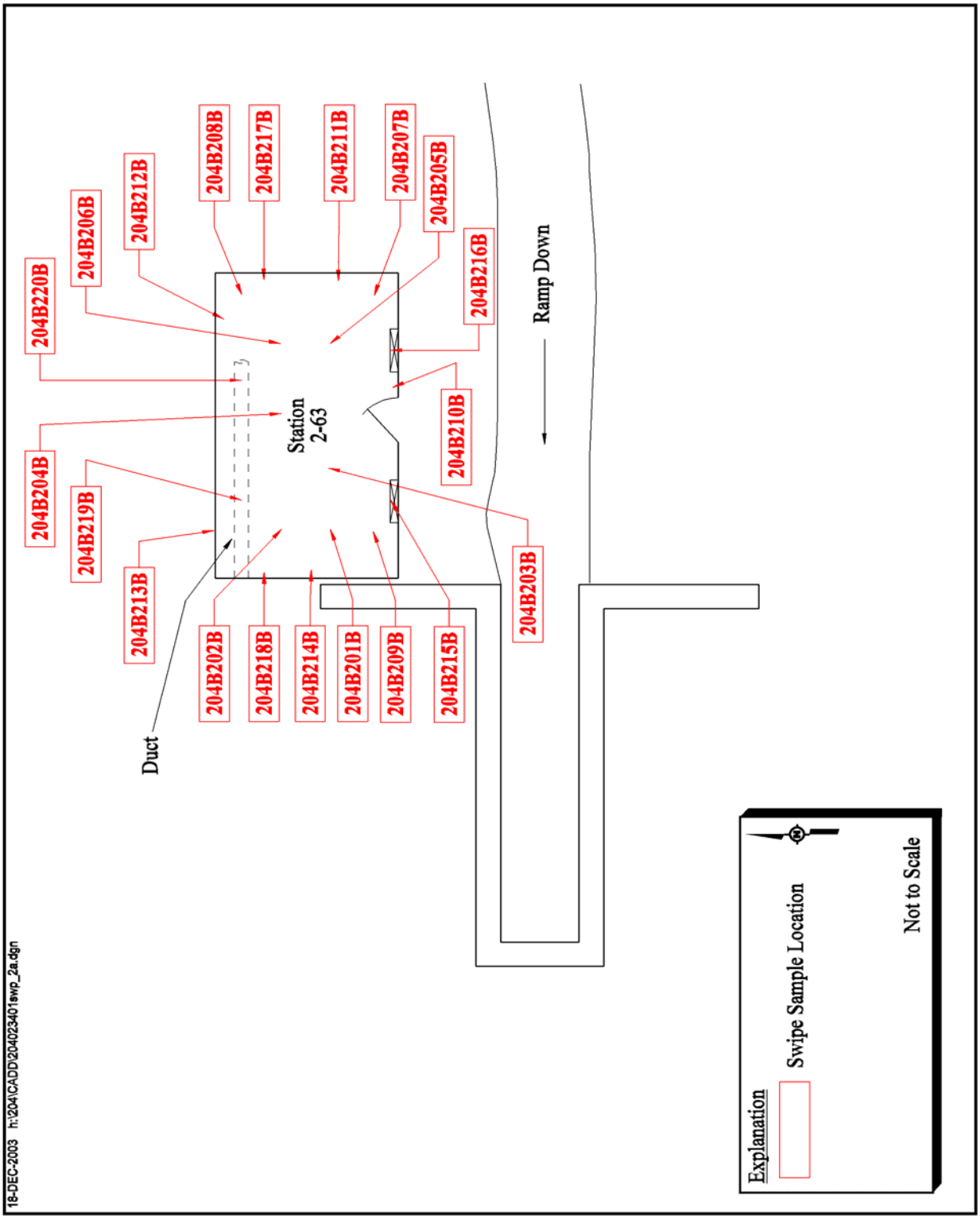

Figure A.4-3
CAS 02-34-01, Radiological Swipe Samples, Station 2-63

Table A.4-2
Swipe Sample Results for CAS 02-34-01
(Page 1 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204B201	16.04	11.76	1-floor	1,400	11.8	10
204B202	-0.67	-2.07	2-wall	1,440	20.5	10
204B203	2.67	-0.14	3-wall	1,325	9.4	10
204B204	-0.67	0.23	4-vent hose	1,129	7.8	10
204B205	-0.67	0.23	5-floor	1,210	28.3	10
204B206	2.67	6.75	6-wall	1,100	31.4	10
204B207	6.01	8.57	7-wall	1,489	29.5	10
204B208	9.36	12.70	8-pipe	1,327	31.4	10
204B209	2.67	-0.14	9-floor	1,580	6.3	10
204B210	-0.67	18.60	10-wall	1,196	7.8	10
204B211	12.70	3.04	11-wall	1,324	21.7	10
204B212	-0.67	2.53	12-floor	1,042	19.1	10
204B213	-0.67	4.82	13-wall	1,180	24.2	10
204B214	-0.67	2.53	14-wall	1,216	23.6	10
204B215	-0.67	0.23	15-floor	1,145	19.1	10
204B216	-0.67	0.23	16-venthose	1,295	27.8	10
204B217	-0.67	4.82	17-pipe	1,286	33.3	10
204B218	-0.67	7.12	18-floor	1,331	27.7	10
204B219	-0.67	18.60	19-floor	1,196	34.5	10
204B220	2.67	4.45	20-floor	1,245	32.1	10
204B221	-0.67	9.42	21-floor	1,439	32.1	10
204B222	9.36	15.00	22-floor	1,284	14.9	10
204B223	12.70	5.34	23-floor	1,262	21.8	10
204B224	-0.67	9.42	24-wall	1,486	30.3	10
204B225	2.67	2.15	25-wall	1,127	27.7	10
204B226	6.01	6.28	26-wall	1,385	38.6	10
204B227	-0.67	0.23	27-wall	1,320	21.8	10
204B228	6.01	13.17	28-AC unit	1,541	35	10

Table A.4-2
Swipe Sample Results for CAS 02-34-01
(Page 2 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204B229	2.67	4.45	29-equipment	1,290	33.3	10
204B230	9.36	3.51	30-equipment	998	23.4	10
204B231	2.67	18.23	31-motor	1,415	28.3	10
204B232	2.67	20.53	23-motor	1,500	18.7	10
204B233	2.67	-2.44	33-duct	1,296	215	10
204B234	2.67	11.34	34-pipe	1,384	19.8	10
204B235	-0.67	71.43	35-vent	1,367	28.6	10
204B238	-0.67	-2.07	38-floor	1,298	36.3	10
204B239	6.01	10.87	39-wall	1,380	29.7	10
204B240	-0.67	2.53	40-floor	1,402	28.6	10
204B241	-0.67	0.23	41-floor	1,295	35.2	10
204B242	6.01	0.23	42-wall	1,277	15.4	10
204B243	-0.67	0.23	43-floor	1,240	29.7	10
204B244	-0.67	-2.07	44-wall	1,245	30.1	10
204B245	-0.67	0.23	45-floor	1,388	21.5	10
204B246	-0.67	4.82	46-floor	1,427	20.5	10
204B247	2.67	4.45	47-floor	1,485	27.7	10
204B248	-0.67	0.23	48-floor	1,485	32.1	10
204B249	-0.67	-2.07	49-floor	1,320	34.5	10
204B250	2.67	-2.44	50-floor	1,580	20.5	10
204B251	-0.67	4.82	51-wall	1,365	9.8	10
204B252	2.67	-2.44	52-wall	1,470	10.3	10
204B253	-0.67	2.53	53-wall	1,423	26.6	10
204B254	-0.67	2.53	54-wall	1,330	33.3	10
204B255	2.67	-0.14	55-AC unit	1,525	321	10
204B256	2.67	2.15	56-AC unit	1,480	24.2	10
204B257	-0.67	0.23	57-shelves	1,400	28.6	10
204B258	2.67	9.04	58-shelves	1,366	27.7	10

Table A.4-2
Swipe Sample Results for CAS 02-34-01
(Page 3 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204B259	-0.67	0.23	59-electric panel	1,421	21.8	10
204B201B	-0.67	-1.61	1B-floor	1,465	14	15
204B202B	6.01	18.22	2B-floor	1,388	7.6	15
204B203B	-0.67	-1.61	3B-floor	1,240	20.5	15
204B204B	9.36	1.67	4B-floor	1,665	16.5	15
204B205B	-0.67	-1.61	5B-floor	1,435	23.7	15
204B206B	-0.67	0.69	6B-floor	1,598	12.4	15
204B207B	-0.67	5.28	7B-floor	1,127	19.8	15
204B208B	-0.67	5.28	8B-floor	1,382	9.8	15
204B209B	-0.67	0.69	9B-wall	1,905	27.4	15
204B210B	-0.67	-1.61	10B-wall	1,461	11.6	15
204B211B	-0.67	5.28	11B-wall	1,590	12.4	15
204B212B	-0.67	2.99	12B-wall	1,362	22.2	15
204B213B	-0.67	-1.61	13B-wall	1,350	19.8	15
204B214B	-0.67	14.47	14B-wall	1,417	11.6	15
204B215B	6.01	9.03	15B-vent	1,368	26.4	15
204B216B	-0.67	2.99	16B-vent	1,695	9.6	15
204B217B	12.70	12.69	17B-pipe	1,182	14.0	15
204B218B	-0.67	5.28	18B-pipe	1,320	16.2	15
204B219B	-0.67	0.69	19B-duct	1,496	21.5	15
204B220B	2.67	0.31	20B duct	1,477	33.3	15

ID = Identification
NA = Not applicable
cpm = Counts per minute
dpm = Disintegrations per minute
cm^2 = Square centimeters

Corrective Action Site 02-34-01 consists of an access ramp leading to the bunker, a hallway, equipment room, coax room, instrument room, and a photoprocessing room. A large section of ventilation hose is located on the loading dock near the entry to the bunker. No significant equipment was found in Station 2-63, but some debris including a wooden box, electrical panels and wiring, and a pump and miscellaneous piping were observed. The equipment room contains ventilation hose, two generators, two adsorptive dryers, electrical panels, and conduit. A compressor, electrical panels with conduit, and miscellaneous hand tools are located in the coax room. The photoprocessing room contained an empty cardboard box, water bottles, and miscellaneous debris. A small room (Station 2-63) is attached to the east side of the bunker (Figure A.4-1). A small area on the ground near the ramp is where it appears lead shot had been discarded as identified during the visual inspection of the bunker's exterior.

A.4.2.2 Land Area Walk-Over Radiological Survey

A radiological walk-over survey of the ground surface within the CAS 02-34-01 boundary was conducted in addition to a radiological survey of the interior of the bunker, which included collecting swipe samples. The swipe samples were evaluated to determine the removable radiological contamination, and direct meter readings of swipe sample locations were taken to identify the fixed plus removable radioactive contamination.

A.4.2.2.1 Radiological Survey Results

The radiological walk-over survey did not produce any readings that exceeded FSLs.

Radiological survey measurements of the interior of the bunker were taken to determine fixed plus removable radiological levels for comparison against unrestricted release criteria. Table A.4-3 provides the fixed plus removable radiological survey results from the bunker interior. None of the sample locations exceeded the unrestricted release criteria per the NV/YMP RadCon Manual (DOE/NV, 2000).

Table A.4-3
Concrete and Paint Chip Samples Detected Above Minimum Reporting Limits at CAS 02-34-01

Sample Number	Sample Matrix	Parameter	Result	Units
204B501	Concrete	Arsenic	3.1	mg/kg
204B501	Concrete	Barium	81	mg/kg
204B501	Concrete	Chromium	11	mg/kg
204B501	Concrete	Lead	1.7 (J)[a]	mg/kg
204B502	Paint Chip	Lead	76 (J)[a]	mg/kg
204B501	Concrete	Diesel-Range Organics	280 (H)	mg/kg
204B501	Concrete	1,2,4-Trimethylbenzene	36 (J)[b]	µg/kg
204B501	Concrete	1,3,5-Trimethylbenzene	18 (J)[b]	µg/kg
204B501	Concrete	2-Butanone	48 (J)[b]	µg/kg
204B501	Concrete	Acetone	660 (J)[c]	µg/kg
204B501	Concrete	Methylene Chloride	17 (J)[b]	µg/kg
204B501	Concrete	Naphthalene	20 (J)[b]	µg/kg
204B501	Concrete	Bis(2-Ethylhexyl)Phthalate	5,000	µg/kg
204B501	Concrete	Gasoline-Range Organics	2 (H)	mg/kg
204B501	Concrete	4,4'-DDE	18 (J)[d]	µg/kg
204B501	Concrete	4,4'-DDT	8.8 (J)[d]	µg/kg
204B501	Concrete	Gamma-Chlordane	2 (J)[e]	µg/kg

[a]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits. Duplicate precision analysis outside control limits.
[b]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Surrogate recovery exceeded the lower limits.
[c]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Average relative response factor <0.05. Relative response factor <0.05. Surrogate recovery exceeded the lower limits.
[d]Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the lower limits.
[e]Qualifier added to laboratory data; record accepted. %D between columns >25. Surrogate recovery exceeded the lower limits.

mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest.
J = Estimated value

A.4.2.3 Waste Characterization

Two waste characterization samples were collected from the interior of the bunker. One sample (204B501) was a chip sample of concrete collected from location B03 (Figure A.4-1). The other was a paint chip sample (204B502) collected from location B04.

The concrete sample was analyzed for VOCs, SVOC, pesticides TPH (GRO and DRO), RCRA metals, and PCBs. The paint sample was analyzed for lead. The specific parameters are shown in Table A.4-1 and analytical methods are shown in Table A.2-2. The waste characterization samples were used to determine the appropriate disposal method of waste material and were compared to established parameter-specific regulatory limits and not to PALs.

A.4.2.3.1 Waste Characterization Results

Analytical results from the waste characterization samples collected from the bunker interior were compared to regulatory limits based on disposal options. If the waste has no hazardous component(s), the regulatory level will be based on the NTS disposal options at NTS landfills (BN, 1995; CFR, 2003a and b; NDEP, 1997a, b, and c). If the waste is hazardous, the release criteria will be based on the interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999).

The analytical results for the waste characterization samples collected that exceed the MRLs are presented in Table A.4-4.

A.4.2.4 Field-Screening

Soil samples were screened for VOCs and alpha and beta/gamma radioactivity. The field readings were compared to FSLs to guide sampling decisions and determine which samples were to be submitted for laboratory analysis.

A.4.2.4.1 Field-Screening Results

No VOCs or alpha and beta/gamma radioactivity greater than FSLs were found during soil sample screening. The results of radiological field screening are discussed in Section A.4.2.5.1.

Table A.4-4
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 02-34-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Selenium
Preliminary Action Levels			**23[a]**	**67,000[b]**	**450[b]**	**450[b]**	**750[b]**	**5,100[b]**
204B001	B01	0.0 - 0.5	5.1	170	3.1 (J)[c]	8.6	85 (J)[d]	0.63 (J)[e]
204B002	B02	0.0 - 0.5	5.4	160	4.6 (J)[f]	15	39 (J)[d]	0.63 (J)[e]
204B003		0.0 - 0.5	5.3	160	3.4 (J)[f]	12	37 (J)[d]	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range.
[b]Based on EPA *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2002)
[c]Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Matrix effects may exist.
[d]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits. Duplicate precision analysis (relative percent difference) outside control limits.
[e]Qualifier added to laboratory data; record accepted. Negative bias found in continuing calibration/method blank.
[f]Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Value exceeded linear/calibration range of instrument.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
J = Estimated value
-- = Not detected above minimum reporting limits

A.4.2.5 Site Characterization

During the visual inspection of CAS 02-34-01, a small area of lead shot and a small stained area were identified outside of the bunker along the access ramp. Surface soil samples were collected from each of these two areas for site characterization. The sample collected from the lead-shot site contained only soil and did not include any of the lead shot. The lead shot was collected and disposed of as IDW. Results from the analysis of the soil samples that exceeded MRLs are discussed in the following sections.

A.4.2.5.1 Soil Characterization Sample Analyses

The parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.4-1 lists the sample-specific analytical parameters. The analytical results of soil samples with concentrations exceeding MRLs or PALs (EPA, 2002) at CAS 02-34-01 are summarized in the following sections.

Radioanalysis of CAS 02-34-01 samples were reviewed against the established specific background concentration and the "rad added" screening levels of the NTS POC (BN, 1995). A portion of the analytical results were rejected during validation; however, these rejected data did not impact closure decisions as discussed in Appendix B.

A.4.2.5.2 Total Metals

Analytical results exceeding MRLs for total metals are reported in Table A.4-4. Six metals were detected in the soil samples. None of the reported metal concentrations exceeded the PALs identified in the CAIP.

A.4.3 Contaminants of Concern

Since the concentration of the analytes of the site characterization samples did not exceed the PALs established in the CAIP, no contaminants of concern other than TPH were identified at CAS 02-34-01.

A.4.4 Nature and Extent of Contamination

Since no COCs were identified at CAS 02-34-01, nature and extent of contamination is not applicable.

A.4.5 Revised Conceptual Site Model

No variations to the CSM were identified.

A.5.0 Underground Bunker (CAS 03-34-01)

Corrective Action Site 03-34-01, Underground Bunker, was used to photograph the T-3 series of atmospheric tests (Holmes & Narver, 1990; AEC, 1953), and has a footprint of approximately 1,160 ft^2 (Holmes & Narver, 1990). It is a soil and asphalt-covered bunker approximately 3,000 ft from ground zero of the T-3 test. This bunker consists of an equipment room, coax room, and instrumentation room. A ventilation duct leads to the outside of the bunker. Additional details are provided in the CAIP (NNSA/NV, 2002a).

A.5.1 Corrective Action Investigation

The CAI consisted of cleaning the interior for hantavirus, a visual inspection of the interior and exterior, radiological walk-over survey, and radiological swipe sampling of the bunker interior. In addition, two waste characterization samples, listed in Table A.5-1, were collected during investigation activities conducted at CAS 03-34-01. The sample locations are shown in Figure A.5-1. The specific CAI activities conducted to meet CAIP requirements at CAS 03-34-01 are described in Table A.2-1.

Table A.5-1
Samples Collected at CAS 03-34-01

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses	
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	PCB
204C301	NA	Water	NA	Trip Blank	VOCs only	
204C501	C01	Concrete	0.0 - 0.5	WM	X	X
204C502	C02	Paint, Concrete	0.0 - 0.5	WM	Lead only	

ft bgs = Feet below ground surface
WM = Waste management

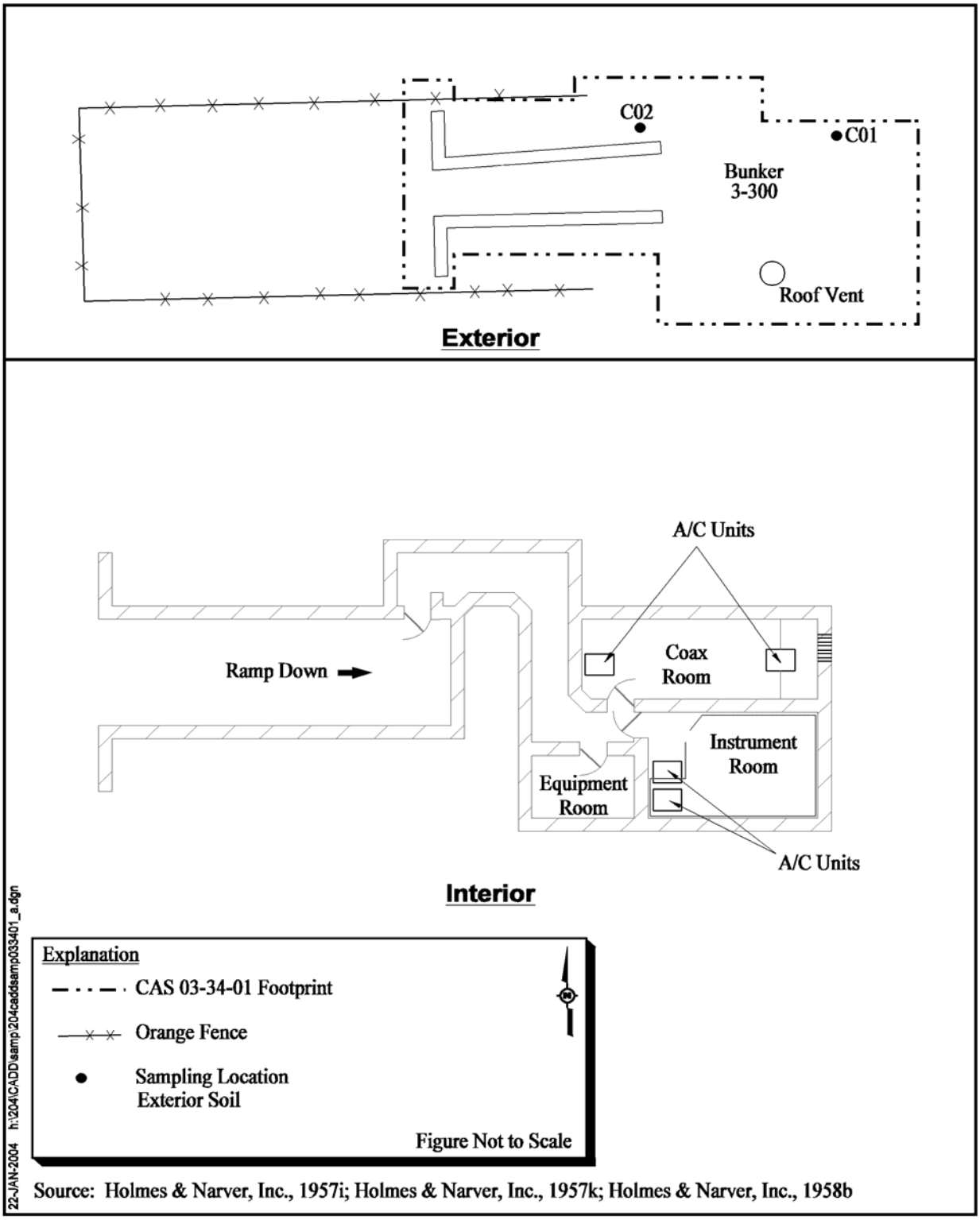

Figure A.5-1
CAS 03-34-01, Sampling Locations

A.5.1.1 Deviations

There were no deviations to the planned activities proposed in the CAIP for CAS 03-34-01.

A.5.2 Investigation Activities

The following sections provide details of the inspection and sampling, FSRs, and sample selection and analysis conducted during the CAI. The samples collected and the analyses performed are shown in Table A.5-1.

A.5.2.1 Bunker Interior Inspection

The initial activity conducted during the CAI was to clear the interior of CAS 03-34-01 for hantavirus. In order to fully assess the potential for soil contamination at CAS 03-34-01, the investigation team first inspected the bunker for possible chemical and radiological release. This evaluation included performing an inspection of equipment within the bunker; inspecting the bunker for visual evidence of releases including stains, corroded materials, or degraded containers; and to identify evidence or location of a contaminant release to the environment. A radiological survey was performed throughout the CAS and swipe samples were collected.

The bunker consists of an access ramp leading to the bunker, a hallway, an equipment room, a coax room, and an instrument room. The instrument room and coax room both contain two air conditioning units.

A.5.2.2 Radiological Survey

A radiological walk-over survey of the ground surface outside the bunker, but within the CAS 03-34-01 boundary, was conducted. In addition, a radiological survey of the interior of the bunker which included collecting swipe samples and direct meter readings of swipe sample locations was conducted (Figure A.5-2).

A.5.2.2.1 Radiological Survey Results

The radiological walk-over survey did not indicate any areas of concern within the boundaries of CAS 03-34-01.

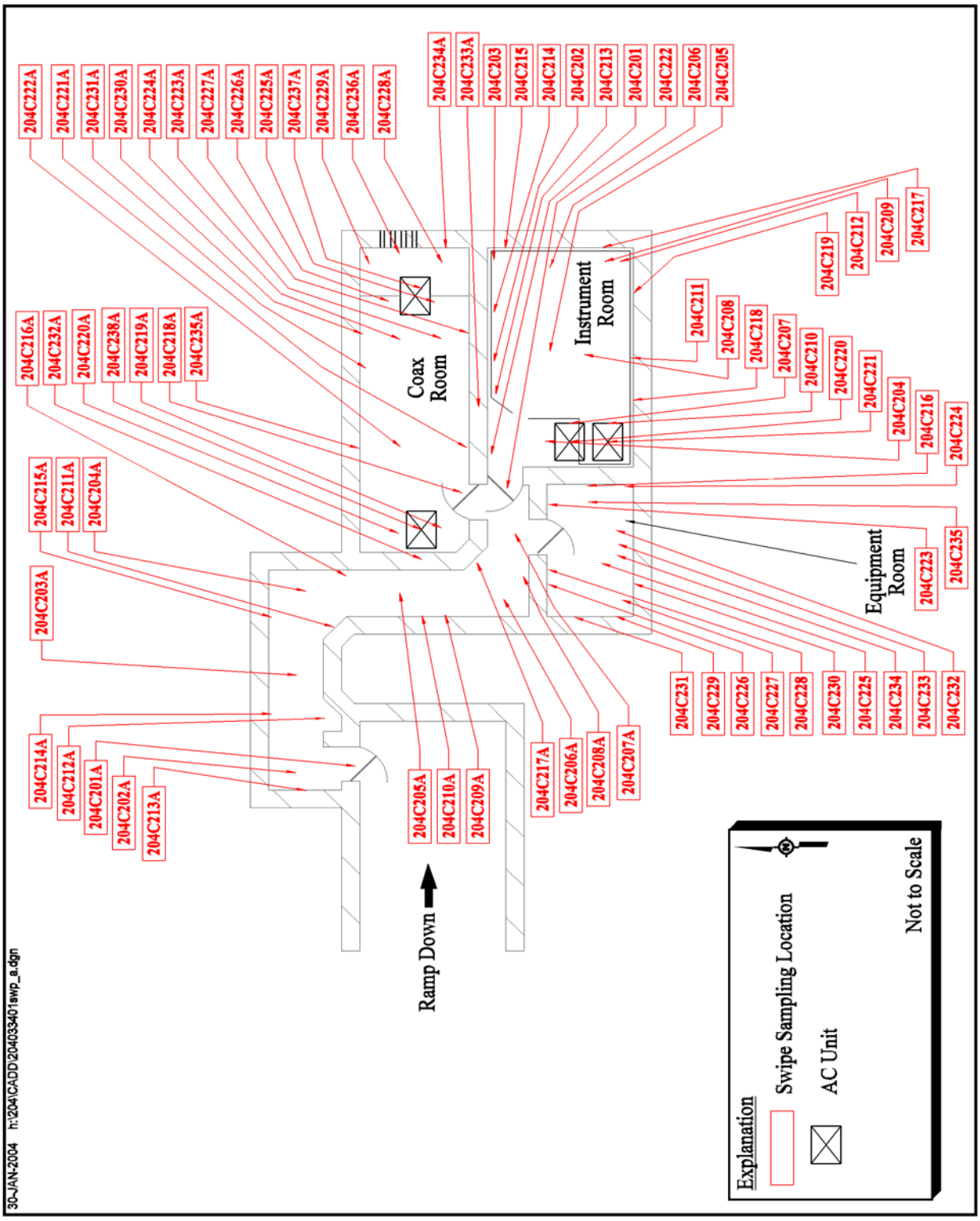

Figure A.5-2
CAS 03-34-01, Radiological Swipe Sample Locations
Bunker Interior

Radiological survey measurements of the interior of the bunker at CAS 03-34-01 were taken for fixed plus removable radiological levels for comparison against unrestricted release criteria. Table A.5-2 provides the fixed plus removable radiological survey results from the interior of the bunker. None of the sample locations exceeded the unrestricted release criteria per the NV/YMP RadCon Manual (DOE/NV, 2000).

A.5.2.3 Waste Characterization

Two waste characterization samples, one concrete and one paint chip, were collected from the interior of the bunker. The concrete sample was analyzed for VOCs, SVOC, TPH (GRO and DRO), RCRA metals, and PCBs. The paint sample was analyzed for lead. The analytical methods used for waste characterization are listed in Table A.2-2. The CAS-specific parameters, sample locations, and sample numbers are presented in Table A.5-1. The waste characterization samples were used to determine the appropriate disposal method of potential waste material and were compared to established parameter-specific regulatory limits and not to PALs.

A.5.2.3.1 Waste Characterization Results

Analytical results from the waste characterization samples collected from the bunker interior were compared to regulatory limits based on disposal options. If the waste has no hazardous component(s), the regulatory level will be based on the NTS disposal options at NTS landfills (BN,1995; CFR, 2003a and b; NDEP, 1997a, b, and c). If the waste is hazardous, the release criteria will be based on the interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999).

The analytical results for the waste characterization samples collected that exceed the MRLs are presented in Table A.5-3.

A.5.2.4 Site Characterization

The results of the radiological screening and visual inspection produced only results for waste characterization. No analytical data was collected for site characterization. There were no visible signs of contamination releases. The physical location of doors and potential release points reduced the potential for contamination migration to the environment. All radiological swipe results were

Table A.5-2
Swipe Sample Results for CAS 03-34-01
(Page 1 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose Rate (microrem/hr)
				Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204C201	0.00	0.00	1-floor	1,535	23.4	15
204C202	0.00	0.00	2-floor	1,568	26.7	15
204C203	5.20	0.00	3-floor	1,540	23.4	15
204C204	10.70	0.00	4-floor	1,500	33.3	15
204C205	2.60	0.00	5-floor	1,600	29.7	15
204C206	5.20	0.00	6-floor	1,414	9.8	15
204C207	13.20	21.70	7-floor	1,508	19.6	15
204C208	2.60	0.00	8-floor	1,396	11.1	15
204C209	18.20	0.00	9-floor	1,484	29.7	15
204C210	7.80	0.00	10-floor	1,584	33.3	15
204C211	7.80	0.00	11-floor	1,462	36.4	15
204C212	13.00	0.00	12-floor	1,449	22.5	15
204C213	3.30	10.80	13-floor	1,673	32.4	15
204C214	18.60	13.60	14-wall	1,590	28.7	15
204C215	10.40	0.00	15-wall	1,585	19.8	15
204C216	11.90	30.70	16-wall	1,645	23.4	15
204C217	13.00	0.00	17-wall	1,623	33.3	15
204C218	17.80	57.30	18-wall	1,600	40.1	15
204C219	10.40	0.00	19-wall	1,389	36.4	15
204C220	13.00	0.00	20-AC unit	1,579	27.5	15
204C221	10.40	0.00	21-AC unit	1,823	19.6	15
204C222	5.20	0.00	22-door	1,666	24.3	15
204C223	11.20	0.00	23-floor	1,620	32.4	15
204C224	7.80	0.00	24-wall	1,511	30.7	15
204C225	8.80	0.00	25-floor	1,375	25.5	15
204C226	5.20	18.80	26-floor	1,341	19.6	15
204C227	18.60	48.90	27-floor	1,984	21.7	15
204C228	7.80	0.00	28-wall	1,762	32.4	15
204C229	10.40	0.00	29-wall	1,525	30.7	15
204C230	18.20	0.00	30-wall	1,685	28.6	15

Table A.5-2
Swipe Sample Results for CAS 03-34-01
(Page 2 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose Rate (microrem/hr)
				Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204C231	5.20	0.00	31-wall	1,533	32.4	15
204C232	15.60	0.00	32-floor	1,462	33.3	15
204C233	0.00	0.00	33-tank	1,507	27.5	15
204C234	15.60	0.00	34-equip	1,621	30.7	15
204C235	0.00	0.00	35-equip	1,580	32.4	15
204C201A	2.67	2.15	1A-door	1,380	24.7	15
204C202A	16.04	16.36	2A-floor	1,342	19.6	15
204C203A	2.67	-0.14	3A-floor	1,460	9.8	15
204C204A	-0.67	2.53	4A-floor	1,460	7.6	15
204C205A	-0.67	11.71	5A-floor	1,296	20.5	15
204C206A	-0.67	7.12	6A-floor	1,583	29.3	15
204C207A	2.67	-2.44	7A-floor	1,441	17.8	15
204C208A	2.67	2.15	8A-wall	1,375	23.4	15
204C209A	-0.67	2.53	9A-wall	1,363	11.6	15
204C210A	-0.67	2.53	10a-pipe	1,462	19.6	15
204C211A	6.01	-0.61	11A-wall	1,784	21.1	15
204C212A	-0.67	4.82	12A-wall	1,370	33.3	15
204C213A	-0.67	0.23	13A-wall	1,368	24.7	15
204C214A	-0.67	2.53	14A-wall	1,427	19.6	15
204C215A	2.67	6.75	15A-wall	1,665	18.7	15
204C216A	2.67	6.75	16A-wall	1,290	19.6	15
204C217A	6.01	6.28	17A-wall	1,310	26.7	15
204C218A	2.67	2.15	18A-door	1,287	33.3	15
204C219A	-0.67	11.71	19A-floor	1,444	11.6	15
204C220A	-0.67	-2.07	20A-floor	1,486	18.7	15
204C221A	2.67	6.75	21A-floor	1,520	32.2	15
204C222A	2.67	4.45	22A-floor	1,471	40.1	15
204C223A	-0.67	-2.07	23A-Floor	1,544	29.8	15
204C224A	-0.67	-2.07	24A-Floor	1,626	23.4	15
204C225A	9.36	1.22	25A-Floor	1,910	24.7	15

Table A.5-2
Swipe Sample Results for CAS 03-34-01
(Page 3 of 3)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose Rate (microrem/hr)
				Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204C226A	-0.67	-2.07	26A-Floor	1,532	18.7	15
204C227A	-0.67	2.53	27A-Bench	1,348	15.5	15
204C228A	6.01	1.68	28A-bench	1,386	19.6	15
204C229A	-0.67	0.23	29A-bench	1,500	23.4	15
204C230A	-0.67	-2.07	30A-bench	1,491	21.1	15
204C231A	-0.67	0.23	31A-bench	1,258	29.8	15
204C232A	-0.67	-2.07	32A-wall	1,644	14.4	15
204C233A	-0.67	-2.07	33A-wall	1,925	23.4	15
204C234A	2.67	-2.44	34A-wall	1,418	26.7	15
204C235A	6.01	15.46	35A-wall	1,385	19.6	15
204C236A	6.01	24.65	36A-pipe	1,470	18.7	15
204C237A	-0.67	2.53	37A-AC unit	1,544	23.4	15
204C238A	-0.67	4.82	38A-AC unit	1,398	32.4	15

ID = Identification
NA = Not applicable
cpm = Counts per minute
dpm = Disintegrations per minute
cm^2 = Square centimeters

below the unrestricted release criteria and there were no radiological readings that exceeded the FSLs in the radiological walk-over survey. Therefore, in accordance with the CAIP, it was considered unnecessary to collected any site characterization samples at CAS 03-34-01.

A.5.3 Contaminants of Concern

Based on the visual inspection of the bunker interior and exterior, a radiological walk-over survey, and radiological swipe sampling, no COCs were identified.

Table A.5-3
Concrete and Paint Chip Samples Detected Above Minimum Reporting Limits at CAS 03-34-01

Sample Number	Sample Matrix	Parameter	Result	Units
204C501	Concrete	Arsenic	7.2	mg/kg
204C501	Concrete	Barium	94	mg/kg
204C501	Concrete	Cadmium	1.5	mg/kg
204C501	Concrete	Chromium	9.1	mg/kg
204C501	Concrete	Lead	12	mg/kg
204C502	Paint Chip	Lead	15	mg/kg
204C501	Concrete	Silver	1.1	mg/kg
204C501	Concrete	Diesel-Range Organics	850 (L, H)	mg/kg
204C501	Concrete	1,1,1-Trichloroethane	80	µg/kg
204C501	Concrete	1,2,4-Trimethylbenzene	490	µg/kg
204C501	Concrete	1,3,5-Trimethylbenzene	180	µg/kg
204C501	Concrete	2-Butanone	49 (J)	µg/kg
204C501	Concrete	Acetone	260 (J)[a]	µg/kg
204C501	Concrete	Ethylbenzene	44	µg/kg
204C501	Concrete	M+P-Xylene	220	µg/kg
204C501	Concrete	N-Propylbenzene	5.3	µg/kg
204C501	Concrete	Naphthalene	56	µg/kg
204C501	Concrete	O-Xylene	110	µg/kg
204C501	Concrete	P-Isopropyltoluene	23 (J)	µg/kg
204C501	Concrete	Bis(2-Ethylhexyl)Phthalate	2,200 (J)[b]	µg/kg
204C501	Concrete	Butyl Benzyl Phthalate	790 (J)[b]	µg/kg
204C501	Concrete	N-Propylbenze	16 (J)	µg/kg
204C501	Concrete	Di-N-Butyl Phthalate	3,600	µg/kg
204C501	Concrete	Diethyl Phthalate	350	µg/kg
204C501	Concrete	Gasoline Range Organics	1.9 (G)	mg/kg
204C501	Concrete	Aroclor-1260	890 (J)[c]	µg/kg

[a]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[b]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Internal standard area count outside control limits.
[c]Qualifier added to laboratory data; record accepted. Surrogates diluted out.

mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
G = The pattern resembles gasoline
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest
J = Estimated value
L = The fuel pattern was in the lighter end of the retention time window

A.5.4 Nature and Extent of Contamination

Since no COCs were identified at CAS 03-34-01, the nature and extent of contamination is not applicable.

A.5.5 Revised Conceptual Site Model

No variations in the CSM were identified.

A.6.0 Chemical Explosives Storage (CAS 05-18-02)

Corrective Action Site 05-18-02, Chemical Explosives Storage, consists of the Sugar Bunker, a smaller adjacent bunker, and two underground cellar units. This bunker was used for various nonnuclear experiments conducted during the voluntary nuclear testing moratorium from 1958 to 1961 (DOE/NV, 2001). The area of the bunker is approximately 2,160 ft^2. The surrounding property included in the CAS is approximately 2 acres. More detail about this CAS is provided in the CAIP (NNSA/NV, 2002a).

A.6.1 Corrective Action Investigation

Subsequent to the hantavirus cleanup, a total of 105 soil samples were collected from 29 locations during investigation activities conducted at CAS 05-18-03 including several duplicate samples. Seven liquid samples were submitted for QC purposes. Of the 105 soil samples collected, more than half were collected during step-out sampling and analyzed for radiological contamination only. These samples were analyzed for the COPCs listed in Table A.6-1. Three waste characterization samples were collected from the interior of the bunker. The sample locations are presented in Figure A.6-1. In addition to soil and waste characterization sampling, swipe samples were collected from the interior and the exterior of the bunker. The swipe samples were analyzed for removable radiological contamination. The specific CAI activities conducted to meet CAIP requirements at CAS 05-18-02 are described in Table A.2-1.

A.6.1.1 Deviations

One deviation from the CAIP occurred at this CAS. Removal of contamination (depleted uranium [DU]) was not originally planned. Upon request by the NNSA/NSO Task Manager, two small areas of DU along the road were collected and disposed of as IDW. This deviation had no adverse affect on the CAI and the CAIP requirements for this CAS were met.

A.6.2 Investigation Activities

The following sections provide descriptions of the CAS-specific investigation activities as outlined in the CAIP. Investigation activities included the inspection and sampling of the bunker and soils, field

Table A.6-1
Samples Collected at CAS 05-18-02
(Page 1 of 5)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses									
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium-90	Gross Alpha/Beta, Tritium	Explosives	Pesticides
204D001	D01	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X	
204D002		Soil	0.0 - 0.5	Field Duplicate of #204D001	X	X	X	X	X		X		X	
204D003	D02	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X	
204D040		Soil	1.0 - 2.0	SC				X			X			
204D041		Soil	3.0 - 4.0	SC				X			X			
204D062		Soil	5.0 - 6.0	SC				X		X				
204D063		Soil	6.0 - 8.0	SC				X		X				
204D064		Soil	10.0 - 12.0	SC				X		X				
204D004	D03	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X	
204D042		Soil	1.0 - 2.0	SC				X			X			
204D043		Soil	3.0 - 4.0	SC				X			X			
204D005	D04	Soil	0.5 - 1.0	SC	X	X	X	X	X		X		X	
204D006	D05	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X	
204D007		Soil	1.0 - 2.0	SC	X	X	X	X	X		X		X	
204D008	D06	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X	
204D009		Soil	1.0 - 2.0	SC	X	X	X	X	X		X		X	
204D010	D11	Soil	0.0 - 0.5	SC				X			X			
204D014		Soil	1.0 - 2.0	SC				X			X			
204D015		Soil	3.0 - 4.0	SC				X			X			
204D016		Soil	7.0 - 7.5	SC				X			X			
204D011	D12	Soil	0.0 - 0.5	SC				X			X			
204D022		Soil	1.0 - 2.0	SC				X			X			
204D023		Soil	3.0 - 4.0	SC				X			X			
204D024		Soil	3.0 - 4.0	Field Duplicate of #204D023				X			X			
204D012	D13	Soil	0.0 - 0.5	SC				X			X			
204D025		Soil	1.0 - 2.0	SC				X			X			
204D026		Soil	3.0 - 4.0	SC				X			X			

Table A.6-1
Samples Collected at CAS 05-18-02
(Page 2 of 5)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses									
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium-90	Gross Alpha/Beta, Tritium	Explosives	Pesticides
204D013	D14	Soil	0.0 - 0.5	SC				X			X			
204D027		Soil	1.0 - 2.0	SC				X			X			
204D028		Soil	3.0 - 4.0	SC, Lab QC				X			X			
204D017	D15	Soil	0.0 - 0.5	SC				X			X			
204D029		Soil	1.0 - 2.0	SC				X			X			
204D030		Soil	3.0 - 4.0	SC				X			X			
204D018	D16	Soil	0.0 - 0.5	SC				X			X			
204D031		Soil	1.0 - 2.0	SC				X			X			
204D032		Soil	3.0 - 4.0	SC				X			X			
204D019	D17	Soil	0.0 - 0.5	SC				X			X			
204D033		Soil	1.0 - 2.0	SC				X			X			
204D034		Soil	3.0 - 4.0	SC				X			X			
204D048		Soil	5.0 - 6.0	SC				X		X				
204D049		Soil	6.0 - 8.0	SC				X		X				
204D050		Soil	10.0 - 12.0	SC, Lab QC				X		X				
204D020	D18	Soil	0.0 - 0.5	SC				X			X			
204D035		Soil	1.0 - 2.0	SC				X			X			
204D036		Soil	3.0 - 4.0	SC				X			X			
204D037		Soil	6.0 - 7.0	SC				X			X			
204D040A		Soil	7.0 - 8.0	SC				X		X				
204D041A		Soil	11.0 - 12.0	SC				X		X				
204D021	D19	Soil	0.0 - 0.5	SC				X			X			
204D038		Soil	1.0 - 2.0	SC				X			X			
204D039		Soil	3.0 - 4.0	SC				X			X			
204D070	D30	Soil	0.0 - 0.5	SC				X		X				
204D071		Soil	1.0 - 2.0	SC				X		X				
204D077	D31	Soil	0.0 - 0.5	SC				X		X				
204D078		Soil	1.0 - 2.0	SC				X		X				
204D079		Soil	4.0 - 6.0	SC				X		X				

Table A.6-1
Samples Collected at CAS 05-18-02
(Page 3 of 5)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses									
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium-90	Gross Alpha/Beta, Tritium	Explosives	Pesticides
204D080	D32	Soil	0.0 - 0.5	SC				X		X				
204D081		Soil	1.0 - 2.0	SC				X		X				
204D082		Soil	4.0 - 6.0	SC				X		X				
204D083	D33	Soil	0.0 - 0.5	SC				X		X				
204D084		Soil	1.0 - 2.0	SC				X		X				
204D085		Soil	4.0 - 6.0	SC				X		X				
204D086	D34	Soil	0.0 - 0.5	SC				X		X				
204D087		Soil	1.0 - 2.0	SC				X		X				
204D088		Soil	4.0 - 6.0	SC				X		X				
204D089		Soil	6.0 - 8.0	SC				X		X				
204D090		Soil	10.0 - 12.0	SC				X		X				
204D091		Soil	10.0 - 12.0	Field Duplicate of #204D090				X		X				
204D092	D35	Soil	0.0 - 0.5	SC				X		X				
204D093		Soil	1.0 - 2.0	SC				X		X				
204D094		Soil	4.0 - 6.0	SC				X		X				
204D095		Soil	6.0 - 8.0	SC				X		X				
204D096		Soil	10.0 - 12.0	SC, Lab QC				X		X				
204D097	D36	Soil	0.0 - 0.5	SC				X		X				
204D098		Soil	1.0 - 2.0	SC				X		X				
204D099		Soil	4.0 - 6.0	SC				X		X				
204D100		Soil	6.0 - 8.0	SC				X		X				
204D101		Soil	10.0 - 12.0	SC				X		X				
204D042A	D37	Soil	0.0 - 0.5	SC				X		X				
204D043A		Soil	1.0 - 2.0	SC				X		X				
204D044		Soil	4.0 - 6.0	SC				X		X				
204D045		Soil	6.0 - 8.0	SC				X		X				
204D046		Soil	10.0 - 12.0	SC				X		X				
204D047		Soil	10.0 - 12.0	Field Duplicate of #204D046				X		X				

Table A.6-1
Samples Collected at CAS 05-18-02
(Page 4 of 5)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses									
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium-90	Gross Alpha/Beta, Tritium	Explosives	Pesticides
204D065	D38	Soil	0.0 - 0.5	SC				X		X				
204D066		Soil	1.0 - 2.0	SC				X		X				
204D067		Soil	4.0 - 6.0	SC				X		X				
204D068		Soil	6.0 - 8.0	SC				X		X				
204D069		Soil	10.0 - 12.0	SC				X		X				
204D072	D39	Soil	0.0 - 0.5	SC				X		X				
204D073		Soil	1.0 - 2.0	SC				X		X				
204D074		Soil	4.0 - 6.0	SC				X		X				
204D075		Soil	6.0 - 8.0	SC				X		X				
204D076		Soil	10.0 - 12.0	SC				X		X				
204D056	D40	Soil	0.0 - 0.5	SC				X		X				
204D057		Soil	0.0 - 0.5	Field Duplicate of #204D056				X		X				
204D058		Soil	1.0 - 2.0	SC				X		X				
204D059		Soil	4.0 - 6.0	SC				X		X				
204D060		Soil	6.0 - 8.0	SC				X		X				
204D061		Soil	10.0 - 12.0	SC, Lab QC				X		X				
204D051	D41	Soil	0.0 - 0.5	SC				X		X				
204D052		Soil	1.0 - 2.0	SC				X		X				
204D053		Soil	4.0 - 6.0	SC				X		X				
204D054		Soil	6.0 - 8.0	SC				X		X				
204D055		Soil	10.0 - 12.0	SC				X		X				
204D301	NA	Water	NA	Trip Blank	VOCs only									
204D302	NA	Water	NA	Field Blank	X	X	X	X	X		X		X	
204D303	NA	Water	NA	Trip Blank	VOCs only									
204D304	NA	Water	NA	Trip Blank	VOCs only									
204D305	NA	Water	NA	Trip Blank	VOCs only									
204D306	NA	Water	NA	Trip Blank	VOCs only									
204D307	NA	Water	NA	Field Blank				X			X			
204D309	NA	Water	NA	Field Blank				X		X				

Table A.6-1
Samples Collected at CAS 05-18-02
(Page 5 of 5)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses									
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium-90	Gross Alpha/Beta, Tritium	Explosives	Pesticides
204D310	NA	Water	NA	Equipment Rinsate Blank				X		X				
204D401	D07	Soil	0.0 - 1.0	Geotechnical	Sample archived; no Analyses performed									
204D402		Soil	1.0 - 2.0	Geotechnical	Sample archived; no Analyses performed									
204D501	D08	Paint chips	0.0 - 0.5	WM	Lead only									
204D502	D09	Concrete	0.0 - 0.5	WM	X		X							
204D503	D10	Concrete	0.0 - 0.5	WM	No metals		X							X
204D504	NA	Water	NA	WM				X		X		X		

ft bgs = Feet below ground surface
QC = Quality control
SC = Site characterization
WM = Waste management

screening, waste characterization, radiological survey, and geotechnical sampling. A list of the samples collected and analyses performed are shown in Table A.6-1.

A.6.2.1 Bunker Interior Inspection

In order to fully assess the potential for soil contamination at CAS 05-18-02 after the hantavirus cleaning, the investigation team first inspected the bunker for possible chemical and radiological release. This evaluation included performing an inspection of equipment within the bunker, inspecting the bunker for visual evidence of releases including stains, corroded materials, degraded containers, and release pathways to the environment. A radiological survey was performed throughout the bunker interior and swipe samples were collected to evaluate the removal and fixed radioactive contamination.

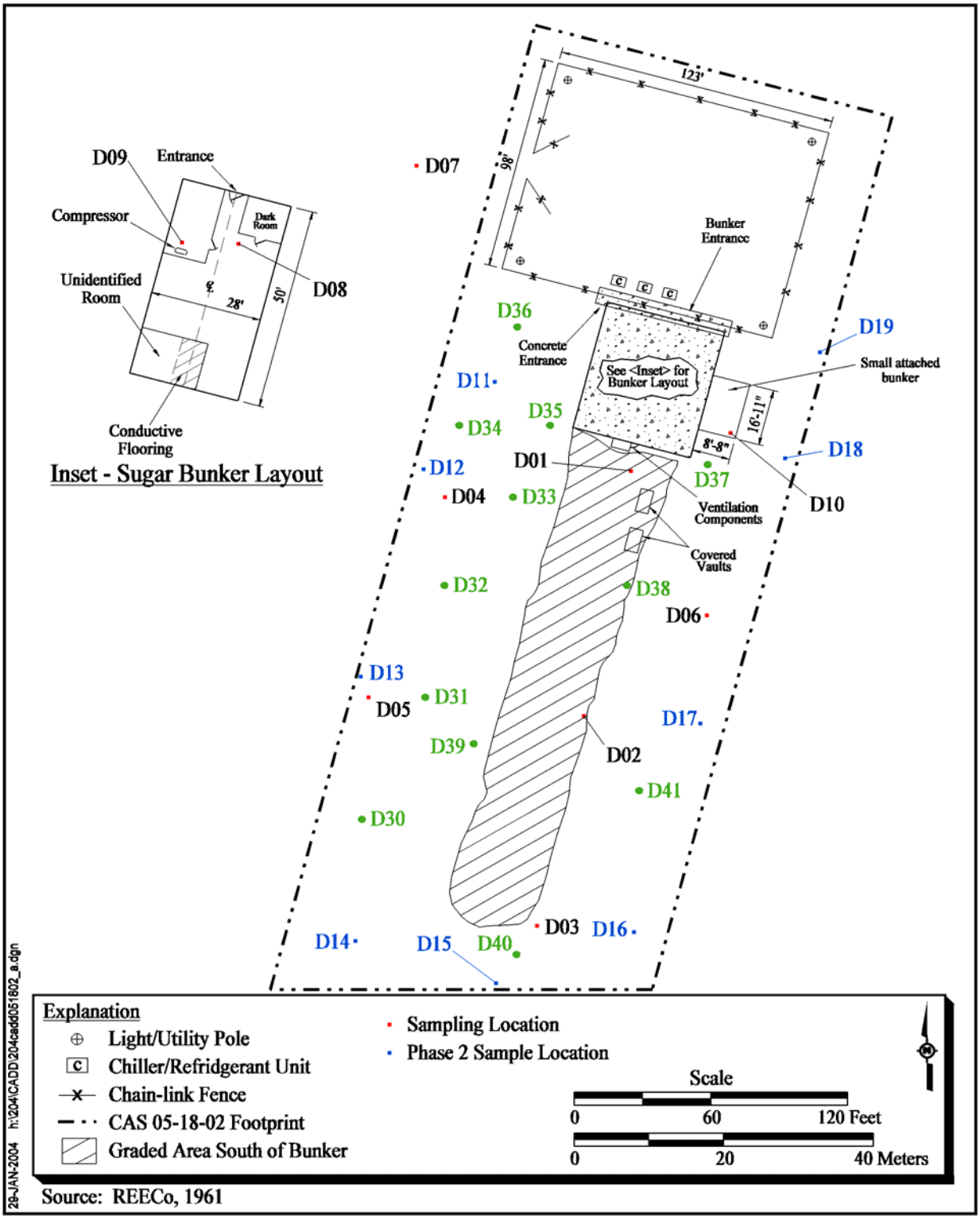

Figure A.6-1
CAS 05-18-02, Sampling Locations

The Sugar Bunker (CAS 05-18-02) is a 1,400 ft^2 facility consisting of the main room, a compressor room to the right of the entrance, a small photoprocessing room to the left of the entrance, and an undefined room in the southwest corner (Figure A.6-1). Adjacent to the east side of the Sugar Bunker is a small 150 ft^2 attached bunker with a separate entrance. There is an elevated graded area behind the bunker on the south side. In this elevated graded area there are two covered vaults. Attached to the south wall of the bunker are the remains of ventilation equipment.

The main room of the Sugar Bunker contains a chain hoist suspended from an I-beam extending across the room, some plumbing, air hoses, and ventilation ducts. The flooring is constructed of a conductible material and is identified as such. There is a vent on the southern end of the main room. No additional equipment or visual evidence of contamination is present in the main room.

The compressor room houses a compressor, ductwork, and multiple electrical control panels. The floor is stained near the compressor. Unlike the floor of the main room, which has conductible flooring, the remaining floor of the bunker is concrete.

With the exception of some shelving and plumbing on the walls, the photo/dark room is empty. The small attached bunker contains no equipment, but housed some lumber and bird nest debris. A 1/8-in. thick layer of rubber sheeting covers the floor of the small attached bunker, and some absorbent material has been spread on top of the rubber sheeting. The sheeting appeared to be attached to the cement floor with an unknown type of adhesive.

No information is available on the contents of the two vaults located behind the Sugar Bunker.

A.6.2.2 Radiological Survey

A radiological walk-over survey of the ground surface within the CAS 05-18-02 boundary was conducted in addition to a radiological survey of the interior of the bunker, which included collecting swipe samples and direct meter readings of swipe sample locations. Swipe sample locations are shown in Figures A.6-2 and A.6-3. The results of the survey are discussed in the following sections.

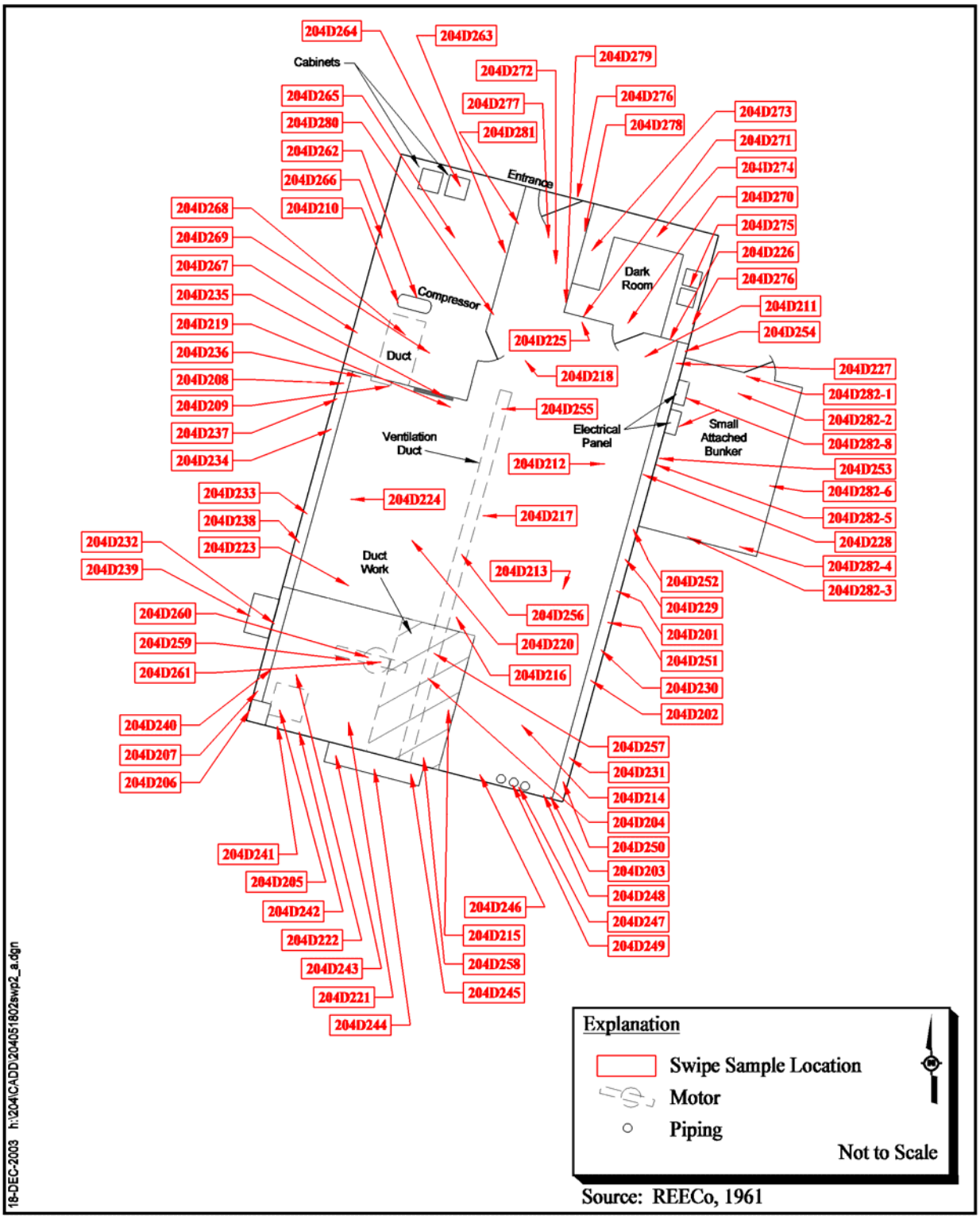

Figure A.6-2
CAS 05-18-02, Swipe Sample Locations, Bunker Interior

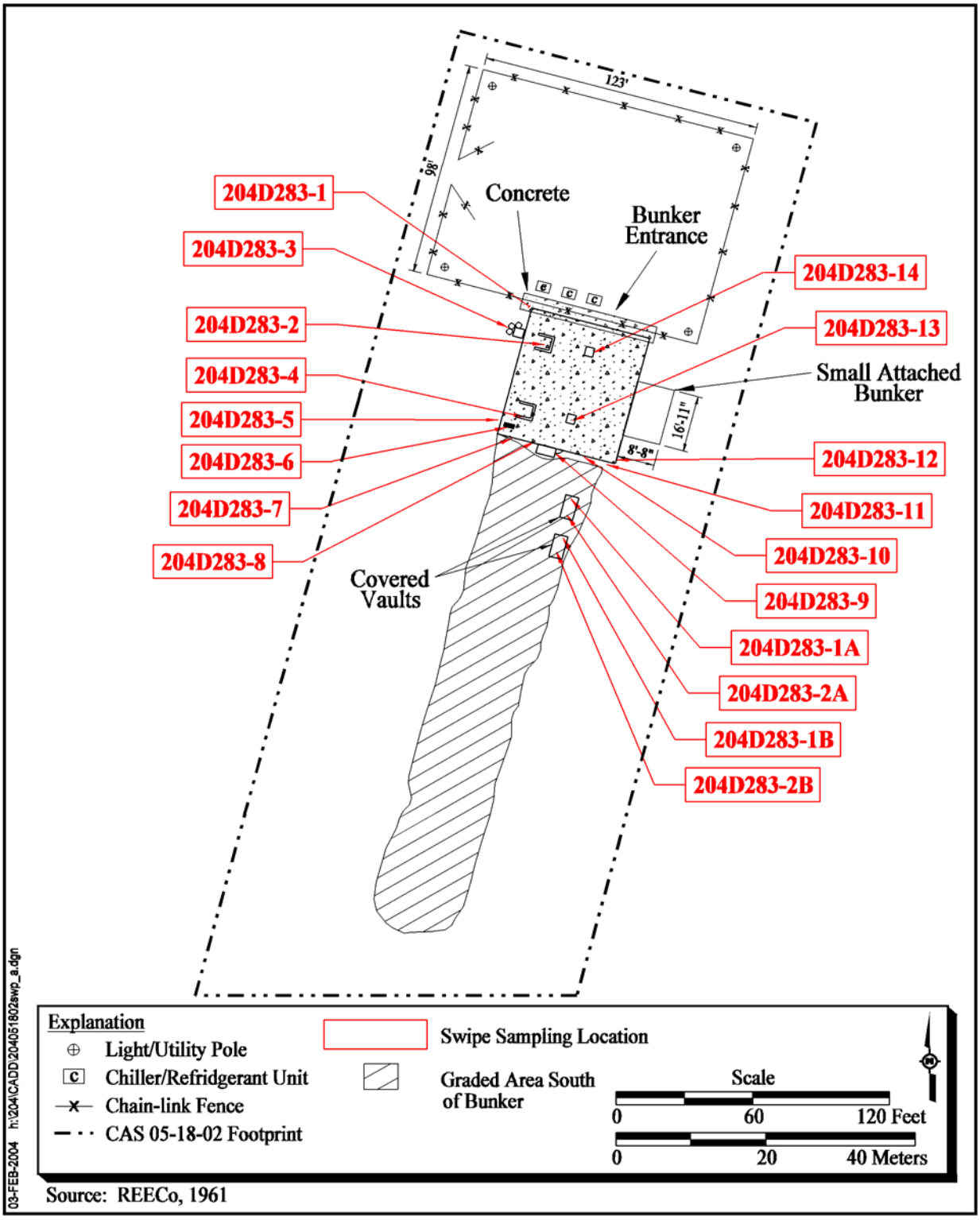

Figure A.6-3
CAS 05-18-02, Swipe Sample Locations, Bunker Interior

A.6.2.2.1 Radiological Survey Results

A radiological walk-over survey and swipe survey were completed on the interior and exterior of the bunker, as well as the area over the two covered vaults. Table A.6-2 provides the swipe survey results with comparisons made to the unrestricted release criteria for the removable radioactive contamination. The controlled release criteria per the NV/YMP RadCon Manual (DOE/NV, 2000) was not exceeded on any of the swipes (used to measure removable contamination) collected from the interior of the bunker. Results of the radiological walk-over survey were used as one of the inputs to determine biased locations for collecting site characterization samples.

A.6.2.3 Waste Characterization

Three waste characterization samples were collected; two from the Sugar Bunker and one from the attached bunker's interior. Two samples (204D502 and 204D503) were chip samples of concrete collected from sample locations D09 and D10, respectively (Figure A.6-1). The other was a paint chip sample (204D501) collected from sample location D08 near the former location of an air compressor.

The concrete samples were analyzed for total VOCs, total SVOCs, total RCRA metals (except Sample 204D502), TPH (DRO and GRO), and PCBs. The paint sample was only analyzed for lead. Table A.6-3 provides analytical results from these samples.

A.6.2.3.1 Waste Characterization Samples Results

Results of the waste characterization samples collected from the bunker interior were compared to regulatory limits based on disposal options. If the waste has no hazardous component(s), the regulatory level will be based on the NTS disposal options at the NTS landfills (BN, 1995; CFR, 2002a and b; NDEP, 1997a, b, and c). If the waste is hazardous, the release criteria will be based on the interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999).

The parameter concentrations that exceed the MRLs are presented in Table A.6-3.

Table A.6-2
Swipe Samples Results for CAS 05-18-02
(Page 1 of 4)

Swipe Sample Analysis				Radiological Survey		Dose Rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204D201	10.02	3.19	1-wall base	3,240	25.6	15
204D202	3.34	4.13	2-wall bolt	5,250	30.1	15
204D203	6.68	61.08	3-floor wall	8,235	52.2	15
204D204	10.02	19.27	4-top of vault	4,400	20.5	15
204D205	3.34	6.42	5-floor	3,541	21.3	15
204D206	0.00	4.59	6-slab concrete	5,350	32.2	15
204D207	6.68	8.25	7-wall base	3,245	25.6	15
204D208	6.68	24.33	8-wall base	4,366	29.9	15
204D209	0.00	9.19	9-shelf	8,875	48.4	15
204D210	0.00	4.59	10-floor	4,250	31.6	15
204D211	3.34	-0.47	1-floor	908	9.6	15
204D212	3.34	17.91	2-floor	787	11.4	15
204D213	16.71	11.44	3-floor	624	12.8	15
204D214	6.68	17.44	4-floor	632	11.4	15
204D215	0.00	16.08	5-floor	677	7.6	15
204D216	0.00	9.19	6-floor	795	13.9	15
204D217	3.34	1.83	7-floor	821	23.4	15
204D218	3.34	11.02	8-floor	803	12.8	15
204D219	0.00	11.48	9-floor	686	18.5	15
204D220	3.34	13.31	10-floor	911	20.5	15
204D221	3.34	4.13	11-floor	1,340	19.8	15
204D222	3.34	13.31	12-floor	745	12.8	15
204D223	0.00	6.89	13-floor	1,150	8.5	15
204D224	0.00	9.19	14-floor	803	9.6	15
204D225	3.34	-0.47	15-wall	796	19.4	15
204D226	3.34	11.02	16-wall	582	22.2	15
204D227	0.00	18.37	17-base concrete	777	24.3	15
204D228	3.34	6.42	18-base concrete	746	20.5	15
204D229	10.02	3.19	19-base concrete	721	32.2	15
204D230	3.34	-2.77	20- base concrete	731	11.4	15
204D231	3.34	6.42	21-base concrete	998	21.7	15
204D232	0.00	4.59	22-base concrete	820	9.6	15

Table A.6-2
Swipe Samples Results for CAS 05-18-02
(Page 2 of 4)

Swipe Sample Analysis				Radiological Survey		Dose Rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204D233	0.00	6.89	23-base concrete	962	9.6	15
204D234	0.00	9.19	24-base concrete	741	13.9	15
204D235	0.00	0	25-vent	735	15.5	15
204D236	10.02	12.38	26-wall	692	22.2	15
204D237	6.68	8.25	27-wall	1,740	12.8	15
204D238	0.00	-2.3	28-wall	1,020	14.4	15
204D239	10.02	0.89	29-door	871	19.4	15
204D240	6.68	1.36	30-wall	848	30.1	15
204D241	0.00	16.08	31-wall	652	23.4	15
204D242	0.00	11.48	32-wall	911	19.8	15
204D243	13.36	18.8	33-pipe	940	11.4	15
204D244	3.34	1.83	34-wall	883	12.8	15
204D245	0.00	0	35-pipe	790	9.6	15
204D246	3.34	11.02	36-wall	1,125	14.4	15
204D247	6.68	3.66	37-pipe	1,341	21.7	15
204D248	6.68	8.25	38-wall	1,200	12.8	15
204D249	6.68	5.95	39-pipe	976	15.5	15
204D250	0.00	9.19	40-wall	998	19.8	15
204D251	3.34	-0.47	41-wall	1,172	25.5	15
204D252	3.34	27.09	42-wall	1,250	17.2	15
204D253	6.68	10.55	43-wall	843	17.2	15
204D254	16.71	22.92	44-wall	1,296	15.5	15
204D255	0.00	4.59	45-duct	917	21.7	15
204D256	3.34	1.83	46-duct	685	9.6	15
204D257	6.68	3.66	47-duct	723	18	15
204D258	0.00	2.3	48-duct	909	19.8	15
204D259	3.34	8.72	49-strap	1,252	30.1	15
204D260	0.00	-2.3	50-chain	1,065	21.5	15
204D261	0.00	2.3	51-motor	1,351	32.3	15
204D262	0.00	2.3	1A-compressor	1,055	11.4	15
204D263	3.34	-0.47	2A-wall	944	9.8	15
204D264	0.00	9.19	3A-cabinet	886	9.8	15

Table A.6-2
Swipe Samples Results for CAS 05-18-02
(Page 3 of 4)

Swipe Sample Analysis				Radiological Survey		Dose Rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204D265	0.00	4.59	4A-floor	921	10.3	15
204D266	3.34	8.72	5A-wall	750	19.6	15
204D267	3.34	13.31	6A-floor	820	11.4	15
204D268	3.34	11.02	7A-duct	741	7.6	15
204D269	3.34	11.02	8A-floor	722	12.3	15
204D270	0.00	-2.3	1B-floor	705	16.2	15
204D271	3.34	-0.47	2B-wall	690	9.8	15
204D272	10.02	10.08	3B-table	841	15.5	15
204D273	3.34	-2.77	4B-wall	766	15.5	15
204D274	0.00	0	5B-sink	813	19.8	15
204D275	3.34	-0.47	6B-wall	705	11.4	15
204D276	3.34	1.83	1C-door	1,112	21.3	15
204D277	0.00	4.59	2C-floor	1,099	19.8	15
204D278	3.34	-0.047	3C-wall	871	9.8	15
204D279	0.00	0	4C-wall	793	16.2	15
204D280	6.68	8.25	5C-wall	1,040	19.8	15
204D281	3.34	11.02	6C-wall	973	11.4	15
204D282-1	-0.67	2.53	1-Attached bunker on east side-door	1,297	12.3	15
204D282-2	-0.67	14.01	2-Attached bunker on east side floor	1,365	11.4	15
204D282-3	2.67	2.15	3-Attached bunker on east side floor	1,170	16.5	15
204D282-4	2.67	4.45	4-Attached bunker on east side wall	1,182	9.8	15
204D282-5	-0.67	-2.07	5-Attached bunker on east side wall	1,040	19.8	15
204D282-6	-0.67	0.23	6-Attached bunker on east side wall	1,190	7.6	15
204D282-7	-0.67	0.23	7-Attached bunker on east side-debris	1,303	11.4	15
204D282-8	6.01	-0.61	8-Attached bunker on east side-electric box	1,252	13.5	15
204D283-1	0.00	2.3	1-concrete	1,214	9.8	20
204D283-2	3.34	13.31	2-concrete	1,300	20.5	20

Table A.6-2
Swipe Samples Results for CAS 05-18-02
(Page 4 of 4)

Swipe Sample Analysis				Radiological Survey		Dose Rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204D283-3	3.34	6.42	3-wire cables	1,123	11.4	20
204D283-4	3.34	4.13	4-concrete	1,198	7.8	20
204D283-5	0.00	6.89	5-concrete	1,566	19.6	20
204D283-6	0.00	0.00	6-electrical box	1,249	12.7	20
204D283-7	0.00	4.59	7-back wall	10,000	40.2	25
204D283-8	3.34	-0.47	8-back wall	10,000	28.4	25
204D283-9	0.00	6.89	9-duct	21,00	20.5	20
204D283-10	3.34	1.83	10-steel plate	100,000	170	100
204D283-11	6.68	-3.23	11-concrete	1,880	22.3	20
204D283-12	0.00	-2.30	12-concrete	1,268	9.8	20
204D283-13	6.68	3.66	13-roof vent	1,325	11.4	20
204D283-14	0.00	6.89	14-roof vent	1,400	12.7	20
204D283-1A	3.34	4.13	1A-top of vault	1,828	20.5	20
204D283-2A	3.34	4.13	2A-inside vault	1,690	11.2	15
204D283-1B	6.08	-3.23	1B-top of vault	1,960	24.3	20
204D283-2B	0.00	13.78	2B-inside vault	1,710	18.8	15
1 (D001)	0.00	19.10	Sample Location 1	100,000	2,100	40
2 (D003)	5.20	0.00	Sample Location 2	540,000	4,400	150
3 (D004)	0.90	41.00	Sample Location 3	258,000	3,110	200
1 (Bag#1)	6.68	29.84	Bag #1 (Waste Soil)	NA	NA	NA
2(Bag#2)	10.02	11.00	Bag #2(Waste Soil)	NA	NA	NA
3(Bag#3)	3.34	-1.85	Bag #3 (Waste Soil)	NA	NA	NA
4(Bag#4)	3.34	7.34	Bag #4 (Waste Soil)	NA	NA	NA
5(PPE)	3.34	9.64	PPE	NA	NA	NA

ID = Identification
NA = Not applicable
dpm = Disintegrations per minute
cm^2 = Square centimeters
PPE = Personal protective equipment

Table A.6-3
Concrete and Paint Chip Samples Detected Above Minimum Reporting Limits at CAS 05-18-02

Sample Number	Matrix	Parameter	Result	Units
204D502	Concrete	Gamma-Chlordane	46 (J)[a]	µg/kg
204D502	Concrete	Dieldrin	320 (J)[b]	µg/kg
204D502	Concrete	4,4'-DDT	370 (J)[b]	µg/kg
204D502	Concrete	4,4'-DDE	390 (J)[b]	µg/kg
204D502	Concrete	Aroclor-1254	490 (J)[c]	µg/kg
204D502	Concrete	Di-N-Butyl Phthalate	510	µg/kg
204D502	Concrete	Bis(2-Ethylhexyl)Phthalate	1,200 (J)[d]	µg/kg
204D503	Concrete	Methylene Chloride	5.1 (J)[e]	µg/kg
204D503	Concrete	Acetone	160 (J)[f]	µg/kg
204D503	Concrete	2-Butanone	25 (J)[g]	µg/kg
204D502	Concrete	Acetone	1,800 (J)[h]	µg/kg
204D502	Concrete	M+P-Xylene	9.6 (J)[i]	µg/kg
204D502	Concrete	4-Methyl-2-Pentanone	26 (J)[i]	µg/kg
204D502	Concrete	2-Hexanone	43 (J)[i]	µg/kg
204D502	Concrete	2-Butanone	340 (J)[i]	µg/kg
204D503	Concrete	Diesel-Range Organics	120 (H)	mg/kg
204D502	Concrete	Diesel-Range Organics	2,300 (H)	mg/kg
204D502	Concrete	Gasoline-Range Organics	1.3 (G)	mg/kg
204D503	Concrete	Lead	7.9	mg/kg
204D503	Concrete	Chromium	13	mg/kg
204D503	Concrete	Cadmium	0.87	mg/kg
204D503	Concrete	Barium	85	mg/kg
204D503	Concrete	Arsenic	8.6	mg/kg
204D501	Paint Chip	Lead	17	mg/kg

[a]Qualifier added to laboratory data; record accepted. Exceeded holding time. %D between columns >25. Surrogates diluted out.
[b]Qualifier added to laboratory data; record accepted. Exceeded holding time. Surrogates diluted out.
[c]Qualifier added to laboratory data; record accepted. %D between columns >25.
[d]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Internal area response show extremely low count.
[e]Qualifier added laboratory data; record accepted. Matrix effects may exist. Value was <10 x the contamination in the calibration/method blank. Surrogate recovery exceeded the lower limits.
[f]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Average relative response factor <0.05. Relative response factor <0.05. Surrogate recovery exceeded the lower limits.
[g]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Surrogate recovery exceeded the lower limits.
[h]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[i]Qualifier added to laboratory data; record accepted. Matrix effects may exist. Surrogate recovery exceeded the lower limits. Internal area response show extremely low count.

mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
G = The pattern resembled gasoline.
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest.
J = Estimated value

A.6.2.4 Field Screening

Soil samples were screened for VOCs and alpha and beta/gamma radioactivity. The field readings were compared to FSLs to guide sampling decisions and determine which samples were to be submitted for laboratory analysis.

A.6.2.4.1 Field-Screening Results

A few VOCs were detected during the soil sampling and these samples were forwarded to the laboratory for analysis. Many alpha and beta/gamma samples detected radioactivity greater than FSLs during soil sample screening. The results of radiological field screening are discussed in Section A.6.2.2.1.

A.6.2.5 Site Characterization

The laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.6-1 lists the sample-specific analytical parameters.

The soil sample analytical results with concentrations exceeding corresponding MRLs or PALs (NNSA/NV, 2002a) at CAS 05-18-02 are summarized in the following sections. The analytical results are compared to appropriate regulatory levels. A portion of the CAS 05-18-02 analytical results were rejected during validation; however, these rejected data did not impact closure decisions as discussed in Appendix B.

A.6.2.5.1 Soil Characterization Sample Analyses

The following sections discuss the results for soil samples in comparison to the levels established in the CAIP.

A.6.2.5.2 Volatile Organic Compounds

Total VOC analytical results for soil samples exceeding MRLs are reported in Table A.6-4. Five VOCs were detected in a total of eight soil samples, five surface and two subsurface, but none of the detected VOC analytical results exceeded the PALs identified in the CAIP.

Table A.6-4
Soil Sample Results for Total VOCs Detected
Above Minimum Reporting Limits at CAS 05-18-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)				
			Acetone	Ethylbenzene	Methylene Chloride	M+P-Xylene	O-Xylene
Preliminary Action Levels[a]			**6,000,000**	**20,000**	**21,000**	**420,000**	**420,000**
204D001	D01	0.0 - 0.5	--	--	--	11	--
204D002		0.0 - 0.5	--	29	--	160	49
204D004	D03	0.0 - 0.5	--	--	--	7.7	--
204D005	D04	0.5 - 1.0	--	--	8.5	--	--
204D006	D05	0.0 - 0.5	--	--	14	--	--
204D007		1.0 - 2.0	--	--	10	--	--
204D008	D06	0.0 - 0.5	25 (J)	--	10	--	--
204D009		1.0 - 2.0	--	--	7.2	--	--

[a]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above minimum reporting limits
J = Estimated value. Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.

A.6.2.5.3 Semivolatile Organic Compounds

Total SVOC analytical results for the soil sample exceeding MRLs is reported in Table A.6-5. Only one surface soil sample had a detectable SVOC (i.e., Bis[2-Ethylhexyl]Phthalate), which did not exceed the PAL identified in the CAIP.

A.6.2.5.4 Total Petroleum Hydrocarbons

Total petroleum hydrocarbon analytical results for soil samples exceeding MRLs are reported in Table A.6-6. Two surface soil samples had detectable DRO and one surface soil sample had detectable GRO, but none of the detected TPH results exceeded the PALs identified in the CAIP.

Table A.6-5
Soil Sample Result for Total SVOCs Detected
Above Minimum Reporting Limits at CAS 05-18-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential of Concern (μg/kg)
			Bis(2-Ethylhexyl)Phthalate
Preliminary Action Levels[a]			120,000
204D004	D03	0.0 - 0.5	890 (J)

[a]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
J = Estimated value. Qualifier added to laboratory data; record accepted. Matrix effects may exist. Internal area response show extremely low count.

Table A.6-6
Soil Sample Results for TPH (DRO and GRO) Detected Above
Minimum Reporting Limits at CAS 05-18-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Levels[a]			100	100
204D003	D02	0.0 - 0.5	37 (H)	--
204D004	D03	0.0 - 0.5	--	0.55 (Z)
204D008	D06	0.0 - 0.5	52 (H)	--

[a]Based on *Nevada Administrative Code 445a, "Water Controls*" (NAC, 2003)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum reporting limits
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest.
Z = A significant fraction of the reported result did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.

A.6.2.5.5 Polychlorinated Biphenyls

The PCB analytical results for soil samples did not exceed MRLs or PALs identified in the CAIP.

A.6.2.5.6 Total Metals

Total metal analytical results exceeding MRLs are reported in Table A.6-7. Seven metals were detected in a total of nine soil samples. None of the detected metal results exceeded the PALs identified in the CAIP.

Table A.6-7
Soil Sample Results for Metals Detected
Above Minimum Reporting Limits at CAS 05-18-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
			Arsenic	Barium	Beryllium	Chromium	Lead	Selenium	Silver
Preliminary Action Levels[a]			**23[b]**	**67,000**	**1,900**	**450**	**750**	**5,100**	**5,100**
204D001	D01	0.0 - 0.5	5.7	200	0.62 (J)[c]	6.4	18 (J)[d]	0.86	--
204D002		0.0 - 0.5	5.2	160	0.59 (J)[c]	6.7	15 (J)[d]	--	--
204D003	D02	0.0 - 0.5	4.2	150	6.2 (J)[c]	8.1	69 (J)[d]	--	2
204D004	D03	0.0 - 0.5	4.3	130	2.9 (J)[c]	6.4	32 (J)[d]	1.1	--
204D005	D04	0.5 - 1.0	3.9	110	1 (J)[d]	5.8	16	0.62 (J)[e]	--
204D006	D05	0.0 - 0.5	3.9	130	2.2 (J)[d]	6.6	23	--	--
204D007		1.0 - 2.0	3.5	110	--	4.9	7	--	--
204D008	D06	0.0 - 0.5	3.9	120	2.7 (J)[d]	6	19	--	--
204D009		1.0 - 2.0	5.4	90	--	4.5	6.5	0.54 (J)[e]	--

[a]Based on EPA, *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)
[b]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[c]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits.
[d]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits. Serial dilution %D outside control limits. Matrix effects may exist.
[e]Qualifier added to laboratory data; record accepted. Negative bias found in continuing calibration/method blank.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
J = Estimated value
-- = Not detected above minimum reporting limits

A.6.2.5.7 Gamma Spectroscopy

A total of 109 soil samples were collected from 27 locations throughout the CAS 05-18-02 boundary and analyzed for gamma-emitting radionuclides. Sample depths ranged from the surface (0 to 0.5 ft

bgs) to 12 ft bgs. Sixty-five samples from 26 locations showed thorium-234 activity that exceeded the MRL. Of these 65 samples, 11 showed thorium activity that exceeded the PALs. The sampling locations are shown on Figure A.6-1 and the gamma-emitting radionuclide analytical results are shown in Table A.6-8. Thorium-234 is a short-lived (24-day half-life) product of U-238. The two radionuclides should be in equilibrium through having the same activity. Because of its very long half-life, the U-238 is considered the COC at these locations.

A.6.2.5.8 Isotopic Uranium

A total of 109 soil samples, including 5 duplicates, were collected from the surface and subsurface soil at 27 locations within the boundary of CAS 05-18-02 and analyzed for isotopic uranium (U-234, U-235, and U-238). Sample intervals ranged from 0 to 0.5 ft to a maximum of 10 to 12 ft bgs. The analytical results and locations are on Table A.6-9 and Figure A.6-1, respectively. Uranium-234 and -238 were detected in all 109 samples and U-235 was detected in 91 samples at a concentration greater than the MRLs. After evaluation of the results, which involved taking background baseline and margins of error into account, 13 samples showed concentrations of U-238, 4 samples showed concentrations of U-234, and 3 samples showed concentrations of U-235 that exceeded the PALs.

A.6.2.5.9 Isotopic Plutonium

Of the 109 samples for analysis from the soils around the Sugar Bunker and analyzed for isotopic plutonium (Pu-239), two samples had concentrations of Pu-239 above MRLs. Of the two samples, none are reported to have Pu-239 readings in excess of PALs. The analytical results are shown in Table A.6-9.

A.6.2.5.10 Strontium-90

Of the 109 samples collected and analyzed for strontium-90, 4 samples had reported concentrations that exceeded the MRL. Of these 4 samples, none had reported concentrations that exceeded the PAL identified in the CAIP. The analytical results are shown in Table A.6-9.

Table A.6-8
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-18-02
(Page 1 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15		
204D001	D01	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.49 ± 0.39	NA	1.18 ± 0.33	NA	0.62 ± 0.22	NA	9.3 ± 3.0	--
204D002		0.0 - 0.5	1.43 ± 0.41	NA	--	NA	--	NA	--	1.35 ± 0.29	NA	0.9 ± 0.21	NA	0.45 ± 0.13	NA	13.6 ± 2.8	--
204D003	D02	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.6 ± 0.54	NA	--	NA	--	NA	1150 ± 190	20.4 ± 3.8
204D004	D03	0.0 - 0.5	1.73 ± 0.58	NA	--	NA	--	NA	--	1.68 ± 0.43	NA	0.93 ± 0.33	NA	0.61 ± 0.22	NA	184 ± 31	3.6 ± 1.1
204D005	D04	0.5 - 1.0	NA	1.46 ± 0.54	NA	--	NA	1.03 ± 0.42	--	NA	1.96 ± 0.44	NA	1.08 ± 0.31	NA	0.53 ± 0.20	24.2 ± 4.4 (J)	--
204D006	D05	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.28 ± 0.41	NA	--	NA	--	NA	**326 ± 55** (J)	6.4 ± 1.6
204D007		1.0 - 2.0	NA	1.5 ± 0.44	NA	--	NA	0.83 ± 0.28	--	NA	1.71 ± 0.35	NA	0.87 ± 0.23	NA	0.6 ± 0.17	--	--
204D008	D06	0.0 - 0.5	2.2 ± 0.60	NA	--	NA	0.88 ± 0.35	NA	--	1.65 ± 0.39	NA	1.26 ± 0.33	NA	0.44 ± 0.17	NA	63 ± 11 (J)	--
204D009		1.0 - 2.0	NA	1.74 ± 0.57	NA	--	NA	1 ± 0.39	--	NA	1.99 ± 0.45	NA	0.93 ± 0.28	NA	0.61 ± 0.20	--	--
204D010	D11	0.0 - 0.5	1.01 ± 0.28	NA	--	NA	0.76 ± 0.20	NA	0.37 ± 0.10	1.19 ± 0.26	NA	0.83 ± 0.20	NA	0.41 ± 0.11	NA	**266 ± 44**	5.09 ± 0.98
204D011	D12	0.0 - 0.5	1.52 ± 0.39	NA	--	NA	1.11 ± 0.28	NA	--	1.8 ± 0.36	NA	1.07 ± 0.25	NA	0.52 ± 0.14	NA	5.7 ± 1.9	--
204D012	D13	0.0 - 0.5	1.47 ± 0.37	NA	--	NA	0.96 ± 0.24	NA	--	1.58 ± 0.32	NA	1.08 ± 0.25	NA	0.49 ± 0.13	NA	91 ± 15	1.62 ± 0.56
204D013	D14	0.0 - 0.5	1.68 ± 0.43	NA	--	NA	1.07 ± 0.3	NA	--	1.4 ± 0.31	NA	1.11 ± 0.26	NA	0.54 ± 0.16	NA	10.3 ± 2.3	--
204D014	D11	1.0 - 2.0	NA	1.48 ± 0.39	NA	--	NA	0.86 ± 0.24	--	NA	1.73 ± 0.35	NA	1.13 ± 0.26	NA	0.51 ± 0.15	47.9 ± 8.1	--
204D015		3.0 - 4.0	NA	1.51 ± 0.36	NA	--	NA	1.06 ± 0.25	--	NA	1.68 ± 0.33	NA	0.97 ± 0.22	NA	0.6 ± 0.14	12 ± 2.2	--
204D016		7.0 - 7.5	NA	1.89 ± 0.38	NA	--	NA	0.97 ± 0.22	--	NA	1.83 ± 0.33	NA	0.98 ± 0.20	NA	0.58 ± 0.12	14.6 ± 2.6	--
204D017	D15	0.0 - 0.5	1.5 ± 0.35	NA	--	NA	1 ± 0.24	NA	--	1.95 ± 0.37	NA	0.88 ± 0.21	NA	0.51 ± 0.13	NA	--	--
204D018	D16	0.0 - 0.5	1.47 ± 0.38	NA	--	NA	0.92 ± 0.25	NA	--	1.73 ± 0.35	NA	0.96 ± 0.23	NA	0.43 ± 0.13	NA	71 ± 12	--
204D019	D17	0.0 - 0.5	1.67 ± 0.40	NA	--	NA	0.85 ± 0.23	NA	--	1.42 ± 0.30	NA	0.98 ± 0.24	NA	0.58 ± 0.15	NA	74 ± 13	1.25 ± 0.42
204D020	D18	0.0 - 0.5	1.3 ± 0.36	NA	--	NA	0.7 ± 0.21	NA	0.44 ± 0.13	1.15 ± 0.26	NA	0.87 ± 0.21	NA	0.43 ± 0.13	NA	8.5 ± 2.0	--
204D021	D19	0.0 - 0.5	1.46 ± 0.39	NA	--	NA	0.91 ± 0.25	NA	--	1.81 ± 0.36	NA	0.91 ± 0.22	NA	0.55 ± 0.15	NA	5.8 ± 1.4	--
204D022	D12	1.0 - 2.0	NA	1.76 ± 0.40	NA	--	NA	0.79 ± 0.22	--	NA	1.62 ± 0.33	NA	1.01 ± 0.23	NA	0.57 ± 0.14	--	--
204D023		3.0 - 4.0	NA	1.84 ± 0.37	NA	--	NA	0.79 ± 0.19	--	NA	1.82 ± 0.33	NA	0.98 ± 0.20	NA	0.6 ± 0.13	--	--
204D024		3.0 - 4.0	NA	1.54 ± 0.39	NA	--	NA	0.99 ± 0.26	--	NA	1.77 ± 0.36	NA	1.3 ± 0.28	NA	0.7 ± 0.17	--	--

Table A.6-8
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-18-02
(Page 2 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15		
204D025	D13	1.0 - 2.0	NA	1.52 ± 0.41	NA	--	NA	0.87 ± 0.28	--	NA	1.62 ± 0.33	NA	0.87 ± 0.21	NA	0.52 ± 0.15	3.04 ± 0.94	--
204D026		3.0 - 4.0	NA	1.52 ± 0.37	NA	--	NA	0.84 ± 0.24	--	NA	1.79 ± 0.35	NA	0.97 ± 0.22	NA	0.57 ± 0.15	2.86 ± 0.89	--
204D027	D14	1.0 - 2.0	NA	1.71 ± 0.35	NA	2.5 ± 1.0	NA	0.76 ± 0.19	--	NA	1.73 ± 0.31	NA	0.9 ± 0.19	NA	0.56 ± 0.12	--	--
204D028		3.0 - 4.0	NA	1.68 ± 0.39	NA	--	NA	0.96 ± 0.23	--	NA	1.95 ± 0.37	NA	1.1 ± 0.24	NA	0.57 ± 0.14	--	--
204D029	D15	1.0 - 2.0	NA	1.65 ± 0.38	NA	--	NA	0.87 ± 0.22	--	NA	1.9 ± 0.36	NA	1.04 ± 0.23	NA	0.48 ± 0.12	--	--
204D030		3.0 - 4.0	NA	1.52 ± 0.42	NA	--	NA	0.93 ± 0.26	--	NA	1.63 ± 0.33	NA	1.01 ± 0.23	NA	0.6 ± 0.15	--	--
204D031	D16	1.0 - 2.0	NA	1.65 ± 0.41	NA	--	NA	0.74 ± 0.24	--	NA	1.82 ± 0.36	NA	1.09 ± 0.25	NA	0.49 ± 0.14	4.7 ± 1.2	--
204D032		3.0 - 4.0	NA	1.77 ± 0.41	NA	--	NA	0.92 ± 0.24	--	NA	1.74 ± 0.35	NA	0.9 ± 0.21	NA	0.68 ± 0.16	11.3 ± 2.2	--
204D033	D17	1.0 - 2.0	NA	1.65 ± 0.34	NA	--	NA	0.78 ± 0.20	--	NA	1.63 ± 0.30	NA	0.96 ± 0.20	NA	0.49 ± 0.11	5.9 ± 1.3	--
204D034		3.0 - 4.0	NA	1.7 ± 0.39	NA	--	NA	0.91 ± 0.23	--	NA	1.71 ± 0.34	NA	0.86 ± 0.20	NA	0.57 ± 0.14	15.6 ± 3.2	--
204D035	D18	1.0 - 2.0	NA	1.75 ± 0.42	NA	--	NA	0.96 ± 0.26	--	NA	1.98 ± 0.39	NA	1.05 ± 0.24	NA	0.56 ± 0.15	7.4 ± 2.0	--
204D036		3.0 - 4.0	NA	1.9 ± 0.43	NA	--	NA	0.95 ± 0.24	--	NA	1.94 ± 0.37	NA	1.08 ± 0.24	NA	0.51 ± 0.13	11.5 ± 2.5	--
204D037		6.0 - 7.0	NA	1.86 ± 0.45	NA	--	NA	0.84 ± 0.27	--	NA	1.82 ± 0.36	NA	0.97 ± 0.24	NA	0.67 ± 0.17	14.2 ± 2.9	--
204D038	D19	1.0 - 2.0	NA	1.42 ± 0.38	NA	--	NA	0.96 ± 0.26	--	NA	1.82 ± 0.36	NA	1.01 ± 0.23	NA	0.53 ± 0.14	--	--
204D039		3.0 - 4.0	NA	1.48 ± 0.37	NA	--	NA	0.9 ± 0.24	--	NA	1.95 ± 0.37	NA	1.07 ± 0.24	NA	0.52 ± 0.13	3.1 ± 1.0	--
204D040	D02	1.0 - 2.0	NA	1.79 ± 0.37	NA	--	NA	0.97 ± 0.22	--	NA	1.6 ± 0.30	NA	0.94 ± 0.20	NA	0.56 ± 0.12	9.1 ± 1.8	--
204D040A	D18	7.0 - 8.0	NA	1.81 ± 0.62	NA	--	NA	0.99 ± 0.4	--	NA	1.69 ± 0.36	NA	0.86 ± 0.28	NA	0.52 ± 0.2	84 ± 10	2.07 ± 0.65
204D041	D02	3.0 - 4.0	NA	1.64 ± 0.38	NA	--	NA	0.82 ± 0.23	--	NA	1.53 ± 0.31	NA	1.08 ± 0.24	NA	0.53 ± 0.13	11.6 ± 2.5	--
204D041A	D18	11.0 - 12.0	NA	1.85 ± 0.56	NA	--	NA	1.41 ± 0.41	--	NA	2.18 ± 0.4	NA	1.45 ± 0.32	NA	0.62 ± 0.19	--	--
204D042	D03	1.0 - 2.0	NA	1.54 ± 0.36	NA	--	NA	0.91 ± 0.25	--	NA	1.96 ± 0.37	NA	1.05 ± 0.23	NA	0.63 ± 0.15	7.8 ± 1.9	--
204D042A	D37	0.0 - 0.5	1.48 ± 0.41	NA	--	NA	0.99 ± 0.3	NA	0.26 ± 0.12 (LT)	1.59 ± 0.32	NA	0.96 ± 0.25	NA	0.42 ± 0.15	NA	9.9 ± 2.5	--
204D043	D03	3.0 - 4.0	NA	1.72 ± 0.43	NA	--	NA	1.12 ± 0.29	--	NA	2.05 ± 0.39	NA	0.94 ± 0.23	NA	0.59 ± 0.16	5.4 ± 1.6	--

Table A.6-8
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-18-02
(Page 3 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15		
204D043A		1.0 - 2.0	NA	1.7 ± 0.52	NA	--	NA	0.84 ± 0.27	--	NA	1.73 ± 0.31	NA	0.85 ± 0.23	NA	0.43 ± 0.14	4.3 ± 1.5 (TI)	--
204D044		4.0 - 6.0	NA	2.04 ± 0.57	NA	--	NA	1.09 ± 0.38	--	NA	1.71 ± 0.34	NA	0.86 ± 0.25	NA	0.66 ± 0.21	3.2 ± 1.2	--
204D045	D37	6.0 - 8.0	NA	1.76 ± 0.48	NA	--	NA	0.84 ± 0.32	--	NA	2 ± 0.36	NA	1.17 ± 0.29	NA	0.63 ± 0.19	--	--
204D046		10.0 - 12.0	NA	1.29 ± 0.32	NA	--	NA	0.56 ± 0.22	--	NA	1.88 ± 0.29	NA	0.81 ± 0.2	NA	0.58 ± 0.14	--	--
204D047		10.0 - 12.0	NA	1.81 ± 0.48	NA	--	NA	1.11 ± 0.34	--	NA	1.93 ± 0.34	NA	1.36 ± 0.29	NA	0.43 ± 0.15	--	--
204D048		5.0 - 6.0	NA	1.91 ± 0.48	NA	--	NA	0.92 ± 0.3	--	NA	2.14 ± 0.36	NA	1.25 ± 0.26	NA	0.55 ± 0.17	--	--
204D049	D17	6.0 - 8.0	NA	1.61 ± 0.54	NA	--	NA	1.26 ± 0.45	--	NA	2.12 ± 0.4	NA	1.34 ± 0.33	NA	0.6 ± 0.2	--	--
204D050		10.0 - 12.0	NA	2.05 ± 0.56	NA	--	NA	1.26 ± 0.38	--	NA	1.78 ± 0.38	NA	1.29 ± 0.32	NA	0.6 ± 0.2	--	--
204D051		0.0 - 0.5	1.61 ± 0.49	NA	--	NA	1.16 ± 0.38	NA	--	1.64 ± 0.35	NA	0.84 ± 0.26	NA	0.52 ± 0.18	NA	195 ± 24	3.75 ± 0.86
204D052		1.0 - 2.0	NA	1.38 ± 0.45	NA	--	NA	0.96 ± 0.38	--	NA	1.68 ± 0.34	NA	1.02 ± 0.28	NA	0.47 ± 0.16	19.6 ± 3.5	--
204D053	D41	4.0 - 6.0	NA	1.56 ± 0.51	NA	--	NA	1 ± 0.33	--	NA	1.65 ± 0.33	NA	1.1 ± 0.28	NA	0.55 ± 0.18	--	--
204D054		6.0 - 8.0	NA	1.63 ± 0.5	NA	--	NA	0.81 ± 0.28	--	NA	1.62 ± 0.31	NA	0.98 ± 0.24	NA	0.66 ± 0.18	--	--
204D055		10.0 - 12.0	NA	1.9 ± 0.58	NA	--	NA	1.08 ± 0.38	--	NA	0.99 ± 0.27	NA	1.73 ± 0.37	NA	0.46 ± 0.18	--	--
204D056		0.0 - 0.5	1.21 ± 0.42	NA	--	NA	0.82 ± 0.31	NA	--	1.63 ± 0.33	NA	1.22 ± 0.28	NA	0.52 ± 0.18	NA	21 ± 3	--
204D057		0.0 - 0.5	1.3 ± 0.41	NA	--	NA	--	NA	--	1.56 ± 0.27	NA	0.86 ± 0.21	NA	0.36 ± 0.12	NA	17.6 ± 2.6	--
204D058		1.0 - 2.0	NA	1.43 ± 0.46	NA	--	NA	0.85 ± 0.34	--	NA	1.38 ± 0.32	NA	1.04 ± 0.27	NA	0.5 ± 0.16	4.6 ± 1.7	--
204D059	D40	4.0 - 6.0	NA	1.89 ± 0.54	NA	--	NA	1.34 ± 0.39	--	NA	2.01 ± 0.39	NA	1.03 ± 0.28	NA	0.69 ± 0.2	--	--
204D060		6.0 - 8.0	NA	2.01 ± 0.53	NA	--	NA	0.98 ± 0.32	--	NA	2.16 ± 0.38	NA	0.95 ± 0.26	NA	0.8 ± 0.21	--	--
204D061		10. 0 - 12.0	NA	1.47 ± 0.43	NA	--	NA	0.94 ± 0.35	--	NA	2.04 ± 0.36	NA	0.93 ± 0.25	NA	0.59 ± 0.19	--	--
204D062		5.0 - 6.0	NA	1.64 ± 0.46	NA	--	NA	0.92 ± 0.3	--	NA	1.67 ± 0.31	NA	0.83 ± 0.23	NA	0.6 ± 0.17	17.1 ± 3.2	--
204D063	D02	6.0 - 8.0	NA	1.76 ± 0.55	NA	--	NA	0.79 ± 0.31	--	NA	2.29 ± 0.4	NA	0.96 ± 0.27	NA	0.69 ± 0.2	--	--
204D064		10.0 - 12.0	NA	2.24 ± 0.68	NA	--	NA	0.84 ± 0.36	--	NA	1.91 ± 0.38	NA	1.04 ± 0.27	NA	0.81 ± 0.23	--	--

Table A.6-8
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-18-02
(Page 4 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15		
204D065	D38	0.0 - 0.5	1.51 ± 0.46	NA	--	NA	1.01 ± 0.38	NA	0.4 ± 0.17 (LT)	1.83 ± 0.36	NA	1.19 ± 0.3	NA	0.61 ± 0.2	NA	17.2 ± 2.5	--
204D066		1.0 - 2.0	NA	1.42 ± 0.41	NA	--	NA	0.72 ± 0.28	--	NA	1.99 ± 0.35	NA	0.98 ± 0.24	NA	0.59 ± 0.17	--	--
204D067		4.0 - 6.0	NA	1.46 ± 0.47	NA	--	NA	0.8 ± 0.33	--	NA	1.54 ± 0.37	NA	1.05 ± 0.29	NA	0.51 ± 0.19	--	--
204D068		6.0 - 8.0	NA	--	NA	--	NA	--	--	NA	1.5 ± 0.31	NA	0.91 ± 0.25	NA	--	10.6 ± 2.4	--
204D069		10.0 - 12.0	NA	1.74 ± 0.46	NA	--	NA	0.89 ± 0.36	--	NA	1.84 ± 0.35	NA	0.99 ± 0.27	NA	0.43 ± 0.18	--	--
204D070	D30	0.0 - 0.5	2.11 ± 0.64	NA	--	NA	0.89 ± 0.33	NA	--	1.59 ± 0.36	NA	1.19 ± 0.3	NA	0.52 ± 0.18	NA	9 ± 1.7	--
204D071		1.0 - 2.0	NA	1.45 ± 0.37	NA	--	NA	0.87 ± 0.28	--	NA	1.59 ± 0.27	NA	0.74 ± 0.2	NA	0.54 ± 0.13	--	--
204D072	D39	0.0 - 0.5	1.63 ± 0.41	NA	--	NA	0.94 ± 0.28	NA	--	1.65 ± 0.32	NA	0.95 ± 0.23	NA	0.55 ± 0.16	NA	33.2 ± 5	--
204D073		1.0 - 2.0	NA	--	NA	--	NA	0.89 ± 0.32	--	NA	1.41 ± 0.3	NA	0.96 ± 0.24	NA	0.48 ± 0.17	16.9 ± 3	--
204D074		4.0 - 6.0	NA	--	NA	--	NA	--	--	NA	1.67 ± 0.36	NA	1.13 ± 0.28	NA	--	0.54 ± 0.2	--
204D075		6.0 - 8.0	NA	2.17 ± 0.5	NA	--	NA	1.19 ± 0.33	--	NA	2.25 ± 0.37	NA	1.08 ± 0.25	NA	0.73 ± 0.19	--	--
204D076		10.0 - 12.0	NA	2.03 ± 0.44	NA	--	NA	0.84 ± 0.27	--	NA	1.89 ± 0.29	NA	0.96 ± 0.21	NA	0.63 ± 0.14	--	--
204D077	D31	0.0 - 0.5	1.81 ± 0.51	NA	--	NA	0.96 ± 0.3	NA	--	1.57 ± 0.32	NA	1.04 ± 0.27	NA	0.46 ± 0.17	NA	37.2 ± 5.5	--
204D078		1.0 - 2.0	NA	1.21 ± 0.38	NA	--	NA	0.79 ± 0.29	--	NA	1.79 ± 0.31	NA	0.73 ± 0.18	NA	0.62 ± 0.18	--	--
204D079		4.0 - 6.0	NA	2.39 ± 0.61	NA	--	NA	0.83 ± 0.35	--	NA	1.46 ± 0.3	NA	0.99 ± 0.26	NA	0.57 ± 0.17	17.4 ± 3	--
204D080	D32	0.0 - 0.5	1.37 ± 0.5	NA	--	NA	1 ± 0.36	NA	--	1.04 ± 0.29	NA	0.98 ± 0.28	NA	--	NA	102 ± 12	2.21 ± 0.67
204D081		1.0 - 2.0	NA	1.84 ± 0.5	NA	--	NA	--	--	NA	1.75 ± 0.35	NA	1.05 ± 0.28	NA	0.72 ± 0.21	3.8 ± 1.2	--
204D082		4.0 - 6.0	NA	1.45 ± 0.43	NA	--	NA	1.01 ± 0.32	--	NA	1.69 ± 0.34	NA	0.87 ± 0.24	NA	0.58 ± 0.18	--	--
204D083	D33	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.17 ± 0.28	NA	0.82 ± 0.27	NA	0.43 ± 0.18	NA	116 ± 14	2.33 ± 0.69
204D084		1.0 - 2.0	NA	1.63 ± 0.52	NA	4.7 ± 2 (TI)	NA	0.84 ± 0.36	--	NA	2.03 ± 0.38	NA	0.9 ± 0.27	NA	0.68 ± 0.21	9.4 ± 1.8	--
204D085		4.0 - 6.0	NA	1.84 ± 0.39	NA	--	NA	0.96 ± 0.26	--	NA	1.7 ± 0.27	NA	1.17 ± 0.23	NA	0.53 ± 0.13	--	--

Table A.6-8
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-18-02
(Page 5 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15		<15	>15	<15	>15	<15	>15		
204D086	D34	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.52 ± 0.32	NA	0.91 ± 0.29	NA	0.49 ± 0.18	NA	**249 ± 30**	5.4 ± 1
204D087		1.0 - 2.0	NA	1.62 ± 0.49	NA	--	NA	0.66 ± 0.27	--	NA	1.44 ± 0.31	NA	1.17 ± 0.27	NA	0.45 ± 0.17	9.5 ± 2.3	--
204D088		4.0 - 6.0	NA	1.87 ± 0.62	NA	--	NA	--	--	NA	1.64 ± 0.35	NA	1.02 ± 0.3	NA	0.69 ± 0.21	7.3 ± 2.1	--
204D089		6.0 - 8.0	NA	1.54 ± 0.55	NA	--	NA	0.92 ± 0.38	--	NA	1.8 ± 0.37	NA	1.05 ± 0.27	NA	0.67 ± 0.21	5.3 ± 1.4	--
204D090		10.0 - 12.0	NA	1.93 ± 0.54	NA	--	NA	1.03 ± 0.39	--	NA	2.44 ± 0.43	NA	1.2 ± 0.29	NA	0.75 ± 0.22	6.4 ± 1.4	--
204D091		10.0 - 12.0	NA	1.84 ± 0.42	NA	--	NA	0.92 ± 0.29	--	NA	2.12 ± 0.32	NA	1.06 ± 0.22	NA	0.55 ± 0.14	5.1 ± 1.3	--
204D092	D35	0.0 - 0.5	1.71 ± 0.42	NA	--	NA	1.03 ± 0.3	NA	--	1.63 ± 0.31	NA	1.02 ± 0.25	NA	0.41 ± 0.14	NA	16.2 ± 3	--
204D093		1.0 - 2.0	NA	--	NA	--	NA	--	--	NA	1.01 ± 0.27	NA	0.76 ± 0.24	NA	--	49.4 ± 6.6	--
204D094		4.0 - 6.0	NA	1.47 ± 0.49	NA	--	NA	--	--	NA	1.69 ± 0.36	NA	1.1 ± 0.3	NA	0.63 ± 0.19	7.4 ± 1.5	--
204D095		6.0 - 8.0	NA	2.03 ± 0.6	NA	--	NA	--	--	NA	1.83 ± 0.39	NA	0.69 ± 0.25	NA	0.45 ± 0.17	25.6 ± 3.6	--
204D096		10.0 - 12.0	NA	1.95 ± 0.47	NA	--	NA	0.96 ± 0.31	--	NA	1.91 ± 0.34	NA	1.06 ± 0.26	NA	0.72 ± 0.19	--	--
204D097	D36	0.0 - 0.5	--	NA	--	NA	0.63 ± 0.25	NA	0.29 ± 0.11 (LT)	0.8 ± 0.21	NA	0.58 ± 0.17	NA	0.27 ± 0.12	NA	--	--
204D098		1.0 - 2.0	NA	1.72 ± 0.62	NA	--	NA	--	--	NA	1 ± 0.29	NA	0.9 ± 0.26	NA	0.47 ± 0.18	12.7 ± 2.1	--
204D099		4.0 - 6.0	NA	2.17 ± 0.57	NA	--	NA	1.18 ± 0.38	--	NA	2.19 ± 0.43	NA	1.16 ± 0.32	NA	0.67 ± 0.21	--	--
204D100		6.0 - 8.0	NA	1.8 ± 0.51	NA	--	NA	1.02 ± 0.35	--	NA	2.07 ± 0.38	NA	0.85 ± 0.23	NA	0.71 ± 0.2	--	--
204D101		10.0 - 12.0	NA	2.01 ± 0.58	NA	--	NA	1.18 ± 0.42	--	NA	2.18 ± 0.43	NA	1.08 ± 0.29	NA	0.7 ± 0.21	--	--

[a]Based on the generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230, and Th-232 as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PAL for these isotopes is specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils. For purposes of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 inches) (DOE, 1993).

[b]Based on the construction, commercial, industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value. Qualifier added to laboratory data; record accepted. Duplicate normalized difference outside control limits.
LT = Result is less than the requested minimum detectable concentration, greater than the specific minimum detectable concentration.
-- = Not detected above minimum reporting limits
NA = Not applicable

Table A.6-9
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-18-01
(Page 1 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Uranium-234	Uranium-235	Uranium-238	Plutonium-239	Strontium-90
Preliminary Action Levels[a]			85.9	10.5	63.2	7.62	503
204D001	D01	0.0 - 0.5	3.06 ± 0.46	0.294 ± 0.086	12.7 ± 1.7	--	--
204D002		0.0 - 0.5	3.14 ± 0.46	0.384 ± 0.096	12.7 ± 1.7	--	--
204D003	D02	0.0 - 0.5	284 ± 46 (J)	**27.1 ± 6.6** (J)	**1,400 ± 220** (J)	0.09 ± 0.055	18 ± 4.3
204D040		1.0 - 2.0	2.4 ± 0.36	0.224 ± 0.066	8.3 ± 1.1	--	--
204D041		3.0 - 4.0	3.51 ± 0.50	0.257 ± 0.071	13.6 ± 1.8	--	--
204D062		5.0 - 6.0	4.95 ± 0.82	0.42 ± 0.11	19.4 ± 3.1	--	--
204D063		6.0 - 8.0	1.37 ± 0.25	0.082 ± 0.04	2.25 ± 0.39	--	--
204D064		10.0 - 12.0	1.2 ± 0.23	0.063 ± 0.034	1.2 ± 0.23	--	--
204D004	D03	0.0 - 0.5	53.6 ± 7.7	3.36 ± 0.88	**212 ± 29**	0.072 ± 0.034	0.93 ± 0.26
204D042		1.0 - 2.0	2.44 ± 0.37	0.256 ± 0.075	7.9 ± 1.1	--	--
204D043		3.0 - 4.0	1.92 ± 0.30	0.201 ± 0.065	5.31 ± 0.75	--	--
204D005	D04	0.5 - 1.0	8.3 ± 1.2	0.68 ± 0.15	28.5 ± 3.9	--	--
204D006	D05	0.0 - 0.5	**202 ± 35** (J)	**19 ± 4.5** (J)	**780 ± 130** (J)	--	2.83 ± 0.73 (Y1)
204D007		1.0 - 2.0	1.69 ± 0.26	0.113 ± 0.044	3.91 ± 0.55	--	--
204D008	D06	0.0 - 0.5	30.7 ± 5.1 (J)	3.36 ± 0.79 (J)	**152 ± 24** (J)	--	--
204D009		1.0 - 2.0	1.05 ± 0.18	0.077 ± 0.038	2.1 ± 0.32	--	--
204D010	D11	0.0 - 0.5	70 ± 11	7.4 ± 1.7	312 ± 45	--	1.31 ± 0.39
204D014		1.0 - 2.0	11.4 ± 1.7	1.04 ± 0.29	42.6 ± 5.7	--	--
204D015		3.0 - 4.0	4.63 ± 0.68	0.304 ± 0.088	13.6 ± 1.9	--	--
204D016		7.0 - 7.5	6.3 ± 0.91	0.52 ± 0.13	27.3 ± 3.7	--	--
204D011	D12	0.0 - 0.5	2.21 ± 0.36	0.106 ± 0.051	6.8 ± 0.98	--	--
204D022		1.0 - 2.0	1.31 ± 0.23	--	2.1 ± 0.34	--	--
204D023		3.0 - 4.0	1.12 ± 0.20	0.074 ± 0.038	1.79 ± 0.29	--	--
204D024		3.0 - 4.0	1.25 ± 0.22	0.098 ± 0.047	1.26 ± 0.23	--	--
204D012	D13	0.0 - 0.5	42.1 ± 6.3	4.22 ± 0.94	**180 ± 26**	--	--
204D025		1.0 - 2.0	1.28 ± 0.21	0.065 ± 0.034	2.93 ± 0.43	--	--
204D026		3.0 - 4.0	1.23 ± 0.20	0.136 ± 0.050	2.26 ± 0.34	--	--
204D013	D14	0.0 - 0.5	2.26 ± 0.36	0.161 ± 0.062	7.8 ± 1.1	--	--
204D027		1.0 - 2.0	1.03 ± 0.18	0.085 ± 0.038	1.09 ± 0.19	--	--
204D028		3.0 - 4.0	1.02 ± 0.17	--	1.07 ± 0.18	--	--
204D017	D15	0.0 - 0.5	1.14 ± 0.20	--	1.96 ± 0.31	--	--
204D029		1.0 - 2.0	0.97 ± 0.17	--	1.43 ± 0.23	--	--
204D030		3.0 - 4.0	1.27 ± 0.21	0.072 ± 0.038	1.68 ± 0.27	--	--
204D018	D16	0.0 - 0.5	13 ± 2.1	1.11 ± 0.37	62.2 ± 8.8	--	--
204D031		1.0 - 2.0	1.64 ± 0.26	0.133 ± 0.050	5.22 ± 0.73	--	--
204D032		3.0 - 4.0	2.6 ± 0.38	0.248 ± 0.070	9 ± 1.2	--	--
204D019	D17	0.0 - 0.5	15.1 ± 2.2	1.83 ± 0.42	**70 ± 9.3**	--	--
204D033		1.0 - 2.0	1.91 ± 0.29	0.162 ± 0.055	5.8 ± 0.80	--	--
204D034		3.0 - 4.0	3.14 ± 0.46	0.358 ± 0.089	11.9 ± 1.6	--	--
204D048		5.0 - 6.0	1.15 ± 0.22	0.096 ± 0.043	1.52 ± 0.28	--	--
204D049		6.0 - 8.0	1.06 ± 0.2	0.057 ± 0.031	1.07 ± 0.2	--	--

Table A.6-9
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-18-01
(Page 2 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Uranium-234	Uranium-235	Uranium-238	Plutonium-239	Strontium-90
Preliminary Action Levels[a]			85.9	10.5	63.2	7.62	503
204D020	D18	0.0 - 0.5	2.5 ± 0.37	0.246 ± 0.069	10.9 ± 1.5	--	--
204D035		1.0 - 2.0	2.21 ± 0.33	0.152 ± 0.050	6.11 ± 0.83	--	--
204D036		3.0 - 4.0	12.8 ± 1.8	1.01 ± 0.21	38.5 ± 5.3	--	--
204D037		6.0 - 7.0	4.9 ± 0.68	0.47 ± 0.10	17 ± 2.2	--	--
204D040A		7.0 - 8.0	24.4 ± 4.5 (Y2, M3)	2.06 ± 0.5 (Y2, M3)	**90 ± 16** (Y2, M3)	--	--
204D041A		11.0 - 12.0	1.26 ± 0.24	--	1.13 ± 0.22	--	--
204D021	D19	0.0 - 0.5	2.91 ± 0.45	0.181 ± 0.067	10.7 ± 1.5	--	--
204D038		1.0 - 2.0	1.08 ± 0.18	0.076 ± 0.036	1.1 ± 0.19	--	--
204D039		3.0 - 4.0	1.3 ± 0.21	--	2.24 ± 0.34	--	--
204D070	D30	0.0 - 0.5	5.19 ± 0.86	0.4 ± 0.1	18.1 ± 2.9	--	--
204D071		1.0 - 2.0	1.05 ± 0.2	0.056 ± 0.031	1.66 ± 0.3	--	--
204D077	D31	0.0 - 0.5	15 ± 2.6 (M3)	1.45 ± 0.32	48.8 ± 8.2	--	--
204D078		1.0 - 2.0	1.2 ± 0.23	0.142 ± 0.052	2.55 ± 0.44	--	--
204D079		4.0 - 6.0	4.79 ± 0.79	0.48 ± 0.11	17.6 ± 2.8	--	--
204D080	D32	0.0 - 0.5	31.9 ± 5.4 (M3)	2.87 ± 0.77 (M3)	**117 ± 19** (M3)	--	--
204D081		1.0 - 2.0	1.69 ± 0.32	0.131 ± 0.055	3.35 ± 0.58	--	--
204D082		4.0 - 6.0	1.22 ± 0.23	0.082 ± 0.039	2 ± 0.36		
204D083	D33	0.0 - 0.5	57.2 ± 9.5 (M3)	6.4 ± 1.4 (M3)	**178 ± 29** (M3)	--	--
204D084		1.0 - 2.0	3.73 ± 0.63	0.302 ± 0.085	10.5 ± 1.7	--	--
204D085		4.0 - 6.0	1.34 ± 0.25	0.1 ± 0.045	2.91 ± 0.5	--	--
204D086	D34	0.0 - 0.5	**86 ± 15** (M3)	7.4 ± 1.8 (M3)	**303 ± 51** (M3)		
204D087		1.0 - 2.0	3.49 ± 0.59	0.255 ± 0.076	10 ± 1.6		
204D088		4.0 - 6.0	3.13 ± 0.53	0.291 ± 0.081	9.5 ± 1.5		
204D089		6.0 - 8.0	1.92 ± 0.34	0.115 ± 0.048	3.99 ± 0.67		
204D090		10.0 - 12.0	2.37 ± 0.41	0.131 ± 0.049	5.39 ± 0.88		
204D091		10.0 - 12.0	2.18 ± 0.38	0.157 ± 0.054	5.24 ± 0.85		
204D092	D35	0.0 - 0.5	4.96 ± 0.82	0.314 ± 0.087	17.5 ± 2.8		
204D093		1.0 - 2.0	44.6 ± 7.6 (M3)	4.5 ± 1.1 (M3)	**193 ± 31** (M3)		
204D094		4.0 - 6.0	2.76 ± 0.47	0.239 ± 0.073	7.8 ± 1.3		
204D095		6.0 - 8.0	7.4 ± 1.5 (M3)	0.5 ± 0.27 (M3)	24.4 ± 4.1 (M3)		
204D096		10.0 - 12.0	1.62 ± 0.29	0.12 ± 0.047	3 ± 0.5		
204D097	D36	0.0 - 0.5	1.14 ± 0.21	0.072 ± 0.034	3.05 ± 0.51		
204D098		1.0 - 2.0	9.5 ± 1.6	0.83 ± 0.2	42.2 ± 7		
204D099		4.0 - 6.0	1.15 ± 0.22	--	1.1 ± 0.21		
204D100		6.0 - 8.0	1.46 ± 0.27	0.084 ± 0.04	2.26 ± 0.4		
204D101		10.0 - 12.0	1.1 ± 0.21	0.055 ± 0.03	1.14 ± 0.21		

Table A.6-9
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-18-01
(Page 3 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Uranium-234	Uranium-235	Uranium-238	Plutonium-239	Strontium-90
Preliminary Action Levels[a]			85.9	10.5	63.2	7.62	503
204D042A	D37	0.0 - 0.5	2.43 ± 0.43	0.198 ± 0.067	10.6 ± 1.7	--	--
204D043A		1.0 - 2.0	1.91 ± 0.34	0.143 ± 0.055	6.6 ± 1.1	--	--
204D044		4.0 - 6.0	1.21 ± 0.23	0.111 ± 0.047	2.47 ± 0.43	--	--
204D045		6.0 - 8.0	1 ± 0.2	0.071 ± 0.039	1.09 ± 0.22	--	--
204D046		10.0 - 12.0	0.98 ± 0.2	--	1.01 ± 0.2	--	--
204D047		10.0 - 12.0	1.05 ± 0.2	--	0.92 ± 0.18	--	--
204D065	D38	0.0 - 0.5	4.59 ± 0.77	0.55 ± 0.13	19.1 ± 3.1	--	--
204D066		1.0 - 2.0	1.43 ± 0.26	0.088 ± 0.04	3.4 ± 0.57	--	--
204D067		4.0 - 6.0	1.23 ± 0.23	0.073 ± 0.036	2.68 ± 0.46	--	--
204D068		6.0 - 8.0	2.86 ± 0.49	0.159 ± 0.058	9.1 ± 1.5	--	--
204D069		10.0 - 12.0	1.03 ± 0.2	--	1.12 ± 0.22	--	--
204D072	D39	0.0 - 0.5	17.4 ± 3.2 (Y2, M3)	1.63 ± 0.4 (Y2, M3)	80 ± 14 (Y2, M3)	--	--
204D073		1.0 - 2.0	18.3 ± 2.9	4.67 ± 0.77	0.4 ± 0.1	--	--
204D074		4.0 - 6.0	1.29 ± 0.24	0.069 ± 0.035	2.34 ± 0.4	--	--
204D075		6.0 - 8.0	1.11 ± 0.21	0.061 ± 0.031	1.31 ± 0.24	--	--
204D076		10.0 - 12.0	0.98 ± 0.19	1.1 ± 0.21	0.084 ± 0.037	--	--
204D056	D40	0.0 - 0.5	3.98 ± 0.66	0.41 ± 0.1	16.7 ± 2.7	--	--
204D057		0.0 - 0.5	4.35 ± 0.72	0.384 ± 0.098	17.2 ± 2.7	--	--
204D058		1.0 - 2.0	2.02 ± 0.35	0.188 ± 0.062	6.09 ± 0.99	--	--
204D059		4.0 - 6.0	1.06 ± 0.2	--	1.07 ± 0.2	--	--
204D060		6.0 - 8.0	1.23 ± 0.23	--	1.26 ± 0.24	--	--
204D061		10. 0 - 12.0	1.17 ± 0.23	0.066 ± 0.036	1.07 ± 0.21	--	--
204D050	D41	10.0 - 12.0	0.99 ± 0.19	--	1.03 ± 0.2	--	--
204D051		0.0 - 0.5	107 ± 19 (Y2, M3)	10.9 ± 2.8 (Y2, M3)	522 ± 92 (Y2, M3)	--	--
204D052		1.0 - 2.0	4.48 ± 0.75	0.43 ± 0.11	15.6 ± 2.5	--	--
204D053		4.0 - 6.0	1.39 ± 0.26	0.105 ± 0.046	2.65 ± 0.46	--	--
204D054		6.0 - 8.0	1.08 ± 0.21	0.054 ± 0.031	1.18 ± 0.23	--	--
204D055		10.0 - 12.0	1.05 ± 0.2	0.082 ± 0.037	1.04 ± 0.2	--	--

[a]Based on the construction, commercial, industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studie*s (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem per year dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value. Qualifier added to laboratory data; record accepted. Chemical yield below control limits.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
Y1 = Chemical yield is in control at 100 - 110%. Quantitative yield is assumed.
Y2 = Chemical yield outside default limits.

A.6.3 Contaminants of Concern

Radiological COPCs became COCs when they were found in levels exceeding PALs as identified in the CAIP.

A.6.4 Nature and Extent of Contamination

Radiological contamination exceeding unrestricted release criteria is fairly even throughout the CAS and is confined to the top foot of soil. The lateral extent of the radiological contamination was not completely delineated. The radiological contamination to the west and south extends into a marked RMA. Therefore, the contamination is considered to extend beyond the CAS boundary. The source of the adjacent contamination is unknown, but expected to be from testing in the area. No organic or inorganic contaminants were found to exist in the soil at a concentration exceeding the PALs. No other contaminant was found to exist in concentrations greater than PALs.

A.6.5 Revised Conceptual Site Model

No variations to the CSM were identified.

A.7.0 Kay Blockhouse (05-33-01)

Corrective Action Site 05-33-01, Kay Blockhouse, consists of an area of approximately 11 acres and includes the Kay Blockhouse, numerous burn pits, and other disturbed areas. The Kay Blockhouse was constructed in 1951 and used as an instrumentation bunker for Operation Ranger, a series of five atmospheric nuclear tests. The burn pits and other surface features within the CAS boundary were not part of the nuclear testing. The Kay Blockhouse is constructed of concrete with a wooden entry way and door. More detail about this CAS is provided in the CAIP (NNSA/NV, 2002a).

A.7.1 Corrective Action Investigation

A total of 285 investigation, waste characterization, and QA samples (listed in Table A.7-1) were collected during investigation activities conducted at CAS 05-33-01. The actual sample locations are shown in Figure A.7-1. The specific CAI activities conducted to meet CAIP requirements at CAS 05-33-01 are described in Table A.2-1.

A.7.1.1 Deviations

There were no deviations from the investigative activities specified in the CAIP for CAS 05-33-01.

A.7.2 Investigation Activities

The following sections provide details of the inspection and sampling of the bunker interior, field-screening results, and characterization sampling and analytical results.

A.7.2.1 Bunker Interior and Exterior Features Inspection

In order to fully assess the potential for soil contamination at CAS 05-33-01 the investigation team first inspected the bunker for visual evidence of releases including stains, corroded materials, or degraded containers. A radiological survey was performed within the bunker and swipe samples were collected.

Several surface features are outside the bunker, including debris areas, burn pits, a geophysical anomaly, and miscellaneous structures that are within the CAS boundary, but not associated with the

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 1 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E001	E01	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E002	E02	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E003	E03	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E004	E04	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E005	E05	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E123		Soil	4.5 - 5.0	SC				X		X							
204E124		Soil	6.0 - 7.0	SC				X		X							
204E006	E06	Soil	0.0 - 0.5	SC	X	X	X	X	X	X			X				
204E007		Soil	1.0 - 2.0	SC	X	X	X	X	X	X			X				
204E008	E07	Soil	0.0 - 0.5	SC	X	X	X	X	X	X			X				
204E009		Soil	0.0 - 0.5	Field Duplicate of #204E008	X	X	X	X	X	X			X				
204E010		Soil	3.0 - 4.0	SC	X	X	X	X	X	X			X				
204E011	E08	Soil	0.0 - 0.5	SC	X	X	X	X	X	X			X				
204E012		Soil	3.0 - 4.0	SC	X	X	X	X	X	X			X				
204E013	E09	Soil	0.0 - 0.5	SC	X	X	X	X	X	X			X				
204E181		Soil	1.0 - 2.0	SC	VOCs only												
204E182		Soil	3.0 - 3.5	SC, Lab QC	VOCs only												
204E014	E10	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E015	E11	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E016	E12	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E017	E13	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E018	E14	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E163		Soil	1.0 - 2.0	SC				X		X							
204E164		Soil	3.0 - 4.0	SC				X		X							
204E019	E15	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E159		Soil	1.0 - 2.0	SC				X		X							
204E162		Soil	3.0 - 4.0	SC				X		X							
204E020	E16	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E021		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E022		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 2 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E023	E17	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E024		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E025		Soil	14.0 - 15.0	SC, Lab QC	X	X	X	X	X		X		X				
204E026	E18	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E027		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E028		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				
204E029	E19	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E030		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E031		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				
204E032		Soil	14.0 - 15.0	Field Duplicate of #204E031	X	X	X	X	X		X		X				
204E033	E20	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E034	E21	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E175		Soil	1.0 - 2.0	SC	Lead only												
204E176		Soil	1.0 - 2.0	Field Duplicate of #204E175	Lead only												
204E177		Soil	3.0 - 4.0	SC	Lead only												
204E035	E22	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E036	E23	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E037	E24	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E038	E25	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E039	E26	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E040	E27	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E143		Soil	1.0 - 2.0	SC				X		X							
204E144		Soil	3.0 - 4.0	SC				X		X							
204E145		Soil	5.5 - 6.0	SC				X		X							
204E041	E28	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E042	E29	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E043	E30	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E044		Soil	1.0 - 2.0	SC	X	X	X	X	X		X		X				
204E045		Soil	1.0 - 2.0	Field Duplicate of #240E044	X	X	X	X	X		X		X				
204E046	E31	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E047		Soil	1.0 - 2.0	SC	X	X	X	X	X		X		X				

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 3 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E048	E32	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E049	E33	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E125		Soil	2.5 - 3.0	SC				X		X							
204E126		Soil	3.0 - 4.0	SC				X		X							
204E050	E34	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E151		Soil	1.0 - 2.0	SC				X		X							
204E152		Soil	3.0 - 4.0	SC				X		X							
204E051	E35	Soil	11.0 - 12.0	SC, Lab QC	X	X	X	X	X		X		X				
204E052		Soil	13.0 - 14.0	SC	X	X	X	X	X		X		X				
204E053		Soil	16.0 - 17.0	SC	X	X	X	X	X		X		X				
204E054		Soil	19.0 - 20.0	SC	X	X	X	X	X		X		X				
204E055	E36	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E056		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E057		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				
204E058		Soil	19.0 - 20.0	SC	X	X	X	X	X		X		X				
204E059		Soil	24.0 - 25.0	SC	X	X	X	X	X		X		X				
204E060		Soil	29.0 - 30.0	SC	X	X	X	X	X		X		X				
204E061	E37	Soil	19.0 - 20.0	SC	X	X	X	X	X		X		X				
204E062		Soil	24.0 - 25.0	Field Duplicate of #204E061	X	X	X	X	X		X		X				
204E063		Soil	24.0 - 25.0	SC	X	X	X	X	X		X		X				
204E064		Soil	29.0 - 30.0	SC	X	X	X	X	X		X		X				
204E065	E38	Soil	9.0 - 10.0	SC, Lab QC	X	X	X	X	X		X		X				
204E066		Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E067		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				
204E068	E39	Soil	9.0 - 10.0	SC	X	X	X	X	X		X		X				
204E069	E39	Soil	11.0 - 12.0	SC	X	X	X	X	X		X		X				
204E070		Soil	14.0 - 15.0	SC	X	X	X	X	X		X		X				
204E071	E40	Soil	0.0 - 0.5	SC	RCRA Metals	X											
204E072	E41	Soil	0.0 - 0.5	SC		X											
204E073	E42	Soil	0.0 - 0.5	SC		X											
204E074	E43	Soil	0.0 - 0.5	SC		X											
204E075	E44	Soil	1.0 - 2.0	SC		X											
204E076	E45	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 4 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E077	E46	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E078	E47	Soil	0.0 - 0.5	SC	RCRA Metals	X											
204E079	E48	Soil	0.0 - 0.5	SC		X											
204E080	E49	Soil	0.0 - 0.5	SC		X											
204E081	E50	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E082	E51	Soil	0.0 - 0.5	SC	X	X	X	X	X		X		X				
204E083	E52	Fiber	NA	WM								X					
204E084	E53	Fiber	NA	WM								X					
204E085	E54	Fiber	NA	WM								X					
204E086	E55	Fiber	NA	WM								X					
204E087	E56	Fiber	NA	WM								X					
204E088	E57	Fiber	NA	WM								X					
204E089	E58	Fiber	NA	WM								X					
204E090	E59	Fiber	NA	WM								X					
204E091	E60	Fiber	NA	WM								X					
204E092	E61	Fiber	NA	WM								X					
204E093	E62	Fiber	NA	Field Duplicate of #204E092								X					
204E094	E63	Fiber	NA	WM, Lab QC								X					
204E095	E64	Fiber	NA	WM								X					
204E096	E65	Fiber	NA	WM								X					
204E097	E66	Fiber	NA	WM								X					
204E098	E67	Fiber	NA	WM								X					
204E099	E68	Fiber	NA	WM								X					
204E100	E69	Fiber	NA	WM								X					
204E101	E70	Fiber	NA	WM								X					
204E102	E71	Fiber	NA	WM								X					
204E103	E72	Fiber	NA	WM								X					
204E104	E73	Fiber	NA	WM								X					
204E105	E74	Fiber	NA	WM								X					
204E106	E75	Fiber	NA	WM								X					
204E107	E76	Fiber	NA	WM								X					
204E108	E77	Fiber	NA	WM								X					
204E109	E78	Fiber	NA	Field Duplicate of 204E108								X					

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 5 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E110	E79	Fiber	NA	WM, Lab QC								X					
204E111	E80	Fiber	NA	WM								X					
204E112	E81	Fiber	NA	WM								X					
204E113	E82	Fiber	NA	WM								X					
204E114	E83	Fiber	NA	WM								X					
204E115	E84	Fiber	NA	WM								X					
204E116	E85	Fiber	NA	WM								X					
204E117	E86	Fiber	NA	WM								X					
204E118	E87	Fiber	NA	WM								X					
204E119	E88	Fiber	NA	WM								X					
204E120	E89	Soil	0.0 - 0.5	SC				X		X							
204E121		Soil	1.0 - 2.0	SC				X		X							
204E122		Soil	3.0 - 4.0	SC				X		X							
204E127	E90	Soil	0.0 - 0.5	SC				X		X							
204E137		Soil	1.0 - 2.0	SC, Lab QC				X		X							
204E138		Soil	3.0 - 4.0	SC				X		X							
204E129	E91	Soil	0.0 - 0.5	SC				X		X							
204E132		Soil	1.0 - 2.0	SC				X		X							
204E133		Soil	1.0 - 2.0	Field Duplicate of #204E132				X		X							
204E134		Soil	3.0 - 4.0	SC				X		X							
204E128	E92	Soil	0.0 - 0.5	SC				X		X							
204E135		Soil	1.0 - 2.0	SC				X		X							
204E136		Soil	3.0 - 4.0	SC				X		X							
204E130	E93	Soil	0.0 - 0.5	SC				X		X							
204E139		Soil	1.0 - 2.0	SC				X		X							
204E140		Soil	3.0 - 4.0	SC				X		X							
204E131	E94	Soil	0.0 - 0.5	SC				X		X							
204E141		Soil	1.0 - 2.0	SC				X		X							
204E142		Soil	3.0 - 4.0	SC				X		X							
204E146	E95	Soil	0.0 - 0.5	SC				X		X							
204E153		Soil	1.0 - 2.0	SC				X		X							
204E154		Soil	3.0 - 4.0	SC				X		X							

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 6 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E147	E96	Soil	0.0 - 0.5	SC				X		X							
204E155		Soil	1.0 - 2.0	SC				X		X							
204E156		Soil	3.0 - 4.0	SC				X		X							
204E148	E97	Soil	0.0 - 0.5	SC, Lab QC				X		X							
204E149		Soil	1.0 - 2.0	SC				X		X							
204E150		Soil	3.0 - 4.0	SC				X		X							
204E165	E98	Soil	0.0 - 0.5	SC	Lead only												
204E178		Soil	1.0 - 2.0	SC	Lead only												
204E179		Soil	3.0 - 4.0	SC	Lead only												
204E166	E99	Soil	0.0 - 0.5	SC	Lead only												
204E173		Soil	1.0 - 2.0	SC, Lab QC	Lead only												
204E174		Soil	3.0 - 4.0	SC	Lead only												
204E157	E100	Soil	0.0 - 0.5	SC	Lead only			X		X							
204E171		Soil	1.0 - 2.0	SC	Lead only			X		X							
204E172		Soil	3.0 - 4.0	SC	Lead only			X		X							
204E160	E101	Soil	0.0 - 0.5	SC				X		X							
204E161		Soil	0.0 - 0.5	Field Duplicate of #204160				X		X							
204E169		Soil	1.0 - 2.0	SC				X		X							
204E170		Soil	3.0 - 4.0	SC				X		X							
204E158	E102	Soil	0.0 - 0.5	SC				X		X							
204E167		Soil	1.0 - 2.0	SC				X		X							
204E168		Soil	3.0 - 4.0	SC				X		X							

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 7 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E180	E103	Soil	0.0 - 0.5	SC	VOCs only												
204E184		Soil	1.0 - 2.0	SC	VOCs only												
204E185		Soil	1.0 - 2.0	Field Duplicate of #204E184	VOCs only												
204E186		Soil	3.0 - 4.0	SC	VOCs only												
204E183	E104	Soil	0.0 - 0.5	SC	VOCs only												
204E187		Soil	1.0 - 2.0	SC	VOCs only												
204E188		Soil	3.0 - 4.0	SC	VOCs only												
204E226	E150	Soil	0.0 - 0.5	SC				X		X							
204E227		Soil	1.0 - 2.0	SC				X		X							
204E233	E152	Soil	0.0 - 0.5	SC				X		X							
204E234		Soil	1.0 - 2.0	SC				X		X							
204E235		Soil	4.0 - 5.0	SC				X		X							
204E236		Soil	6.0 - 7.0	SC				X		X							
204E199	E153	Soil	0.0 - 0.5	SC				X		X							
204E200		Soil	2.0 - 3.0	SC				X		X							
204E201		Soil	5.0 - 6.0	SC				X		X							
204E202		Soil	9.0 - 10.0	SC				X		X							
204E203	E154	Soil	0.0 - 0.5	SC				X		X							
204E204		Soil	2.0 - 3.0	SC				X		X							
204E205		Soil	5.0 - 6.0	SC				X		X							
204E206		Soil	9.0 - 10.0	SC				X		X							
204E207	E155	Soil	0.0 - 0.5	SC				X		X							
204E208		Soil	2.0 - 3.0	SC				X		X							
204E209		Soil	5.0 - 6.0	SC				X		X							
204E210		Soil	9.0 - 10.0	SC				X		X							
204E211		Soil	9.0 - 10.0	Field Duplicate of #204E210				X		X							
204E193	E156	Soil	0.0 - 0.5	SC				X		X							
204E194		Soil	1.0 - 2.0	SC				X		X							
204E195		Soil	3.0 - 4.0	SC				X		X							

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 8 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E189	E157	Soil	0.0 - 0.5	SC				X		X							
204E190		Soil	0.0 - 0.5	Field Duplicate of #204E189				X		X							
204E191		Soil	1.0 - 2.0	SC				X		X							
204E192		Soil	3.0 - 4.0	SC				X		X							
204E196	E158	Soil	0.0 - 0.5	SC				X		X							
204E197		Soil	1.0 - 2.0	SC				X		X							
204E198		Soil	3.0 - 4.0	SC, Lab QC				X		X							
204E228	E159	Soil	0.0 - 0.5	SC				X		X							
204E229		Soil	1.0 - 2.0	SC				X		X							
204E230		Soil	1.0 - 2.0	Field Duplicate of #204E229				X		X							
204E231	E160	Soil	0.0 - 0.5	SC				X		X							
204E232		Soil	1.0 - 2.0	SC, Lab QC				X		X							
204E212	E161	Soil	0.0 - 0.5	SC, Lab QC				X		X							
204E213		Soil	2.0 - 3.0	SC				X		X							
204E214		Soil	5.0 - 6.0	SC				X		X							
204E215		Soil	9.0 - 10.0	SC				X		X							
204E216	E162	Soil	0.0 - 0.5	SC				X		X							
204E217		Soil	2.0 - 3.0	SC				X		X							
204E218		Soil	5.0 - 6.0	SC				X		X							
204E219		Soil	9.0 - 10.0	SC				X		X							
204E220	E163	Soil	0.0 - 0.5	SC				X		X							
204E221		Soil	2.0 - 3.0	SC				X		X							
204E222		Soil	5.0 - 6.0	SC				X		X							
204E223	E164	Soil	0.0 - 0.5	SC				X		X							
204E224	E165	Soil	0.0 - 0.5	SC				X		X							
204E225	E166	Soil	0.0 - 0.5	SC				X		X							
204E237	E167	Soil	0.0 - 0.5	WC				X		X					X		
204E301	NA	Water	NA	Trip Blank	VOCs only												
204E302	NA	Water	NA	Source Blank	X	X	X	X	X		X		X			X	X
204E303	NA	Water	NA	Trip Blank	VOCs only												

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 9 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E304	NA	Water	NA	Trip Blank	VOCs only												
204E305	NA	Water	NA	Trip Blank	VOCs only												
204E306	NA	Water	NA	Trip Blank	VOCs only												
204E307	NA	Water	NA	Field Blank	X	X	X	X	X		X		X				
204E308	NA	Water	NA	Trip Blank	VOCs only												
204E309	NA	Water	NA	Trip Blank	VOCs only												
204E310	NA	Water	NA	Trip Blank	VOCs only												
204E311	NA	Water	NA	Trip Blank	VOCs only												
204E312	NA	Water	NA	Trip Blank	VOCs only												
204E313	NA	Water	NA	Trip Blank	VOCs only												
204E314	NA	Water	NA	Equipment Rinsate Blank	X	X	X	X	X		X		X				
204E315	NA	Water	NA	Equipment Rinsate Blank	X	X	X	X	X		X		X				
204E315A	NA	Water	NA	Trip Blank	VOCs only												
204E316	NA	Water	NA	Trip Blank	VOCs only												
204E317	NA	Water	NA	Trip Blank	VOCs only												
204E318	NA	Water	NA	Trip Blank	VOCs only												
204E319	NA	Water	NA	Field Blank	X	X	X	X	X		X		X				
204E320	NA	Water	NA	Trip Blank	VOCs only												
204E321	NA	Water	NA	Trip Blank	VOCs only												
204E322	NA	Water	NA	Field Blank	X	X	X	X	X		X		X				
204E323	NA	Water	NA	Trip Blank	VOCs only												
204E324	NA	Water	NA	Trip Blank	VOCs only												

Table A.7-1
Samples Collected at CAS 05-33-01
(Page 10 of 10)

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses												
					Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO, GRO)	Total Beryllium	PCB	Gamma Spectroscopy	Isotopic Plutonium	Isotopic Uranium	Isotopic Uranium, Strontium 90	Asbestos	Explosives	Gross Alpha/Beta, Tritium	Thorium	Zinc	Warfarin
204E325	NA	Water	NA	Equipment Rinsate Blank	X	X	X	X	X		X		X			X	X
204E326	NA	Water	NA	Trip Blank	VOCs only												
204E327	NA	Water	NA	Trip Blank	VOCs only												
204E327A	NA	Water	NA	Trip Blank	VOCs only												
204E328	NA	Water	NA	Equipment Rinsate Blank	X	X	X	X	X		X		X			X	X
204E330	NA	Water	NA	Field Blank				X		X							
204E331	NA	Water	NA	Field Blank	X			X		X							
204E332	NA	Water	NA	Trip Blank	VOCs Only												
204E333	NA	Water	NA	Field Blank	VOCs Only												
204E334	NA	Water	NA	Equipment Rinsate Blank				X		X							
204E335	NA	Water	NA	Source Blank				X		X							
204E336	NA	Water	NA	Source Blank				X		X							
204E337	NA	Water	NA	Source Blank				X		X							
204E338	NA	Water	NA	Field Blank				X		X					X		
204E339	NA	Water	NA	Equipment Rinsate Blank				X		X					X		
204E340	NA	Water	NA	Source Blank				X		X					X		
204E341	NA	Water	NA	Source Blank				X		X					X		
204E401	E39	Soil	0.0 - 1.0	Geotechnical	Sample archived, no analyses performed												
204E402		Soil	4.0 - 5.0	Geotechnical	Sample archived, no analyses performed												
204E403		Soil	10.0 - 11.0	Geotechnical	Sample archived, no analyses performed												
204E501	NA	Water	NA	WM										X	X		
204E502	NA	Water	NA	WM										X	X		
204E503	NA	Water	NA	WM										X	X		

ft bgs = Feet below ground surface
QC = Quality control
SC = Site characterization
WM = Waste management

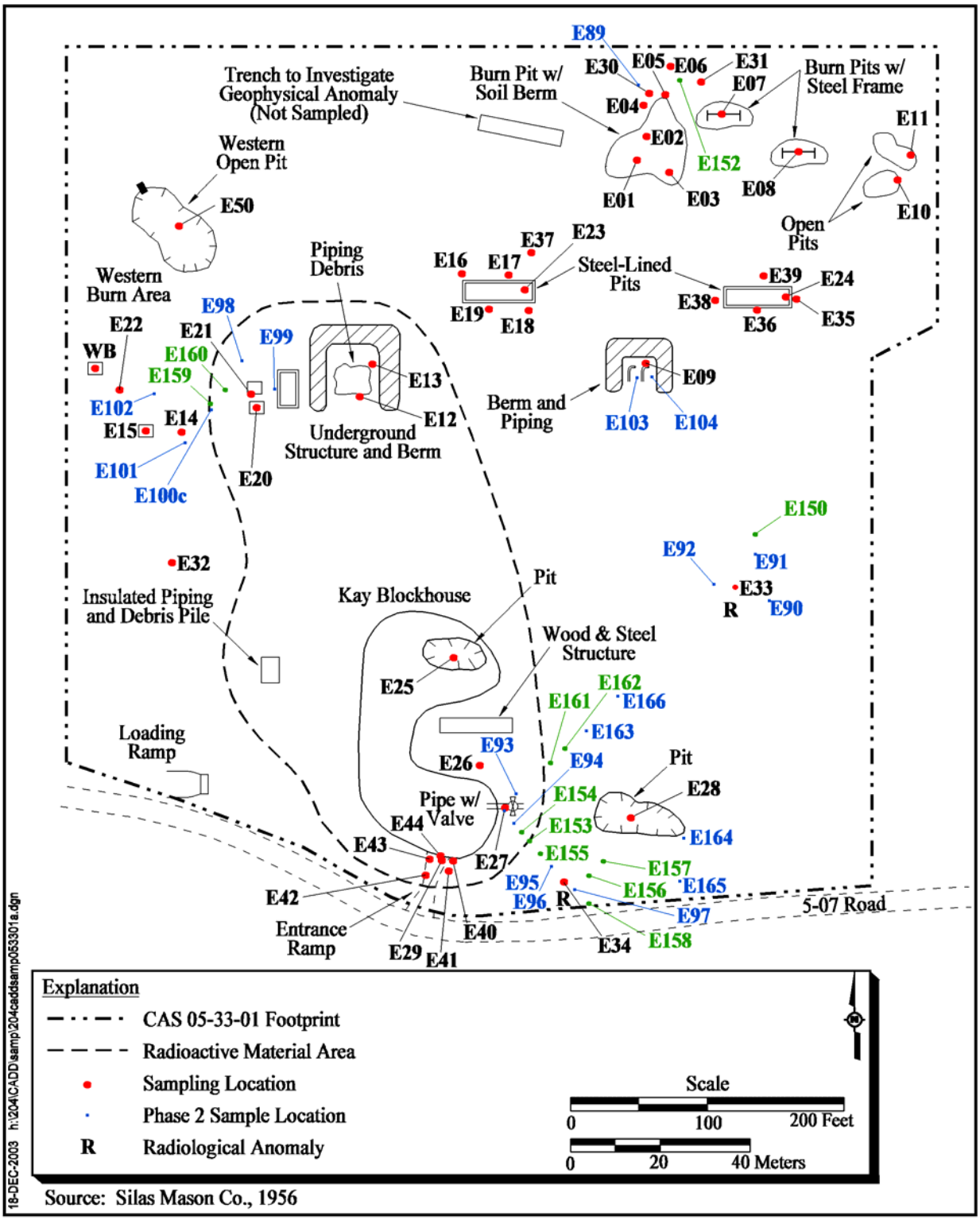

Figure A.7-1
CAS 05-33-01, Sampling Locations Exterior Soils

atmospheric testing for which the bunker was constructed. These features were also potential sources of contamination and were inspected prior to sampling (Figure A.7-1).

The bunker at CAS 05-33-01 consists of a south-facing hallway, the main room, and a smaller room on the north end of the bunker designated as the rack room (Figure A.7-2). The bunker entrance way and hallway are timber-framed with wooden walls. The two main rooms of the bunker have concrete floors, walls, and ceilings. The floor of the main room is covered with about 3 in. of soil sediment. A ventilation duct extends the length of the hallway, and the hallway walls are lined with wooden benches and shelves. Except for a wooden table and a small rack, the rack room is empty.

In the main room, several wooden crates, a wooden table, and a bank of six 24-volt batteries were encountered. Also, an orange-colored compressed gas cylinder (6,000 pounds per square inch [psi]) was found on the floor near the center of the main room. The batteries and the gas cylinder were removed from the bunker by the field investigation crew. The gas cylinder was returned to the Nevada Compressed Gas Company, the owners of the cylinder. The batteries were stored in the CAU 204 hazardous waste accumulation area (HWAA) and will ultimately be released for recycling.

In a depression on the east side of the Kay Blockhouse is a wood and steel structure, the purpose of which is unknown. To the south of this structure, extending from the bunker is a pipe with a valve opening to the ground.

To the north of the Kay Blockhouse is a U-shaped berm containing piping debris. Both this U-shaped berm and the Kay Blockhouse are enclosed with fencing and posted as a RMA. To the east is a smaller berm enclosing two pipes stubbed from the ground. The berms appear to have been constructed to protect the piping from potential testing. To the north of the smaller berm are two steel-lined pits. These pits are approximately 8 ft deep. The steel floors are littered with windblown soil and debris. An insulating material suspected of containing asbestos lines the walls of both pits.

In the northeast corner of the facility are two burn pits with steel structures, two small open pits, and a larger burn area surrounded by a soil berm.

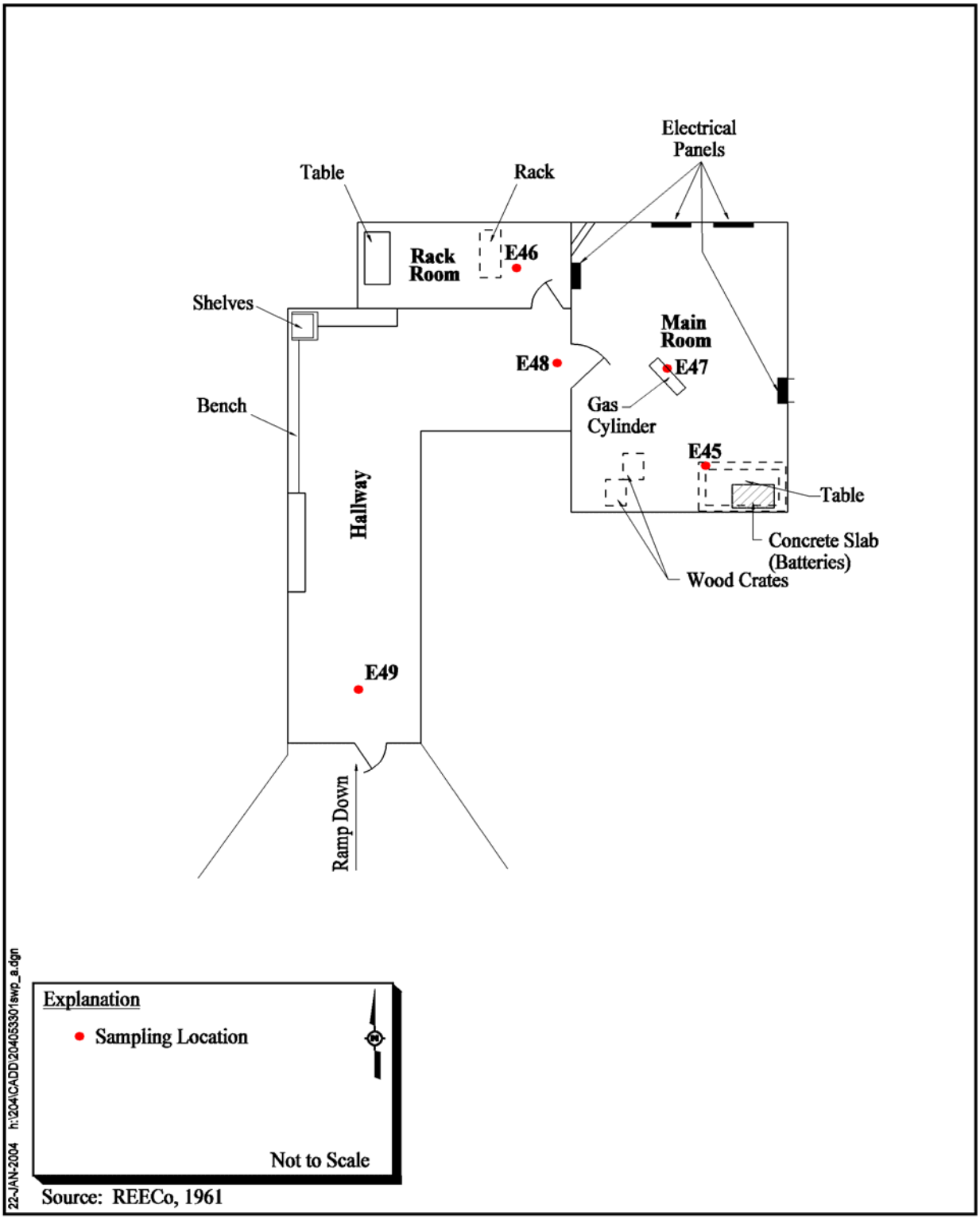

Figure A.7-2
CAS 05-33-01, Soil Sampling Locations, Interior Soils

Along the western edge of the CAS is the Western Burn Area (two small burn pits) and a larger open Western Pit. At the extreme north end of the CAS, a geophysical anomaly was identified during a geophysical survey conducted during the Preliminary Assessment.

Finally, several soil piles and excavated areas were investigated as potential sources of contamination. Each of the features described are considered to be areas of potential contamination and were sampled in accordance with the CAIP. In addition to the previously mentioned features, there are many wires and cables running on the surface within the CAS boundary.

A.7.2.2 Radiological Survey

A radiological survey was conducted on the interior of the Kay Blockhouse. The swipe sample locations are shown on Figure A.7-3 for swipe sample locations and Table A.7-2 for swipe sample data. A walk-over survey of the area within CAS 05-33-01 was also conducted during the PA activities. The description and details of that walk-over are contained in a summary memorandum (IT, 2002b).

A.7.2.2.1 Radiological Survey Results

A radiological swipe survey was completed on the interior and a walk-over radiological survey conducted over the exterior of the bunker, and the area included within the CAS boundary. Table A.7-2 provides the swipe survey results with comparisons made to the unrestricted release criteria for the removable radioactive contamination. The unrestricted criteria per the NV/YMP RadCon Manual (DOE/NV, 2000) was not exceeded on any of the swipes collected from the interior of the bunker, but results of the radiological walk-over survey were used as one of the inputs to determine biased locations for collecting site characterization samples.

A.7.2.3 Waste Characterization

Because the floor of the Kay Blockhouse is covered in sediment; there were no visible spills or leaks observed. Therefore, no samples of concrete or paint were collected for waste characterization purposes. However, five sediment samples were collected from inside the bunker. These results are included in the discussion of the soils analyses in Section A.7.2.4. Additionally, several of the structural features in the burn pits appeared to have asbestos-like material associated with them. This

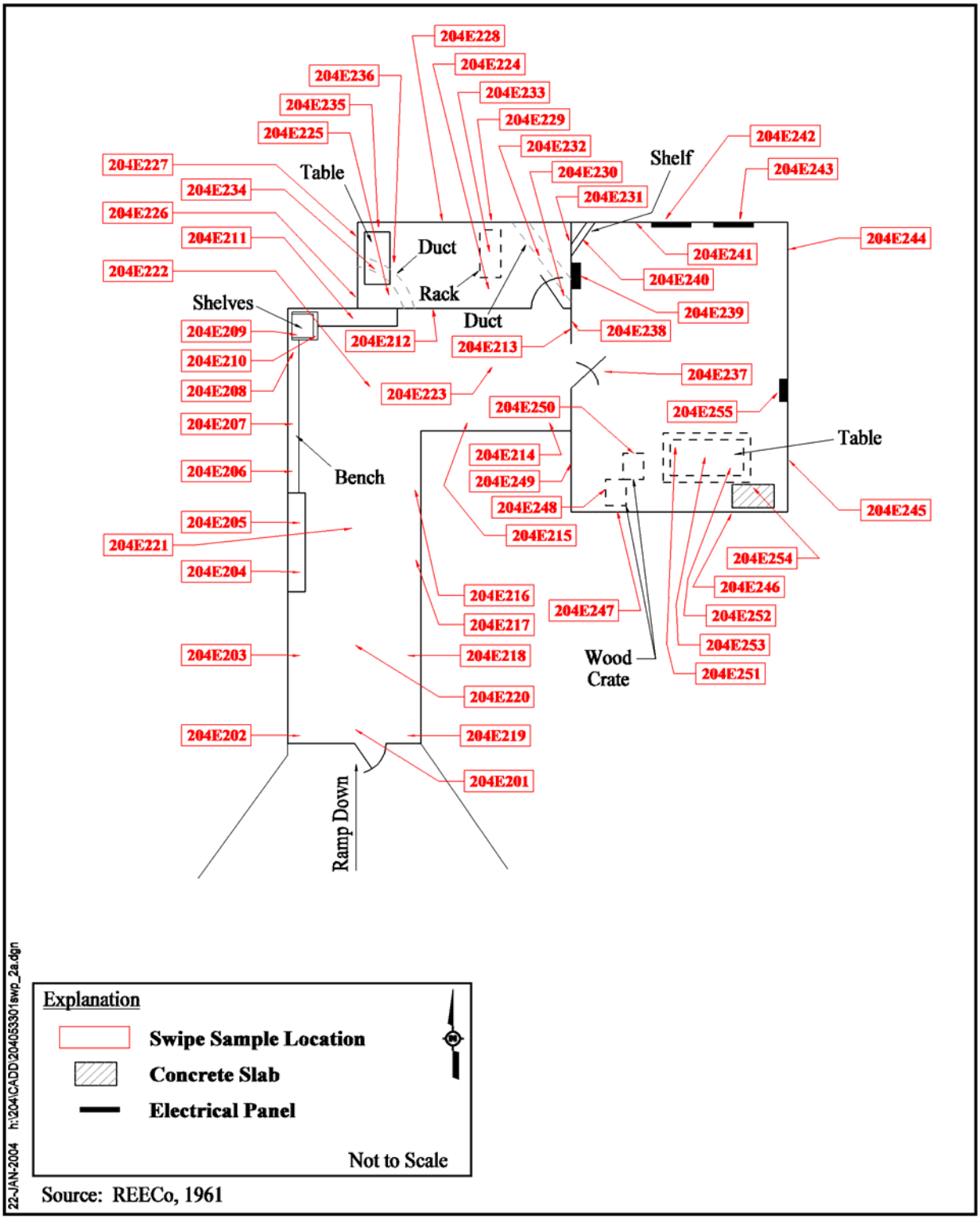

Figure A.7-3
CAS 05-33-01, Radiological Swipe Sample Locations

Table A.7-2
Swipe Sample Analysis for CAS 05-33-01
(Page 1 of 2)

Swipe Sample Analysis				Radiological Survey		Dose rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204E201	-0.67	2.99	1-Door	1,263	18.6	15
204E202	-0.67	2.99	2-Wall	1,310	24.4	15
204E203	-0.67	-1.61	3-Wall	980	19.3	15
204E204	-0.67	7.58	4-Bench	1,255	17.3	15
204E205	-0.67	5.28	5-Wall	1,190	14.4	15
204E206	-0.67	2.99	6-Bench	1,181	26.3	15
204E207	-0.67	0.69	7-Wall	1,245	30.1	15
204E208	-0.67	2.99	8-Bench	1,341	21.7	15
204E209	-0.67	-1.61	9-Shelves	1,052	15.5	15
204E210	-0.67	-1.61	10-Shelves	1,106	11.4	15
204E211	-0.67	5.28	11-Bench	1,218	18.6	15
204E212	2.67	7.20	12-Wall	1,485	16.5	15
204E213	16.04	19.11	13-Wall	1,290	22.2	15
204E214	-0.67	9.88	14-Wall	1,310	19.3	15
204E215	2.67	7.20	15-Wall	1,363	21.7	15
204E216	-0.67	7.58	16-Wall	1,360	28.2	15
204E217	9.36	3.97	17-Wall	1,410	32.2	15
204E218	-0.67	2.99	18-Wall	1,444	30.1	15
204E219	-0.67	-1.61	19-Wall	1,098	19.3	15
204E220	2.67	11.80	20-Ceiling	1,245	11.5	15
204E221	19.38	30.13	21-Ceiling	1,127	13.6	15
204E222	6.01	13.63	22-Ceiling	1,562	18.6	15
204E223	-0.67	2.99	23-Ceiling	1,129	21.7	15
204E224	6.01	-2.45	24-Wall	1,437	36.4	15
204E225	2.67	18.69	25-Wall	1,455	17.3	15
204E226	6.01	9.03	26-wall	1,468	11.4	15
204E227	-0.67	19.06	27-Wall	1,623	20.5	15
204E228	12.70	1.21	28-Wall	1,241	19.3	15
204E229	9.36	15.45	29-Wall	1,005	29.8	15
204E230	9.36	10.86	30-Wall	989	33.3	15
204E231	9.36	33.83	31-Wall	1,100	21.7	15
204E232	2.67	11.80	32-Duct	1,530	15.5	15

Table A.7-2
Swipe Sample Analysis for CAS 05-33-01
(Page 2 of 2)

Swipe Sample Analysis				Radiological Survey		
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		Dose rate (microrem/hr)
				Beta/Gamma (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	
204E233	-0.67	5.28	33-Rack	1,545	19.3	15
204E234	6.01	4.44	34-Table	1,566	16.5	15
204E235	-0.67	5.28	35-Table	1,545	22.2	15
204E236	9.36	15.45	36-Duct	1,489	13.6	15
204E237	2.67	4.91	37-Door	1,479	27.3	15
204E238	-0.67	-1.61	38-Wall	1,205	24.4	15
204E239	-0.67	0.69	39-Electrical Panel	1,627	20.5	15
204E240	-0.67	5.28	40-Shelf	1,333	19.3	15
204E241	-0.67	0.69	41-Wall	1,284	21.7	15
204E242	2.67	-1.98	42-Electrical Panel	1,422	36.4	15
204E243	-0.67	7.58	43-Electrical Panel	1,401	19.3	15
204E244	-0.67	2.99	44-Wall	1,326	19.3	15
204E245	-0.67	2.99	45-Wall	1,292	18.7	15
204E246	-0.67	0.69	46-Wall	1,475	22.2	15
204E247	-0.67	7.58	47-Wall	1,088	19.3	15
204E248	-0.67	5.28	48-Wood Crate	1,176	20.5	15
204E249	-0.67	2.99	49-Wall	1,577	26.7	15
204E250	-0.67	2.99	50-Wood Crate	1,609	23.4	15
204E251	-0.67	2.99	51-Table	1,310	10.3	15
204E252	9.36	6.27	52-Table	1,254	36.4	15
204E253	-0.67	-1.61	53-Table/shelf	1,196	29.8	15
204E254	-0.67	-1.61	54-Slab Concrete	1,041	15.5	15
204E255	-0.67	0.69	55-Electrical Panel	1,382	22.2	15

ID = Identification
NA = Not applicable
cpm = Counts per minute
dpm = Disintegrations per minute
cm^2 = Square centimeters

material was sampled for asbestos analyses and the results are discussed below. Biased soil samples were analyzed for RCRA metals and TCLP metals.

A.7.2.3.1 Waste Characterization Results

A total of 37 samples of suspected ACM material were collected from the insulating lining of the steel-lined burn pits, from pipe insulation from the northeast burn pit with the steel frame, and debris from the northeast burn pit with the soil berm (Figure A.7-4). These samples were analyzed for chrysolite, amosite, crocidolite, actinolite/tremolite and anthophyllite asbestos. The analytical results are shown in Table A.7-3. Amosite is present in concentrations ranging from 5 to 20 percent asbestos and chrysolite is present in concentrations ranging from 1 to 20 percent asbestos. Crocidolite, actinolite/tremolite, and anthophyllite were nondetect.

Of the samples collected and analyzed for TCLP, one sample (Sample Number 204E034) showed TCLP lead in concentrations than exceeded the regulatory limits (Table A.7-4) and three locations with lead in concentrations greater than PALs described in Section A.7.2.4.6.

A.7.2.4 Site Characterization

The soil sample analytical results with concentrations exceeding corresponding MRLs or PALs (NNSA/NV, 2002a) at CAS 05-33-01 are summarized in the following sections. The analytical results are compared to appropriate regulatory levels. A portion of the CAS 05-33-01 analytical results were rejected during validation; however, these rejected data did not impact closure decisions as discussed in Section B.1.4 of Appendix B.

A.7.2.4.1 Site Characterization Sample Analyses

The following sections discuss the results for soil samples in comparison to the levels established in the CAIP.

A.7.2.4.2 Total Volatile Organic Compounds

Of the 128 samples analyzed for total VOCs, 44 exceeded the MRLs, but none exceeded the PALs identified in the CAIP. The analytical results are shown in Table A.7-5.

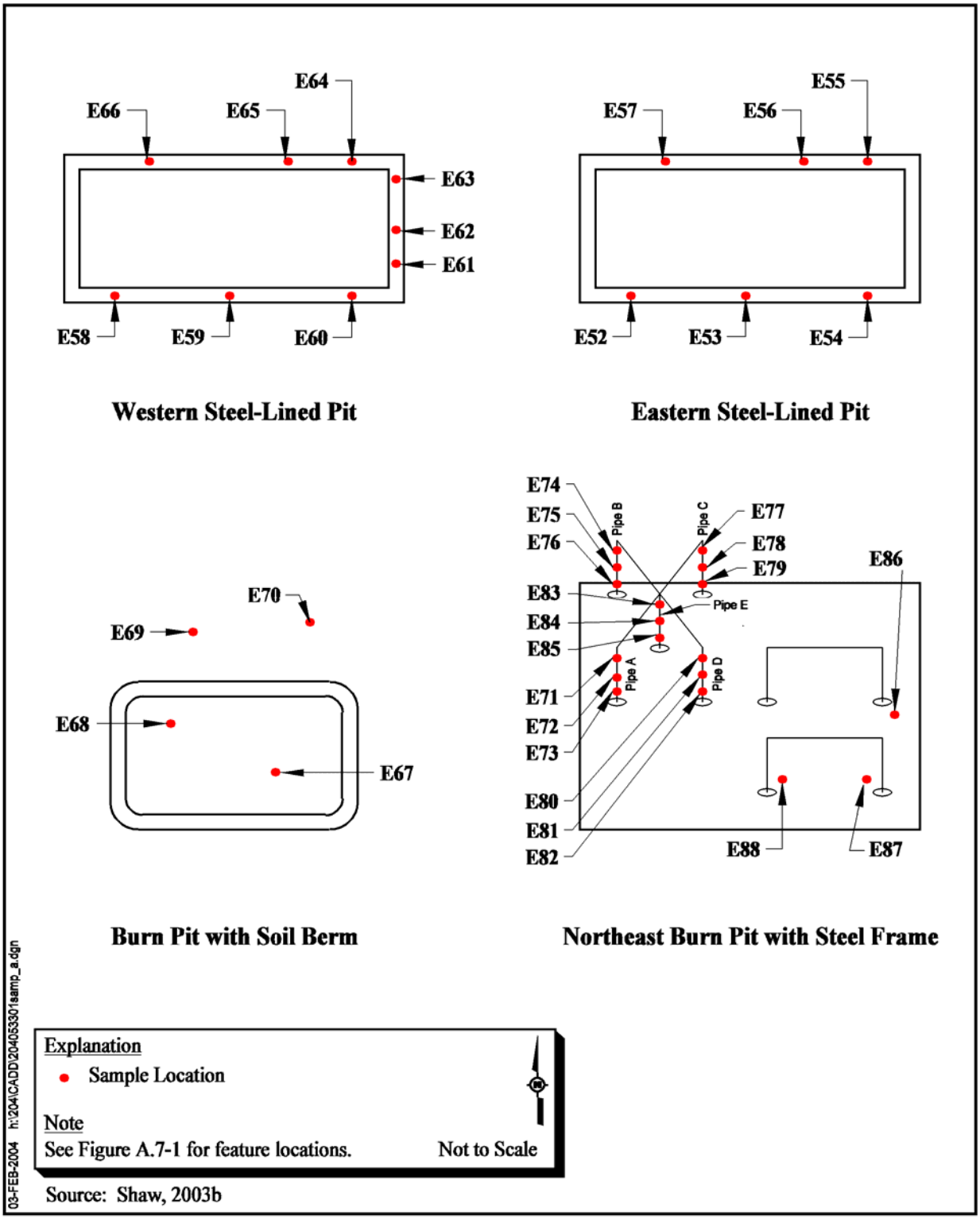

Figure A.7-4
CAS 05-33-01, Asbestos Sampling Locations

Table A.7-3
Waste Characterization Results for Asbestos Sampled at CAS 05-33-01
(Page 1 of 2)

Sample Identification Number	Sample Location	Contaminant of Potential Concern				
		Chrysolite % Asbestos	Amosite % Asbestos	Crocidolite % Asbestos	Actinolite/tremolite % Asbestos	Anthophyllite % Asbestos
204E083	E52	3-<5	5-<10	ND	ND	ND
204E084	E53	3-<5	5-<10	ND	ND	ND
204E085	E54	3-<5	5-<10	ND	ND	ND
204E086	E55	1-<3	5-<10	ND	ND	ND
204E087	E56	3-<5	5-<10	ND	ND	ND
204E088	E57	3-<5	5-<10	ND	ND	ND
204E089	E58	3-<5	5-<10	ND	ND	ND
204E090	E59	1-<3	5-<10	ND	ND	ND
204E091	E60	ND	10-<20	ND	ND	ND
204E092	E61	5-<10	10-<20	ND	ND	ND
204E093	E62	3 - <5	10-<20	ND	ND	ND
204E094	E63	3-<5	10<20	ND	ND	ND
204E095	E64	<1	10-<20	ND	ND	ND
204E096	E65	3-<5	10-<20	ND	ND	ND
204E097	E66	5-<10	10-<20	ND	ND	ND
204E098	E67	<1	ND	ND	ND	ND
204E099	E68	1-<3	ND	ND	ND	ND
204E100	E69	5-<10	ND	ND	ND	ND
204E101	E70	1-<3	ND	ND	ND	ND
204E102	E71	3-<5	ND	ND	ND	ND
204E103	E72	3-<5	ND	ND	ND	ND
204E104	E73	3-<5	ND	ND	ND	ND
204E105	E74	5-<10	ND	ND	ND	ND
204E106	E75	5-<10	ND	ND	ND	ND
204E107	E76	5-<10	ND	ND	ND	ND
204E108	E77	10-<20	ND	ND	ND	ND
204E109	E78	10-<20	ND	ND	ND	ND
204E110	E79	5-<10	ND	ND	ND	ND
204E111	E80	1-<3	ND	ND	ND	ND

Table A.7-3
Waste Characterization Results for Asbestos Sampled at CAS 05-33-01
(Page 2 of 2)

Sample Identification Number	Sample Location	Contaminant of Potential Concern				
		Chrysolite % Asbestos	Amosite % Asbestos	Crocidolite % Asbestos	Actinolite/tremolite % Asbestos	Anthophyllite % Asbestos
204E112	E81	1-<3	ND	ND	ND	ND
204E113	E82	1-<3	ND	ND	ND	ND
204E114	E83	3-<5	ND	ND	ND	ND
204E115	E84	1-<3	ND	ND	ND	ND
204E116	E85	3-<5	ND	ND	ND	ND
204E117	E86	3-<5	ND	ND	ND	ND
204E118	E87	3-<5	ND	ND	ND	ND
204E119	E88	1-<3	ND	ND	ND	ND

ND = Nondetect

Table A.7-4
Soil Sample Results for TCLP Metals
Detected Above Minimum Reporting Limits at CAS 05-33-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/L)	
			Cadmium	Lead
Regulatory Limits[a]			**1.0**	**5.0**
204E034	E21	0.0 - 0.5	0.79	49
204E036	E23	0.0 - 0.5	--	0.34 (J)
204E037	E24	0.0 - 0.5	--	0.77 (J)
204E040	E27	0.0 - 0.5	--	1.8 (J)

[a] 40 CFR 261.24 (CFR, 2003b)

ft bgs = Feet below ground surface
mg/L = Milligrams per liter
J = Estimated value. Qualifier added to laboratory data; record accepted. Duplicate precision analysis relative percent difference (RPD) outside control limits.
-- = Not detected above minimum reporting limits

A.7.2.4.3 Total Semivolatile Organic Compounds

Of the samples analyzed for total SVOCs, four exceeded the MRLs, but none exceeded the PALs identified in the CAIP. The analytical results are shown in Table A.7-6.

Table A.7-5
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 1 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)								
			2-Butanone	4-Methyl-2-Pentanone	Acetone	Ethylbenzene	Methylene Chloride	M+P-Xylene	Naphthalene	O-Xylene	Styrene
Preliminary Action Levels[a]			**NI**	**NI**	**6,000,000**	**20,000**	**21,000**	**420,000**	**190,000**	**420,000**	**1,700,000**
204E001	E01	0.0 - 0.5	--	--	--	--	--	8	--	--	--
204E002	E02	0.0 - 0.5	--	--	--	8.7	--	39	--	12	--
204E005	E05	0.0 - 0.5	--	--	--	11	--	62	--	20	--
204E008	E07	0.0 - 0.5	--	--	--	--	--	14	--	--	--
204E009		0.0 - 0.5	--	--	--	--	--	20	--	6.1	--
204E011	E08	0.0 - 0.5	--	--	--	--	--	7.1	--	--	--
204E013	E09	0.0 - 0.5	--	--	65 (J)[b]	240	170 (B)	670	--	260	--
204E014	E10	0.0 - 0.5	--	--	--	27	--	110	--	39	--
204E015	E11	0.0 - 0.5	--	--	--	7.7	--	28	--	9.6	--
204E016	E12	0.0 - 0.5	--	--	--	7.3	--	27	--	9.6	--
204E018	E14	0.0 - 0.5	--	--	--	--	--	18	--	6.4	--
204E019	E15	0.0 - 0.5	--	--	--	17	--	64	--	25	--
204E020	E16	9.0 - 10.0	--	--	--	--	5.3	--	--	--	--
204E022		14.0 - 15.0	--	--	--	--	5.1	--	--	--	--
204E025	E17	14.0 - 15.0	--	--	--	--	9.7	--	--	--	--
204E026	E18	9.0 - 10.0	--	--	--	--	11	--	--	--	--
204E027		11.0 - 12.0	--	--	--	--	13	--	--	--	--

Table A.7-5
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 2 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)								
			2-Butanone	4-Methyl-2-Pentanone	Acetone	Ethylbenzene	Methylene Chloride	M+P-Xylene	Naphthalene	O-Xylene	Styrene
Preliminary Action Levels[a]			**NI**	**NI**	**6,000,000**	**20,000**	**21,000**	**420,000**	**190,000**	**420,000**	**1,700,000**
204E029	E19	9.0 - 10.0	--	--	--	--	5.3	--	--	--	--
204E031		14.0 - 15.0	--	--	--	--	7.6	--	--	--	--
204E032		14.0 - 15.0	--	--	--	--	8.3	--	--	--	--
204E034	E21	0.0 - 0.5	--	--	25 (J)[b]	16	11	64	--	25	--
204E035	E22	0.0 - 0.5	--	--	--	--	9	--	--	--	--
204E036	E23	0.0 - 0.5	--	--	--	--	5.5	--	--	--	--
204E037	E24	0.0 - 0.5	--	--	--	--	9.5	--	--	--	--
204E038	E25	0.0 - 0.5	--	--	--	--	15	7.4	--	--	--
204E039	E26	0.0 - 0.5	--	--	21 (J)[b]	13	27	43	--	16	--
204E040	E27	0.0 - 0.5	--	--	--	5.3	8.5	17	--	6.5	--
204E041	E28	0.0 - 0.5	--	--	33 (J)[b]	6.7	26	23	--	8.5	--
204E042	E29	0.0 - 0.5	--	--	--	6	18	20	--	7.1	--
204E043	E30	0.0 - 0.5	--	--	--	--	16	--	--	--	--
204E046	E31	0.0 - 0.5	--	--	--	--	5.8	--	--	--	--
204E048	E32	0.0 - 0.5	--	--	--	--	7.6	--	--	--	--
204E049	E33	0.0 - 0.5	--	--	--	--	--	9	--	--	--
204E050	E34	0.0 - 0.5	--	--	--	--	12	--	--	--	--

Table A.7-5
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 3 of 3)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)								
			2-Butanone	4-Methyl-2-Pentanone	Acetone	Ethylbenzene	Methylene Chloride	M+P-Xylene	Naphthalene	O-Xylene	Styrene
Preliminary Action Levels[a]			**NI**	**NI**	**6,000,000**	**20,000**	**21,000**	**420,000**	**190,000**	**420,000**	**1,700,000**
204E056	E36	11.0 - 12.0	--	--	--	--	14 (B)	--	--	--	--
204E058		19.0 - 20.0	--	--	--	--	13 (B)	--	--	--	--
204E059		24.0 - 25.0	--	--	--	--	20 (B)	--	--	--	--
204E065	E38	9.0 - 10.0	--	--	--	--	6.6	--	--	--	--
204E066		11.0 - 12.0	--	--	--	--	6.4	--	--	--	--
204E067		14.0 - 15.0	--	--	--	--	7.2	--	--	--	--
204E068	E39	9.0 - 10.0	--	--	--	--	5.9	--	--	--	--
204E069		11.0 - 12.0	--	--	--	--	6.7	--	--	--	--
204E070		14.0 - 15.0	--	--	--	--	6.9	--	--	--	--
204E076	E45	0.0 - 0.5	33 (J)[c]	30 (J)[c]	140 (J)[d]	--	28 (B)	5.1	34 (J)[c]	--	--
204E077	E46	0.0 - 0.5	26 (J)[c]	--	110 (J)[b]	--	--	--	--	--	8.3
204E082	E51	0.0 - 0.5	--	--	--	--	25 (B)	--	21	--	--

[a]Based on EPA, *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)
[b]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[c]Qualifier added to laboratory data; record accepted. Calibration verification did not meet criteria or was not performed.
[d]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Calibration verification did not meet criteria or was not performed.

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
-- = Not detected above minimum reporting limits
B = Analyte found in both sample and associated blank.
J = Estimated value
NI = Not identified

Table A.7-6
Soil Sample Results for Total SVOCs
Detected Above Minimum Reporting Limits at CAS 05-33-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)			
			Bis(2-Ethylhexyl)Phthalate	Dibenzofuran	Phenanthrene	Pyrene
Preliminary Action Levels[a]			**120,000**	**3,100,000**	**NI**	**29,000,000**
204E036	E23	0.0 - 0.5	--	--	--	680
204E052	E35	13.0 - 14.0	690	--	--	--
204E076	E45	0.0 - 0.5	440	430	520	--
204E077	E46	0.0 - 0.5	--	420	--	--

[a]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above minimum reporting limits

A.7.2.4.4 Total Petroleum Hydrocarbons

Of the samples analyzed for TPH, four exceeded the MRLs, but none exceeded the PALs identified in the CAIP. The analytical results are shown in Table A.7-7.

A.7.2.4.5 Polychlorinated Biphenyls

Of the samples analyzed for PCBs, three exceeded the MRLs, but none exceeded the PALs identified in the CAIP. The analytical results are shown in Table A.7-8.

A.7.2.4.6 Total Metals

Total metal analytical results exceeding the MRLs are reported in Table A.7-9. The only metal determined to exceed PALs was lead. The extent of the contamination was determined to be in the

Table A.7-7
Soil Sample Results for TPH (DRO and GRO)
Detected Above Minimum Reporting Limits at CAS 05-33-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Levels[a]			**100**	**100**
204E013	E09	0.0 - 0.5	--	1.6 (Z)
204E015	E11	0.0 - 0.5	--	0.92 (Z)
204E034	E21	0.0 - 0.5	--	0.62 (Z)
204E076	E45	0.0 - 0.5	48 (H)	--

[a]Based on NAC 445A, "Water Controls" (NAC, 2003)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum reporting limits
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest.
Z = A significant fraction of the reported result did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.

Table A.7-8
Soil Sample Results for PCBs Detected
Above Minimum Reporting Limits at CAS 05-33-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			Aroclor 1254	Aroclor 1260
Preliminary Action Levels[a]			**740**	**740**
204E035	E22	0.0 - 0.5	--	34
204E036	E23	0.0 - 0.5	80	--
204E076	E45	0.0 - 0.5	460	--
204E077	E46	0.0 - 0.5	--	46

[a]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
-- = Not detected above minimum reporting limits

Table A.7-9
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 1 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Preliminary Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	450[b]	750[b]	310[b]	5,100[b]	5,100[b]
204E001	E01	0.0 - 0.5	4.3	140	0.59	--	6.9	17	--	--	--
204E002	E02	0.0 - 0.5	4.7	150	0.59	--	6.6	14	--	--	--
204E003	E03	0.0 - 0.5	4.2	130	0.54	--	6.3	10	--	--	--
204E004	E04	0.0 - 0.5	3.7	130	--	--	5.2	9.4	--	--	--
204E005	E05	0.0 - 0.5	3.8	120	--	--	5.5	23	--	--	--
204E006	E06	0.0 - 0.5	4.1	130	--	--	6.6	11 (J)[c]	--	--	--
204E007		1.0 - 2.0	4.1	130	--	--	5.4	6.6 (J)[c]	--	0.58	--
204E008	E07	0.0 - 0.5	4.6	160	0.66 (J)[d]	--	8.6	39 (J)[c]	--	0.7	--
204E009		0.0 - 0.5	4.2	160	0.67 (J)[d]	--	9	50 (J)[c]	--	0.56	--
204E010		3.0 - 4.0	4.8	120	0.56 (J)[d]	--	6.4	8.1 (J)[c]	--	--	--
204E011	E08	0.0 - 0.5	3.9	150	0.51 (J)[d]	--	6.6	13 (J)[c]	--	--	--
204E012		3.0 - 4.0	5	120	--	--	6.5	7.8 (J)[c]	--	--	--
204E013	E09	0.0 - 0.5	3.8	140	--	--	5	21	--	--	--
204E014	E10	0.0 - 0.5	4.4	150	0.53	--	4.9	17	--	--	--
204E015	E11	0.0 - 0.5	4.3	150	0.58	--	5.3	13	--	--	--
204E016	E12	0.0 - 0.5	3.7	120	--	--	5.3	19	--	--	--
204E017	E13	0.0 - 0.5	3.7	120	--	--	4.9	14	--	--	--
204E018	E14	0.0 - 0.5	3.6	120	0.53	--	5.8	12	--	--	--
204E019	E15	0.0 - 0.5	4.1	130	--	--	5.2	11	--	--	--
204E020	E16	9.0 - 10.0	4.1	130	--	--	6.9	6.6	--	--	--
204E021		11.0 - 12.0	3.7	150	--	--	5.2	6	--	--	--
204E022		14.0 - 15.0	4.2	150	--	--	5.5	6.8	--	--	--

Table A.7-9
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 2 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Preliminary Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
204E023	E17	9.0 - 10.0	4.2	150	--	--	6.3	6.2	--	--	--
204E024		11.0 - 12.0	3.7	140	--	--	5	6.8	--	--	--
204E025		14.0 - 15.0	3.9	160	--	--	5.3	6.5	--	0.58	--
204E026	E18	9.0 - 10.0	4	150	--	--	5.1	6.8	0.1 (J)[e]	0.92	--
204E027		11.0 - 12.0	3.9	160	--	--	4.7	6.7	--	--	--
204E028		14.0 - 15.0	4.7	140	--	--	5.1	5.8	--	--	--
204E029	E19	9.0 - 10.0	4.4	170	0.54	--	8.5	7.1	--	--	--
204E030		11.0 - 12.0	4.2	150	--	--	5.5	6.8	--	--	--
204E031		14.0 - 15.0	3.5	160	--	--	5.2	10	--	--	--
204E032		14.0 - 15.0	3.8	160	--	--	5	6.3	--	0.63	--
204E033	E20	0.0 - 0.5	3.1	140	--	1.4	5.1	16	--	--	--
204E034	E21	0.0 - 0.5	4.1	120	--	50	12	**2,300**	--	--	1.5
204E035	E22	0.0 - 0.5	3.5	140	--	--	4.3	10	--	--	--
204E036	E23	0.0 - 0.5	2.9	210	2.8 (J)[f]	170	84	**1,300**	290 (J)[d]	--	150
204E037	E24	0.0 - 0.5	3.9	170	0.99 (J)[f]	60	43	**1,200**	--	--	15
204E038	E25	0.0 - 0.5	5.3	180	0.82 (J)[f]	--	9.2	25	--	--	--
204E039	E26	0.0 - 0.5	5.1	150	0.65 (J)[f]	--	6.6	12	--	0.53	--
204E040	E27	0.0 - 0.5	3.9	150	4.8 (J)[f]	--	6.3	480	--	--	--
204E041	E28	0.0 - 0.5	5.1	170	1.2 (J)[f]	--	9	42	--	--	--
204E042	E29	0.0 - 0.5	3.8	150	170 (J)[f]	--	6.2	33	--	--	--

Table A.7-9
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 3 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Preliminary Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
204E043	E30	0.0 - 0.5	3.9	130	0.63 (J)[f]	--	6.1	12	--	--	--
204E044		1.0 - 2.0	3.3	130	--	--	5.5	10	--	--	--
204E045		1.0 - 2.0	4.1	130	--	--	5.6	8.4	--	--	--
204E046	E31	0.0 - 0.5	3.6	130	--	--	5.8	8.1	--	--	--
204E047		1.0 - 20.0	3.9	120	--	--	5.3	7	--	--	--
204E048	E32	0.0 - 0.5	3.7	130	--	--	5.7	10	--	--	--
204E049	E33	0.0 - 0.5	3.7	120	1.6 (J)[f]	--	5.8	79	--	--	--
204E050	E34	0.0 - 0.5	4	150	0.62 (J)[f]	--	6.2	12	--	--	--
204E051	E35	11.0 - 12.0	3.6	170	--	--	5.9 (J)[g]	5.9	--	--	--
204E052		13.0 - 14.0	4.5	150	--	--	4.2 (J)[g]	6.8	--	0.61	--
204E053		16.0 - 17.0	3.7	130	--	--	9.2 (J)[g]	5.8	--	--	--
204E054		19.0 - 20.0	3.5	130	--	--	4 (J)[g]	6	--	--	--
204E055	E36	9.0 - 10.0	3.3	160	--	--	3.4 (J)[g]	5.9	--	--	--
204E056		11.0 - 12.0	3.8	120	--	--	4.5 (J)[g]	6.3	--	--	--
204E057		14.0 - 15.0	3.8	130	--	--	4.1 (J)[g]	5.8	--	--	--
204E058		19.0 - 20.0	3.5	150	--	--	4.4 (J)[g]	6.4	--	--	--
204E059		24.0 - 25.0	4.2	220	--	--	4.8 (J)[g]	11	--	--	--
204E060		29.0 - 30.0	3.2	160	--	--	7.5 (J)[g]	5.9	--	--	--
204E061	E37	19.0 - 20.0	3.5	130	--	--	7.1 (J)[g]	6	--	--	3.6
204E062		24.0 - 25.0	4.5	110	--	--	3.7 (J)[g]	6.3	--	--	--
204E063		24.0 - 25.0	3.8	130	--	--	3.8 (J)[g]	6.5	--	--	--
204E064		29.0 - 30.0	3.2	100	--	--	8 (J)[g]	5.4	--	--	--

Table A.7-9
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 4 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Preliminary Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
204E065	E38	9.0 - 10.0	5.1	160	0.58 (J)[f]	--	5.3	6.8	--	0.6 (J)[e]	2 (J)[d]
204E066		11.0 - 12.0	3.6	160	--	--	4.6	7	--	--	8.4 (J)[d]
204E067		14.0 - 15.0	4.5	150	--	--	4.6	6.8	--	--	--
204E068	E39	9.0 - 10.0	4.5	150	--	--	3.7	5.5	--	--	86 (J)[d]
204E069		11.0 - 12.0	3.7	160	--	--	5.1	6.4	--	0.68	--
204E070		14.0 - 15.0	4.4	150	--	--	9.2	5.8	--	--	--
204E071	E40	0.0 - 0.5	4.8	180	2.4	--	8.7	520 (J)[h]	--	--	--
204E072	E41	0.0 - 0.5	4.8	170	1.5	--	11	160 (J)[h]	--	--	--
204E073	E42	0.0 - 0.5	4.2	160	0.94	--	7.7	97 (J)[h]	--	--	--
204E074	E43	0.0 - 0.5	9.4	160	5.4	--	7.5	36 (J)[h]	--	--	--
204E075	E44	1.0 - 2.0	4.1	100	0.97	--	23	5.8	--	--	--
204E076	E45	0.0 - 0.5	6.9	220	1.7	--	13	90 (J)[h]	--	--	--
204E077	E46	0.0 - 0.5	7	200	1.4	--	13	28 (J)[h]	--	--	--
204E078	E47	0.0 - 0.5	6.3	210	1.2	--	21	87 (J)[h]	--	--	--
204E079	E48	0.0 - 0.5	6.4	230	1.5	--	13	36 (J)[h]	--	0.67	--
204E080	E49	0.0 - 0.5	4.5	190	1.6	--	7.6	39 (J)[h]	--	--	--
204E081	E50	0.0 - 0.5	3.2	140	--	--	4	11	--	--	--
204E082	E51	0.0 - 0.5	3.9	110	--	--	5.1	7.6	--	--	--
204E157	E100	0.0 - 0.5	--	--	--	--	--	14	--	--	--
204E165	E98	0.0 - 0.5	--	--	--	--	--	47	--	--	--
204E166	E99	0.0 - 0.5	--	--	--	--	--	14	--	--	--

Table A.7-9
Soil Sample Results for Metals Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 5 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Preliminary Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**750[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
204E171	E100	1.0 - 2.0	--	--	--	--	--	7.5	--	--	--
204E172		3.0 - 4.0	--	--	--	--	--	9.7	--	--	--
204E173	E99	1.0 - 20.0	--	--	--	--	--	9.5	--	--	--
204E174		3.0 - 4.0	--	--	--	--	--	7.6	--	--	--
204E175	E21	1.0 - 2.0	--	--	--	--	--	6.8	--	--	--
204E176		1.0 - 2.0	--	--	--	--	--	6.9	--	--	--
204E177		3.0 - 4.0	--	--	--	--	--	8.4	--	--	--
204E178	E98	1.0 - 2.0	--	--	--	--	--	7	--	--	--
204E179		3.0 - 4.0	--	--	--	--	--	6.8	--	--	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)
[c]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits. Serial dilution %D outside control limits. Matrix effects may exist.
[d]Qualifier added to laboratory data; record accepted. Matrix spike recovery outside control limits.
[e]Qualifier added to laboratory data; record accepted. Negative bias found in continuing calibration/method blank.
[f]Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Matrix effects may exist.
[g]Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Duplicate precision analysis (relative percent different) outside control limits. Matrix effects may exist.
[h]Qualifier added to laboratory data; record accepted. Matrix spike recovery grossly outside control limits. Duplicate precision analysis (relative percent different) outside control limits.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above minimum reporting limits

two steel-lined pits located in the northern end of CAS 05-33-01(E23 and E24) and in a single burn pit located in the western central area of CAS 05-33-01 (Sample Location E21).

A.7.2.4.7 Gamma Spectroscopy

Of the total samples collected from the Kay Blockhouse and the surrounding area and analyzed for gamma-emitting radionuclides, 125 samples were reported with concentrations that exceeded the MRLs. After analysis of the results, 3 of the 125 samples were reported to have thorium-234 readings in excess of PALs, and one sample (Sample Location E23) was reported to have readings that exceeded the PALs for actinium-228, bismuth-212 and lead-212. The analytical results are shown in Table A.7-10.

A.7.2.4.8 Isotopic Uranium

Of the soil samples collected from the Kay Blockhouse and the surrounding area and analyzed for isotopic uranium (i.e., U-234, U-235, U-238), 126 samples came back with readings above MRLs for U-234, 84 sample came back with readings above MRLs for U-235, and 126 samples came back with readings above MRLs for U-238. After analysis of the results, which involves taking background baselines and margins of error into account, no samples were reported to have U-234 readings in concentrations greater than PALs no samples were reported to have U-235 readings that exceeded the PALs and 5 samples were reported to have U-238 readings that exceeded the PALs. The analytical results are shown in Table A.7-11.

A.7.2.4.9 Isotopic Plutonium

Of the soil samples collected from the Kay Blockhouse and the surrounding area and analyzed for isotopic plutonium (Pu-239), 12 samples came back with readings above MRLs. Of the 12 samples, no samples are reported to have Pu-239 readings that exceeded the PALs. The analytical results are shown in Table A.7-11.

A.7.2.4.10 Strontium-90

Strontium-90 analytical results for soil samples did not exceed the MRLs or PALs identified in the CAIP.

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 1 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E001	E01	0.0 - 0.5	1.29 ± 0.44	NA	--	NA	0.75 ± 0.31	NA	--	0.87 ± 0.31 (TI)	1.71 ± 0.40	NA	1.16 ± 0.30	NA	0.46 ± 0.18	NA	--	--
204E002	E02	0.0 - 0.5	--	NA	--	NA	1.14 ± 0.46	NA	--	1.07 ± 0.44 (TI)	1.25 ± 0.38	NA	0.98 ± 0.33	NA	--	NA	--	--
204E003	E03	0.0 - 0.5	1.23 ± 0.48	NA	--	NA	0.91 ± 0.33	NA	--	--	1.64 ± 0.39	NA	0.97 ± 0.29	NA	0.48 ± 0.18	NA	--	--
204E004	E04	0.0 - 0.5	1.59 ± 0.46	NA	--	NA	1.08 ± 0.35	NA	--	--	1.37 ± 0.32	NA	1 ± 0.27	NA	0.44 ± 0.16	NA	--	--
204E005	E05	0.0 - 0.5	1.85 ± 0.57	NA	--	NA	0.89 ± 0.35	NA	--	0.88 ± 0.32 (TI)	1.83 ± 0.42	NA	0.96 ± 0.29	NA	0.55 ± 0.19	NA	6.3 ± 1.6	--
204E006	E06	0.0 - 0.5	1.75 ± 0.52	NA	--	NA	0.85 ± 0.32	NA	--	0.79 ± 0.27 (TI)	1.54 ± 0.37	NA	0.9 ± 0.26	NA	0.54 ± 0.19	NA	--	--
204E007		1.0 - 2.0	NA	1.63 ± 0.46	NA	--	NA	0.88 ± 0.30	--	--	NA	1.91 ± 0.40	NA	1.11 ± 0.28	NA	0.6 ± 0.19	5.3 ± 2.1 (TI)	--
204E008	E07	0.0 - 0.5	1.49 ± 0.19	NA	--	NA	0.91 ± 0.34	NA	0.45 ± 0.18	--	1.48 ± 0.37	NA	1.04 ± 0.29	NA	--	NA	0.54 ± 0.20	--
204E009		0.0 - 0.5	2.01 ± 0.69	NA	--	NA	0.95 ± 0.40	NA	--	--	1.68 ± 0.42	NA	0.93 ± 0.30	NA	0.51 ± 0.21	NA	--	--
204E010		3.0 - 4.0	NA	2.16 ± 0.95	NA	--	NA	--	--	--	NA	1.73 ± 0.43	NA	0.95 ± 0.33	NA	0.7 ± 0.25	--	--
204E011	E08	0.0 - 0.5	1.72 ± 0.52	NA	--	NA	0.72 ± 0.31	NA	--	--	1.52 ± 0.36	NA	0.85 ± 0.27	NA	0.45 ± 0.18	NA	--	--
204E012		3.0 - 4.0	NA	1.67 ± 0.50	NA	--	NA	1.02 ± 0.35	--	--	NA	1.87 ± 0.40	NA	1.1 ± 0.28	NA	0.55 ± 0.19	--	--
204E013	E09	0.0 - 0.5	--	NA	--	NA	--	NA	--	--	1.35 ± 0.40	NA	0.96 ± 0.34	NA	--	NA	--	--
204E014	E10	0.0 - 0.5	--	NA	--	NA	1.08 ± 0.36	NA	0.48 ± 0.20	--	1.5 ± 0.37	NA	0.83 ± 0.26	NA	0.63 ± 0.20	NA	--	--
204E015	E11	0.0 - 0.5	--	NA	--	NA	1.03 ± 0.43	NA	--	--	1.45 ± 0.39	NA	0.97 ± 0.32	NA	--	NA	--	--
204E016	E12	0.0 - 0.5	--	NA	--	NA	--	NA	--	--	1.85 ± 0.45	NA	0.85 ± 0.30	NA	0.5 ± 0.21	NA	--	--
204E017	E13	0.0 - 0.5	1.92 ± 0.52	NA	--	NA	0.88 ± 0.31	NA	--	0.96 ± 0.36 (TI)	1.82 ± 0.41	NA	1.19 ± 0.31	NA	0.49 ± 0.17	NA	--	--
204E018	E14	0.0 - 0.5	1.29 ± 0.44	NA	--	NA	0.91 ± 0.33	NA	--	1.23 ± 0.35 (TI)	1.53 ± 0.36	NA	1.05 ± 0.29	NA	0.47 ± 0.17	NA	11.8 ± 2	--
204E019	E15	0.0 - 0.5	1.88 ± 0.66	NA	--	NA	1.33 ± 0.47	NA	--	1.24 ± 0.46 (TI)	1.33 ± 0.36	NA	1.1 ± 0.31	NA	--	NA	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 2 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E020	E16	9.0 - 10.0	NA	2.29 ± 0.70	NA	--	NA	--	--	--	NA	2.16 ± 0.47	NA	1.08 ± 0.30	NA	0.69 ± 0.23	--	--
204E021		11.0 - 12.0	NA	--	NA	--	NA	1.09 ± 0.48	--	--	NA	1.61 ± 0.44	NA	1.17 ± 0.38	NA	--	--	--
204E022		14.0 - 15.0	NA	1.49 ± 0.39	NA	--	NA	0.59 ± 0.24	--	--	NA	1.52 ± 0.30	NA	0.8 ± 0.20	NA	0.47 ± 0.13	--	--
204E023	E17	9.0 - 10.0	NA	1.73 ± 0.48	NA	--	NA	0.87 ± 0.33	--	--	NA	1.99 ± 0.42	NA	1.24 ± 0.31	NA	0.66 ± 0.19	--	--
204E024		11.0 - 12.0	NA	2.07 ± 0.62	NA	--	NA	0.82 ± 0.34	--	--	NA	1.79 ± 0.43	NA	1.11 ± 0.31	NA	0.46 ± 0.19	--	--
204E025		14.0 - 15.0	NA	1.58 ± 0.65	NA	--	NA	--	--	--	NA	2.26 ± 0.51	NA	0.85 ± 0.34	NA	0.58 ± 0.22	--	--
204E026	E18	9.0 - 10.0	NA	2.01 ± 0.61	NA	--	NA	1.02 ± 0.34	--	--	NA	1.94 ± 0.42	NA	0.93 ± 0.27	NA	0.52 ± 0.18	--	--
204E027		11.0 - 12.0	NA	2.05 ± 0.63	NA	--	NA	0.92 ± 0.35	--	--	NA	1.54 ± 0.39	NA	1.02 ± 0.30	NA	0.6 ± 0.22	--	--
204E028		14.0 - 15.0	NA	1.42 ± 0.45	NA	--	NA	0.69 ± 0.29	--	--	NA	1.42 ± 0.35	NA	1.03 ± 0.28	NA	0.57 ± 0.18	--	--
204E029	E19	9.0 - 10.0	NA	1.91 ± 0.68	NA	--	NA	1.32 ± 0.45	--	--	NA	1.39 ± 0.39	NA	1.11 ± 0.32	NA	--	--	--
204E030		11.0 - 12.0	NA	1.93 ± 0.60	NA	--	NA	--	--	--	NA	1.5 ± 0.40	NA	1.09 ± 0.32	NA	0.51 ± 0.21	--	--
204E031		14.0 - 15.0	NA	1.32 ± 0.41	NA	--	NA	--	--	--	NA	1.67 ± 0.35	NA	0.88 ± 0.23	NA	0.47 ± 0.15	--	--
204E032		14.0 - 15.0	NA	1.78 ± 0.52	NA	--	NA	1.01 ± 0.36	--	--	NA	1.8 ± 0.40	NA	1.1 ± 0.29	NA	0.65 ± 0.21	--	--
204E033	E20	0.0 - 0.5	1.6 ± 0.66 (TI)	NA	--	NA	--	NA	--	--	1.3 ± 0.37	NA	0.86 ± 0.29	NA	0.52 ± 0.22	NA	--	--
204E034	E21	0.0 - 0.5	--	NA	--	NA	--	NA	--	--	1.46 ± 0.36	NA	1.06 ± 0.32	NA	--	NA	5.3 ± 1.4	--
204E035	E22	0.0 - 0.5	1.37 ± 0.49	NA	--	NA	--	NA	--	0.88 ± 0.37 (TI)	1.41 ± 0.40	NA	0.95 ± 0.30	NA	--	NA	--	--
204E036	E23	0.0 - 0.5	**29.1 ± 5.2**	NA	**27.1 ± 8.2**	NA	2.62 ± 0.99	NA	--	--	31.1 ± 5.3	NA	3.33 ± 0.89	NA	8.3 ± 1.6	NA	17.7 ± 4.5 (J)[c]	--
204E037	E24	0.0 - 0.5	--	NA	--	NA	--	NA	--	--	1.22 ± 0.53	NA	--	NA	--	NA	--	--
204E038	E25	0.0 - 0.5	1.97 ± 0.64	NA	--	NA	1.64 ± 0.49	NA	0.63 ± 0.23	--	1.7 ± 0.42	NA	1.18 ± 0.34	NA	0.54 ± 0.22	NA	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 3 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E039	E26	0.0 - 0.5	4.9 ± 1.2	NA	--	NA	--	NA	--	--	4.6 ± 0.89	NA	1.16 ± 0.42	NA	1.4 ± 0.37	NA	--	--
204E040	E27	0.0 - 0.5	--	NA	--	NA	--	NA	--	--	0.88 ± 0.22	NA	0.57 ± 0.18	NA	0.26 ± 0.11	NA	54.2 ± 9.3 (J)[c]	--
204E041	E28	0.0 - 0.5	--	NA	--	NA	--	NA	0.48 ± 0.21	--	1.35 ± 0.38	NA	1.12 ± 0.33	NA	0.55 ± 0.23	NA	4.6 ± 1.4 (J)[c]	--
204E042	E29	0.0 - 0.5	1.43 ± 0.50	NA	--	NA	1.25 ± 0.45	NA	--	--	1.53 ± 0.41	NA	1.13 ± 0.34	NA	0.45 ± 0.19	NA	--	--
204E043	E30	0.0 - 0.5	1.44 ± 0.39	NA	--	NA	0.99 ± 0.31	NA	--	0.7 ± 0.25 (TI)	1.28 ± 0.28	NA	0.89 ± 0.22	NA	0.51 ± 0.15	NA	5.3 ± 1.7 (J)[c]	--
204E044		1.0 - 2.0	NA	1.69 ± 0.55	NA	--	NA	0.84 ± 0.32	--	--	NA	1.43 ± 0.35	NA	1.08 ± 0.29	NA	0.52 ± 0.17	--	--
204E045		1.0 - 2.0	NA	1.59 ± 0.56	NA	--	NA	--	--	--	NA	1.69 ± 0.40	NA	0.96 ± 0.29	NA	0.56 ± 0.21	3.9 ± 1.2 (J)[c]	--
204E046	E31	0.0 - 0.5	1.94 ± 0.71	NA	--	NA	--	NA	--	--	1.39 ± 0.38	NA	0.89 ± 0.33	NA	0.61 ± 0.22	NA	--	--
204E047		1.0 - 20.0	NA	1.61 ± 0.43	NA	--	NA	0.75 ± 0.27	--	--	NA	1.71 ± 0.34	NA	0.87 ± 0.22	NA	0.52 ± 0.14	--	--
204E048	E32	0.0 - 0.5	2.32 ± 0.63	NA	--	NA	1.27 ± 0.42	NA	--	1.09 ± 0.35	2.15 ± 0.46	NA	1.12 ± 0.30	NA	0.7 ± 0.20	NA	--	--
204E049	E33	0.0 - 0.5	NA	--	NA	--	NA	1.08 ± 0.36	--	1.23 ± 0.35	NA	1.78 ± 0.39	NA	1.07 ± 0.29	NA	0.69 ± 0.21	9.3 ± 2.4 (J)[c]	--
204E050	E34	0.0 - 0.5	1.42 ± 0.53	NA	--	NA	0.89 ± 0.35	NA	--	1.64 ± 0.48 (TI)	1.64 ± 0.41	NA	1.17 ± 0.34	NA	--	NA	62 ± 11 (J)[c]	--
204E051	E35	11.0 - 12.0	NA	1.62 ± 0.34	NA	--	NA	0.9 ± 0.20	--	--	NA	1.76 ± 0.32	NA	1 ± 0.20	NA	0.56 ± 0.12	--	--
204E052		13.0 - 14.0	NA	1.79 ± 0.42	NA	2.4 ± 1.1	NA	0.69 ± 0.21	--	--	NA	1.87 ± 0.36	NA	0.85 ± 0.20	NA	0.64 ± 0.15	--	--
204E053		16.0 - 17.0	NA	1.86 ± 0.37	NA	--	NA	1.01 ± 0.22	--	--	NA	1.78 ± 0.32	NA	1.08 ± 0.21	NA	0.55 ± 0.12	--	--
204E054		19.0 - 20.0	NA	1.77 ± 0.36	NA	--	NA	0.9 ± 0.20	--	--	NA	1.72 ± 0.31	NA	0.9 ± 0.18	NA	0.52 ± 0.11	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 4 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E055	E36	9.0 - 10.0	NA	2.02 ± 0.40	NA	--	NA	0.85 ± 0.20	--	--	NA	1.93 ± 0.35	NA	1.04 ± 0.21	NA	0.64 ± 0.13	--	--
204E056		11.0 - 12.0	NA	1.67 ± 0.34	NA	2.12 ± 0.87	NA	0.84 ± 0.19	--	--	NA	1.73 ± 0.32	NA	1.05 ± 0.21	NA	0.5 ± 0.11	--	--
204E057		14.0 - 15.0	NA	1.49 ± 0.32	NA	--	NA	0.72 ± 0.18	--	--	NA	1.67 ± 0.31	NA	0.93 ± 0.19	NA	0.46 ± 0.10	--	--
204E058		19.0 - 20.0	NA	1.79 ± 0.41	NA	--	NA	0.99 ± 0.25	--	--	NA	1.79 ± 0.35	NA	0.96 ± 0.23	NA	0.63 ± 0.15	--	--
204E059		24.0 - 25.0	NA	1.6 ± 0.33	NA	2.33 ± 0.87	NA	1.07 ± 0.23	--	--	NA	1.71 ± 0.31	NA	0.97 ± 0.20	NA	0.54 ± 0.11	--	--
204E060		29.0 - 30.0	NA	1.68 ± 0.40	NA	--	NA	1.05 ± 0.26	--	--	NA	2.11 ± 0.41	NA	1.03 ± 0.24	NA	0.63 ± 0.15	--	--
204E061	E37	19.0 - 20.0	NA	1.72 ± 0.35	NA	--	NA	1 ± 0.22	--	--	NA	1.7 ± 0.31	NA	1.08 ± 0.21	NA	0.53 ± 0.11	--	--
204E062		24.0 - 25.0	NA	1.63 ± 0.39	NA	--	NA	1.17 ± 0.29	--	--	NA	1.71 ± 0.34	NA	1.11 ± 0.24	NA	0.63 ± 0.15	--	--
204E063		24.0 - 25.0	NA	1.97 ± 0.39	NA	--	NA	0.94 ± 0.21	--	--	NA	1.87 ± 0.34	NA	0.96 ± 0.19	NA	0.59 ± 0.12	2.8 ± 1.0 (TI)	--
204E064		29.0 - 30.0	NA	1.49 ± 0.30	NA	--	NA	0.9 ± 0.20	--	--	NA	1.84 ± 0.33	NA	1.03 ± 0.20	NA	0.6 ± 0.12	--	--
204E065	E38	9.0 - 10.0	NA	1.37 ± 0.47	NA	--	NA	1.04 ± 0.35	--	--	NA	1.58 ± 0.37	NA	0.71 ± 0.23	NA	0.54 ± 0.18	--	--
204E066		11.0 - 12.0	NA	1.5 ± 0.46	NA	--	NA	1.06 ± 0.39	--	--	NA	1.59 ± 0.36	NA	1.07 ± 0.27	NA	0.46 ± 0.16	--	--
204E067		14.0 - 15.0	NA	--	NA	--	NA	--	--	--	NA	1.79 ± 0.43	NA	1.12 ± 0.31	NA	0.57 ± 0.21	--	--
204E068	E39	9.0 - 10	NA	--	NA	--	NA	1.02 ± 0.39	--	--	NA	1.85 ± 0.42	NA	1.11 ± 0.35	NA	0.67 ± 0.22	--	--
204E069		11.0 - 12.0	NA	1.55 ± 0.54	NA	--	NA	0.73 ± 0.31	--	--	NA	1.64 ± 0.37	NA	1.2 ± 0.30	NA	0.51 ± 0.18	--	--
204E070		14.0 - 15.0	NA	1.45 ± 0.50	NA	--	NA	1.21 ± 0.41	--	--	NA	2.15 ± 0.46	NA	1.12 ± 0.31	NA	0.52 ± 0.20	--	--
204E076	E45	0.0 - 0.5	1.86 ± 0.52	NA	--	NA	0.85 ± 0.26	NA	0.59 ± 0.18	--	1.42 ± 0.32	NA	1.06 ± 0.26	NA	0.43 ± 0.15	NA	--	--
204E077	E46	0.0 - 0.5	1.66 ± 0.44	NA	--	NA	0.93 ± 0.27	NA	0.74 ± 0.20	--	1.82 ± 0.37	NA	0.98 ± 0.26	NA	0.43 ± 0.15	NA	4.4 ± 1.2	--
204E081	E50	0.0 - 0.5	1.25 ± 0.30	NA	--	NA	0.75 ± 0.20	NA	0.293 ± 0.088	0.87 ± 0.21	1.34 ± 0.26	NA	0.85 ± 0.19	NA	0.5 ± 0.12	NA	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 5 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E082	E51	0.0 - 0.5	1.69 ± 0.42	NA	--	NA	0.75 ± 0.23	NA	--	0.64 ± 0.21	1.61 ± 0.34	NA	0.97 ± 0.23	NA	0.45 ± 0.14	NA	--	--
204E120	E89	0.0 - 0.5	1.65 ± 0.41	NA	--	NA	0.85 ± 0.25	NA	--	0.96 ± 0.26	1.7 ± 0.35	NA	0.93 ± 0.22	NA	0.55 ± 0.15	NA	4.1 ± 1.1	--
204E121		1.0 2.0	NA	1.73 ± 0.40	NA	--	NA	0.91 ± 0.24	--	--	NA	1.75 ± 0.34	NA	0.95 ± 0.21	NA	0.56 ± 0.14	--	--
204E122		3.0 - 4.0	NA	1.95 ± 0.40	NA	--	NA	0.97 ± 0.22	--	--	NA	1.75 ± 0.32	NA	1.1 ± 0.22	NA	0.56 ± 0.12	--	--
204E123	E05	4.5 - 5.0	NA	1.56 ± 0.38	NA	--	NA	0.86 ± 0.23	--	--	NA	1.54 ± 0.32	NA	1.01 ± 0.22	NA	0.58 ± 0.14	21.4 ± 4.0	--
204E124		6.0 - 7.0	NA	1.61 ± 0.41	NA	--	NA	0.86 ± 0.26	--	--	NA	1.78 ± 0.36	NA	0.95 ± 0.24	NA	0.66 ± 0.17	--	--
204E125	E33	2.5 - 3.0	NA	1.61 ± 0.41	NA	--	NA	1.06 ± 0.29	--	--	NA	1.83 ± 0.37	NA	1.02 ± 0.24	NA	0.55 ± 0.15	--	--
204E126		3.0 - 4.0	NA	1.64 ± 0.38	NA	--	NA	1.11 ± 0.28	--	--	NA	1.99 ± 0.38	NA	0.94 ± 0.21	NA	0.62 ± 0.15	--	--
204E127	E90	0.0 - 0.5	1.72 ± 0.39	NA	--	NA	1.02 ± 0.26	NA	--	1.46 ± 0.31	1.99 ± 0.38	NA	1.19 ± 0.26	NA	0.49 ± 0.13	NA	--	--
204E128	E92	0.0 - 0.5	1.51 ± 0.33	NA	--	NA	0.91 ± 0.22	NA	--	1.21 ± 0.25	1.69 ± 0.31	NA	1.05 ± 0.22	NA	0.58 ± 0.13	NA	3.7 ± 1.1	--
204E129	E91	0.0 - 0.5	1.23 ± 0.37	NA	--	NA	1.1 ± 0.29	NA	--	1.05 ± 0.27	1.67 ± 0.34	NA	0.95 ± 0.23	NA	0.4 ± 0.14	NA	5.8 ± 1.7	--
204E130	E93	0.0 - 0.5	1.46 ± 0.36	NA	--	NA	0.79 ± 0.23	NA	--	--	1.95 ± 0.37	NA	1 ± 0.22	NA	0.57 ± 0.14	NA	16.3 ± 3.2	--
204E131	E94	0.0 - 0.5	1.17 ± 0.33	NA	--	NA	0.95 ± 0.26	NA	--	--	1.4 ± 0.30	NA	1.01 ± 0.24	NA	0.51 ± 0.14	NA	18 ± 3.4	--
204E132	E91	1.0 - 2.0	NA	1.52 ± 0.36	NA	--	NA	0.96 ± 0.25	--	0.52 ± 0.19 (TI)	NA	1.76 ± 0.34	NA	1.04 ± 0.23	NA	0.53 ± 0.14	--	--
204E133		1.0 - 2.0	NA	1.81 ± 0.40	NA	--	NA	0.87 ± 0.23	--	0.54 ± 0.19 (TI)	NA	1.57 ± 0.31	NA	0.9 ± 0.21	NA	0.48 ± 0.13	--	--
204E134		3.0 - 4.0	NA	1.66 ± 0.40	NA	--	NA	0.94 ± 0.26	--	--	NA	1.83 ± 0.36	NA	0.78 ± 0.20	NA	0.55 ± 0.14	--	--
204E135	E92	1.0 - 2.0	NA	1.63 ± 0.39	NA	--	NA	1.25 ± 0.29	--	--	NA	1.84 ± 0.36	NA	1.12 ± 0.25	NA	0.67 ± 0.16	--	--
204E136		3.0 - 4.0	NA	1.65 ± 0.37	NA	--	NA	1.11 ± 0.26	--	--	NA	1.75 ± 0.34	NA	1.25 ± 0.26	NA	0.59 ± 0.14	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 6 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E137	E90	1.0 - 2.0	NA	1.88 ± 0.38	NA	--	NA	0.86 ± 0.20	--	--	NA	1.83 ± 0.33	NA	1.04 ± 0.21	NA	0.6 ± 0.12	--	--
204E138		3.0 - 4.0	NA	1.95 ± 0.43	NA	--	NA	1.02 ± 0.25	--	--	NA	2.22 ± 0.42	NA	1.08 ± 0.24	NA	0.65 ± 0.16	--	--
204E139	E93	1.0 - 2.0	NA	1.33 ± 0.37	NA	--	NA	0.89 ± 0.27	--	--	NA	1.7 ± 0.34	NA	0.96 ± 0.22	NA	0.43 ± 0.12	5.3 ± 1.5	--
204E140		3.0 - 4.0	NA	1.4 ± 0.36	NA	3 ± 1.2	NA	0.93 ± 0.25	--	--	NA	1.64 ± 0.33	NA	0.99 ± 0.23	NA	0.58 ± 0.15	13.2 ± 2.5	--
204E141	E94	1.0 - 2.0	NA	1.66 ± 0.38	NA	--	NA	1.07 ± 0.25	--	--	NA	1.58 ± 0.32	NA	1 ± 0.22	NA	0.52 ± 0.13	2.62 ± 0.84	--
204E142		3.0 - 4.0	NA	1.69 ± 0.34	NA	--	NA	0.88 ± 0.20	--	--	NA	1.66 ± 0.30	NA	0.97 ± 0.20	NA	0.53 ± 0.11	--	--
204E143	E27	1.0 - 2.0	NA	1.61 ± 0.36	NA	--	NA	0.8 ± 0.21	--	--	NA	1.67 ± 0.32	NA	0.94 ± 0.22	NA	0.54 ± 0.13	8.5 ± 2.0	--
204E144		3.0 - 4.0	NA	1.63 ± 0.38	NA	--	NA	0.97 ± 0.24	--	--	NA	1.57 ± 0.31	NA	0.84 ± 0.20	NA	0.52 ± 0.13	19.1 ± 3.6	--
204E145		5.5 - 6.0	NA	1.93 ± 0.49	NA	--	NA	0.8 ± 0.27	--	--	NA	1.95 ± 0.38	NA	0.97 ± 0.23	NA	0.53 ± 0.15	22.2 ± 4.2	--
204E146	E95	0.0 - 0.5	1.5 ± 0.39	NA	--	NA	1.02 ± 0.27	NA	--	--	1.55 ± 0.32	NA	0.98 ± 0.23	NA	0.44 ± 0.13	NA	5 ± 1.2	--
204E147	E96	0.0 - 0.5	1.27 ± 0.34	NA	--	NA	0.85 ± 0.24	NA	--	0.63 ± 0.20	1.7 ± 0.34	NA	0.92 ± 0.22	NA	0.48 ± 0.13	NA	13.8 ± 2.5	--
204E148	E97	0.0 - 0.5	1.54 ± 0.39	NA	--	NA	0.9 ± 0.24	NA	--	0.79 ± 0.23	1.59 ± 0.32	NA	0.88 ± 0.22	NA	0.48 ± 0.14	NA	3.8 ± 1.1	--
204E149		1.0 - 2.0	NA	1.17 ± 0.29	NA	--	NA	0.77 ± 0.20	--	--	NA	1.35 ± 0.27	NA	0.79 ± 0.18	NA	0.4 ± 0.11	--	--
204E150		3.0 - 4.0	NA	1.1 ± 0.28	NA	--	NA	0.66 ± 0.18	--	--	NA	1.02 ± 0.21	NA	0.66 ± 0.16	NA	0.341 ± 0.097	--	--
204E151	E34	1.0 - 2.0	NA	1.34 ± 0.36	NA	--	NA	0.98 ± 0.27	--	--	NA	1.38 ± 0.30	NA	0.97 ± 0.23	NA	0.48 ± 0.13	4.3 ± 1.3	--
204E152		3.0 - 4.0	NA	1.62 ± 0.22	NA	--	NA	0.85 ± 0.37	--	--	NA	1.77 ± 0.34	NA	0.76 ± 0.19	NA	0.63 ± 0.15	4.5 ± 1.1	--
204E153	E95	1.0 - 2.0	NA	1.41 ± 0.31	NA	--	NA	0.83 ± 0.20	--	--	NA	1.32 ± 0.25	NA	0.9 ± 0.19	NA	0.442 ± 0.098	--	--
204E154		3.0 - 4.0	NA	1.37 ± 0.34	NA	--	NA	0.95 ± 0.24	--	--	NA	1.66 ± 0.33	NA	0.87 ± 0.20	NA	0.53 ± 0.13	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 7 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E155	E96	1.0 - 2.0	NA	1.51 ± 0.35	NA	--	NA	0.93 ± 0.23	--	--	NA	1.58 ± 0.31	NA	1.03 ± 0.22	NA	0.54 ± 0.13	--	--
204E156		3.0 - 4.0	NA	1.6 ± 0.41	NA	--	NA	0.99 ± 0.28	--	--	NA	1.91 ± 0.37	NA	0.9 ± 0.23	NA	0.59 ± 0.15	--	--
204E157	E100	0.0 - 0.5	1.39 ± 0.38	NA	--	NA	0.97 ± 0.28	NA	0.65 ± 0.17	0.91 ± 0.25 (TI)	1.54 ± 0.32	NA	0.97 ± 0.24	NA	0.57 ± 0.15	NA	--	--
204E158	E102	0.0 - 0.5	1.35 ± 0.37	NA	--	NA	1.08 ± 0.28	NA	0.42 ± 0.13	1.09 ± 0.29 (TI)	1.71 ± 0.34	NA	1.03 ± 0.24	NA	0.58 ± 0.15	NA	--	--
204E159	E15	1.0 - 2.0	NA	1.6 ± 0.33	NA	--	NA	0.9 ± 0.21	--	0.7 ± 0.17	NA	1.73 ± 0.32	NA	0.97 ± 0.20	NA	0.56 ± 0.12	--	--
204E160	E101	0.0 - 0.5	1.71 ± 0.40	NA	--	NA	1.09 ± 0.26	NA	--	1.02 ± 0.25	1.62 ± 0.33	NA	0.97 ± 0.22	NA	0.57 ± 0.14	NA	--	--
204E161		0.0 - 0.5	1.87 ± 0.50	NA	--	NA	1 ± 0.29	NA	--	0.9 ± 0.26 (TI)	1.48 ± 0.32	NA	1.15 ± 0.26	NA	0.58 ± 0.15	NA	--	--
204E162	E15	3.0 - 4.0	NA	1.85 ± 0.43	NA	--	NA	0.97 ± 0.27	--	0.73 ± 0.24 (TI)	NA	1.96 ± 0.38	NA	1.08 ± 0.24	NA	0.58 ± 0.15	--	--
204E163	E14	1.0 - 2.0	NA	1.88 ± 0.43	NA	--	NA	0.9 ± 0.24	--	--	NA	2.03 ± 0.39	NA	0.99 ± 0.23	NA	0.58 ± 0.15	--	--
204E164		3.0 - 4.0	NA	1.66 ± 0.34	NA	--	NA	0.73 ± 0.18	--	0.65 ± 0.17 (TI)	NA	1.52 ± 0.28	NA	1.04 ± 0.21	NA	0.49 ± 0.11	--	--
204E167	E102	1.0 - 2.0	NA	1.51 ± 0.36	NA	--	NA	0.93 ± 0.23	--	--	NA	1.91 ± 0.36	NA	1.01 ± 0.22	NA	0.65 ± 0.15	--	--
204E168		3.0 - 4.0	NA	1.55 ± 0.37	NA	--	NA	0.94 ± 0.24	--	--	NA	1.93 ± 0.36	NA	1.19 ± 0.25	NA	0.6 ± 0.14	--	--
204E169	E101	1.0 - 2.0	NA	1.68 ± 0.39	NA	--	NA	0.98 ± 0.25	--	--	NA	1.86 ± 0.36	NA	1.07 ± 0.24	NA	0.6 ± 0.14	--	--
204E170		3.0 - 4.0	NA	1.68 ± 0.44	NA	--	NA	0.91 ± 0.28	--	--	NA	1.77 ± 0.35	NA	1.02 ± 0.24	NA	0.52 ± 0.14	--	--
204E171	E100	1.0 - 2.0	NA	1.69 ± 0.42	NA	--	NA	0.89 ± 0.26	--	--	NA	1.78 ± 0.36	NA	1.16 ± 0.26	NA	0.64 ± 0.17	--	--
204E172		3.0 - 4.0	NA	1.86 ± 0.43	NA	--	NA	1.01 ± 0.26	--	--	NA	2.04 ± 0.39	NA	0.95 ± 0.23	NA	0.66 ± 0.16	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 8 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E189	E157	0.0 - 0.5	1.82 ± 0.62	NA	--	NA	--	NA	--	1.82 ± 0.62	1.34 ± 0.32	NA	1.12 ± 0.3	NA	--	NA	**66.6 ± 8.7**	--
204E190		0.0 - 0.5	--	NA	--	NA	0.77 ± 0.33	NA	--	0.6 ± 0.32 (TI)	1.35 ± 0.35	NA	1.13 ± 0.31	NA	--	NA	**67.4 ± 8.4**	2.38 ± 0.76
204E191		1.0 - 2.0	NA	2.13 ± 0.62	NA	--	NA	1.07 ± 0.37	--	1.26 ± 0.36 (TI)	NA	1.53 ± 0.34	NA	1.07 ± 0.29	NA	0.59 ± 0.18	--	--
204E192		3.0 - 4.0	NA	1.24 ± 0.34	NA	--	NA	0.64 ± 0.25	--	--	NA	1.46 ± 0.24	NA	0.84 ± 0.19	NA	0.35 ± 0.12	--	--
204E193	E156	0.0 - 0.5	--	NA	--	NA	1.23 ± 0.38	NA	--	0.97 ± 0.39 (TI)	1.57 ± 0.35	NA	1.32 ± 0.31	NA	0.6 ± 0.21	NA	4.8 ± 1.4	--
204E194		1.0 - 2.0	NA	1.63 ± 0.5	NA	--	NA	1.06 ± 0.38	--	1.77 ± 0.86	NA	1.23 ± 0.3	NA	1.39 ± 0.32	NA	0.56 ± 0.19	--	--
204E195		3.0 - 4.0	NA	1.65 ± 0.38	NA	--	NA	0.79 ± 0.28	--	--	NA	1.55 ± 0.25	NA	1 ± 0.22	NA	0.48 ± 0.13	--	--
204E196	E158	0.0 - 0.5	--	NA	--	NA	--	NA	--	1.14 ± 0.41 (TI)	1.19 ± 0.28	NA	1 ± 0.29	NA	--	NA	13.1 ± 2.6	--
204E197		1.0 - 2.0	NA	--	NA	--	NA	1.29 ± 0.45	--	0.94 ± 0.36 (TI)	NA	1.78 ± 0.36	NA	1.49 ± 0.33	NA	0.43 ± 0.18	4.2 ± 1.3	--
204E198		3.0 - 4.0	NA	1.51 ± 0.47	NA	--	NA	1.09 ± 0.32	--	--	NA	1.73 ± 0.33	NA	0.98 ± 0.27	NA	0.37 ± 0.16	--	--
204E199	E153	3.0 - 4.0	NA	--	NA	--	NA	--	--	--	NA	1.5 ± 0.33	NA	1.1 ± 0.29	NA	0.44 ± 0.17	14.9 ± 2.9	--
204E200		2.0 - 3.0	NA	--	NA	--	NA	1.12 ± 0.41	--	--	NA	1.7 ± 0.35	NA	1.02 ± 0.29	NA	0.61 ± 0.2	3.4 ± 1.1	--
204E201		5.0 - 6.0	NA	1.89 ± 0.56	NA	--	NA	--	--	--	NA	1.46 ± 0.33	NA	1.02 ± 0.26	NA	0.54 ± 0.19	--	--
204E202		9.0 - 10.0	NA	1.4 ± 0.39	NA	--	NA	0.73 ± 0.29	--	--	NA	1.72 ± 0.28	NA	0.75 ± 0.2	NA	0.38 ± 0.13	--	--
204E203	E154	0.0 - 0.5	1.55 ± 0.53	NA	--	NA	--	NA	--	--	NA	1.29 ± 0.32	NA	0.94 ± 0.27	NA	0.46 ± 0.17	32.2 ± 4.8	--
204E204		2.0 - 3.0	NA	--	NA	--	NA	1 ± 0.34	--	--	NA	1.6 ± 0.34	NA	0.92 ± 0.27	NA	0.63 ± 0.21	--	--
204E205		5.0 - 6.0	NA	1.61 ± 0.57	NA	--	NA	--	--	--	NA	1.66 ± 0.37	NA	0.96 ± 0.28	NA	0.53 ± 0.2	--	--
204E206		9.0 - 10.0	NA	1.18 ± 0.4	NA	--	NA	1.07 ± 0.35	--	--	NA	1.29 ± 0.31	NA	0.99 ± 0.27	NA	0.44 ± 0.16	--	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 9 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E207	E155	0.0 - 0.5	--	NA	--	NA	0.89 ± 0.35	NA	--	--	1.58 ± 0.37	NA	1.1 ± 0.3	NA	0.52 ± 0.19	NA	3.8 ± 1.5 (TI)	--
204E208		2.0 - 3.0	NA	1.68 ± 0.39	NA	--	NA	0.74 ± 0.26	--	--	NA	1.7 ± 0.27	NA	0.82 ± 0.2	NA	0.49 ± 0.13	--	--
204E209		5.0 - 6.0	NA	1.19 ± 0.4	NA	--	NA	0.71 ± 0.28	--	--	NA	1.31 ± 0.27	NA	0.78 ± 0.22	NA	0.51 ± 0.16	--	--
204E210		9.0 - 10.0	NA	1.56 ± 0.56 (TI)	NA	--	NA	0.91 ± 0.37	--	--	NA	1.45 ± 0.33	NA	0.65 ± 0.23	NA	0.45 ± 0.17	--	--
204E211		9.0 - 10.0	NA	1.61 ± 0.54	NA	--	NA	0.96 ± 0.41	--	--	NA	1.95 ± 0.36	NA	0.91 ± 0.26	NA	0.54 ± 0.19	--	--
204E212	E161	0.0 - 0.5	1.44 ± 0.44	NA	--	NA	1.01 ± 0.34	NA	--	--	1.58 ± 0.32	NA	0.94 ± 0.26	NA	0.47 ± 0.17	NA	21 ± 3	--
204E213		2.0 - 3.0	NA	1.44 ± 0.4	NA	--	NA	1.04 ± 0.29	--	--	NA	1.43 ± 0.3	NA	0.97 ± 0.24	NA	0.45 ± 0.16	32.2 ± 4.9	--
204E214		5.0 - 6.0	NA	2.08 ± 0.62	NA	--	NA	--	--	--	NA	1.94 ± 0.35	NA	1.12 ± 0.27	NA	0.64 ± 0.2	--	--
204E215		9.0 - 10.0	NA	1.56 ± 0.58	NA	--	NA	--	--	--	NA	1.52 ± 0.34	NA	1 ± 0.29	NA	0.56 ± 0.21	--	--
204E216	E162	0.0 - 0.5	1.31 ± 0.48	NA	--	NA	--	NA	--	--	1.56 ± 0.33	NA	0.78 ± 0.25	NA	0.53 ± 0.18	NA	52.4 ± 6.6	--
204E217		2.0 - 3.0	NA	1.43 ± 0.5	NA	--	NA	0.76 ± 0.3	--	0.84 ± 0.3 (TI)	NA	1.68 ± 0.34	NA	0.95 ± 0.26	NA	0.64 ± 0.17	--	--
204E218		5.0 - 6.0	NA	--	NA	--	NA	0.86 ± 0.35	--	--	NA	1.85 ± 0.33	NA	1 ± 0.24	NA	0.52 ± 0.17	--	--
204E219		9.0 - 10.0	NA	1.7 ± 0.49	NA	--	NA	0.79 ± 0.31	--	--	NA	1.88 ± 0.37	NA	0.86 ± 0.24	NA	0.54 ± 0.18	--	--
204E220	E163	0.0 - 0.5	1.43 ± 0.44	NA	--	NA	--	NA	--	--	1.77 ± 0.36	NA	1.08 ± 0.3	NA	0.63 ± 0.19	NA	**95 ± 12**	2.32 ± 0.69
204E221		2.0 - 3.0	NA	1.95 ± 0.49	NA	--	NA	0.95 ± 0.3	--	--	NA	1.7 ± 0.28	NA	0.88 ± 0.21	NA	0.47 ± 0.13	--	--
204E222		5.0 - 6.0	NA	1.88 ± 0.45	NA	--	NA	0.8 ± 0.3		--	NA	1.58 ± 0.3	NA	1.23 ± 0.27	NA	0.55 ± 0.15	--	--
204E223	E164	0.0 - 0.5	1.29 ± 0.52	NA	--	NA	1.16 ± 0.33	NA	--	--	1.4 ± 0.29	NA	0.97 ± 0.23	NA	0.5 ± 0.16	NA	--	--
204E224	E165	0.0 - 0.5	1.79 ± 0.6	NA	--	NA	0.92 ± 0.34	NA	--	--	1.51 ± 0.39	NA	1.3 ± 0.32	NA	0.52 ± 0.19	NA	19.2 ± 2.9	--
204E225	E166	0.0 - 0.5	1.37 ± 0.46	NA	--	NA	0.8 ± 0.33	NA	--	--	1.42 ± 0.32	NA	0.79 ± 0.29	NA	--	NA	24.7 ± 3.4	--

Table A.7-10
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 10 of 10)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cesium-137[b]	Europium-152[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]		Thorium-234[b]	Uranium-235[b]
Preliminary Action Levels			5	15	5	15	5	15	7.30	3.40	5	15	5	15	5	15	63.2	10.5
Depth bgs (cm)			<15	>15	<15	>15	<15	>15			<15	>15	<15	>15	<15	>15		
204E226	E150	0.0 - 0.5	1.26 ± 0.37	NA	--	NA	0.74 ± 0.27	NA	--	0.95 ± 0.24	1.38 ± 0.25	NA	0.83 ± 0.2	NA	0.36 ± 0.13	NA	--	--
204E227		1.0 - 2.0	NA	1.94 ± 0.55	NA	--	NA	0.75 ± 0.31	--	--	NA	1.67 ± 0.32	NA	0.82 ± 0.24	NA	0.56 ± 0.18	--	--
204E228	E159	0.0 - 0.5	2.2 ± 0.57	NA	--	NA	0.86 ± 0.34	NA	--	1.19 ± 0.35 (TI)	1.68 ± 0.34	NA	1 ± 0.25	NA	0.45 ± 0.16	NA	--	--
204E229		1.0 - 2.0	NA	1.7 ± 0.54	NA	--	NA	1.2 ± 0.41	--	1.2 ± 0.42 (TI)	NA	1.89 ± 0.4	NA	0.86 ± 0.25	NA	0.56 ± 0.2	--	--
204E230		1.0 - 2.0	NA	1.59 ± 0.53	NA	--	NA	1.04 ± 0.35	--	1.29 ± 0.41 (TI)	NA	1.95 ± 0.4	NA	1.04 ± 0.31	NA	0.66 ± 0.23	--	--
204E231	E160	0.0 - 0.5	1.53 ± 0.37	NA	--	NA	--	NA	--	0.63 ± 0.22 (TI)	1.78 ± 0.29	NA	0.9 ± 0.2	NA	0.61 ± 0.15	NA	13.2 ± 2.1	--
204E232		1.0 - 2.0	NA	1.65 ± 0.47	NA	--	NA	0.93 ± 0.32	--	--	NA	1.84 ± 0.36	NA	0.87 ± 0.24	NA	0.43 ± 0.15	--	--
204E233	E152	0.0 - 0.5	--	NA	--	NA	1.09 ± 0.39	NA	--	--	1.7 ± 0.35	NA	1.09 ± 0.31	NA	0.58 ± 0.21	NA	3.8 ± 1.2	--
204E234		1.0 - 2.0	NA	1.38 ± 0.44	NA	--	NA	0.72 ± 0.27	--	--	NA	1.6 ± 0.28	NA	0.83 ± 0.22	NA	0.41 ± 0.12	--	--
204E235		4.0 - 5.0	NA	1.75 ± 0.46	NA	--	NA	0.75 ± 0.3	--	--	NA	1.74 ± 0.32	NA	1.15 ± 0.27	NA	0.56 ± 0.17	--	--
204E236		6.0 - 7.0	NA	1.56 ± 0.44	NA	--	NA	1.25 ± 0.34	--	--	NA	1.72 ± 0.34	NA	1.1 ± 0.27	NA	0.57 ± 0.16	--	--

[a]Based on the generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230, and Th-232 as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PAL for these isotopes is specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils. For purposes of this document 15 centimeters is assumed to be equivalent to 0.5 ft (6 inches) (DOE, 1993).
[b]Based on the construction, commercial, industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem dose.
[c]The Eu-152 PAL value was derived by performing a query on the analytical laboratories reported MDA for Eu-152 and then determining the 95 percentile value.
[d]Qualifier added to laboratory data; record accepted. Duplicate normalized difference outside control limits.
[e]Qualifier added to laboratory data; record accepted. Duplicate normalized difference outside control limits.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value
TI = Tentatively identified
-- = Not detected above minimum reporting limits

Table A.7-11
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 1 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels			7.62	85.9	10.5	63.2
204E001	E01	0.0 - 0.5	--	0.95 ± 0.17	0.093 ± 0.041	1.03 ± 0.18 (J)[b]
204E002	E02	0.0 - 0.5	--	0.87 ± 0.16	--	0.88 ± 0.16 (J)[b]
204E003	E03	0.0 - 0.5	--	0.99 ± 0.17	0.088 ± 0.039	2.9 ± 0.42 (J)[b]
204E004	E04	0.0 - 0.5	--	1.01 ± 0.18	0.1 ± 0.044	3.26 ± 0.48 (J)[b]
204E005	E05	0.0 - 0.5	0.073 ± 0.039	1.66 ± 0.27	0.174 ± 0.059	7.9 ± 1.1 (J)[b]
204E006	E06	0.0 - 0.5	--	1.22 ± 0.21	0.12 ± 0.048	5.71 ± 0.80
204E007		1.0 - 2.0	--	1.02 ± 0.18	0.104 ± 0.045	2.75 ± 0.41
204E008	E07	0.0 - 0.5	0.075 ± 0.035	1.03 ± 0.18	--	2.17 ± 0.34
204E009		0.0 - 0.5	0.14 ± 0.050	0.96 ± 0.17	0.077 ± 0.037	2.39 ± 0.36
204E010		3.0 - 4.0	--	1.17 ± 0.20	--	1.22 ± 0.21
204E011	E08	0.0 - 0.5	--	1.13 ± 0.19	0.078 ± 0.037	2.18 ± 0.33
204E012		3.0 - 4.0	--	0.87 ± 0.16	0.089 ± 0.040	0.98 ± 0.17
204E013	E09	0.0 - 0.5	--	1.29 ± 0.21	0.073 ± 0.035 (LT)	2.24 ± 0.34
204E014	E10	0.0 - 0.5	--	1.01 ± 0.18	--	1.35 ± 0.22
204E015	E11	0.0 - 0.5	--	0.88 ± 0.17	0.094 ± 0.046 (LT)	1.05 ± 0.19
204E016	E12	0.0 - 0.5	--	0.92 ± 0.17	0.095 ± 0.043 (LT)	1.61 ± 0.26
204E017	E13	0.0 - 0.5	--	1.59 ± 0.25	0.112 ± 0.045	3.38 ± 0.49
204E018	E14	0.0 - 0.5	--	10.8 ± 1.5	0.93 ± 0.20	28.6 ± 4.0
204E019	E15	0.0 - 0.5	0.077 ± 0.039	0.88 ± 0.16	--	1.19 ± 0.20
204E020	E16	9.0 - 10.0	--	1.09 ± 0.20	--	0.95 ± 0.18
204E021		11.0 - 12.0	--	1.08 ± 0.18	--	0.98 ± 0.17
204E022		14.0 - 15.0	--	0.76 ± 0.14	0.077 ± 0.038	0.97 ± 0.17
204E023	E17	9.0 - 10.0	--	1.05 ± 0.18	--	0.89 ± 0.16
204E024		11.0 - 12.0	--	0.95 ± 0.17	--	0.92 ± 0.16
204E025		14.0 - 15.0	--	1.14 ± 0.19	0.071 ± 0.035	1.07 ± 0.18
204E026	E18	9.0 - 10.0	--	0.95 ± 0.16	--	0.97 ± 0.16
204E027		11.0 - 12.0	--	0.99 ± 0.17	--	1 ± 0.17
204E028		14.0 - 15.0	--	0.93 ± 0.16	0.093 ± 0.038	0.94 ± 0.16
204E029	E19	9.0 - 10.0	--	1.08 ± 0.18	0.058 ± 0.030	1 ± 0.17
204E030		11.0 - 12.0	--	0.97 ± 0.17	--	0.97 ± 0.17
204E031		14.0 - 15.0	--	0.99 ± 0.17	0.054 ± 0.028	0.86 ± 0.15
204E032		14.0 - 15.0	--	1 ± 0.17	0.071 ± 0.034	0.98 ± 0.17
204E033	E20	0.0 - 0.5	0.061 ± 0.032	0.8 ± 0.15	0.066 ± 0.034	2.04 ± 0.31
204E034	E21	0.0 - 0.5	0.076 ± 0.035	1.19 ± 0.19	0.087 ± 0.037	4.53 ± 0.62
204E035	E22	0.0 - 0.5	--	0.85 ± 0.15	--	0.93 ± 0.16
204E036	E23	0.0 - 0.5	--	1.11 ± 0.24	--	1.26 ± 0.26
204E037	E24	0.0 - 0.5	0.049 ± 0.030 (LT)	1.73 ± 0.27	0.096 ± 0.040	2.84 ± 0.41
204E038	E25	0.0 - 0.5	0.199 ± 0.061	1.68 ± 0.27	0.126 ± 0.048	3.87 ± 0.55
204E039	E26	0.0 - 0.5	--	1.05 ± 0.19	0.099 ± 0.047	1.2 ± 0.21

Table A.7-11
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 2 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels			**7.62**	**85.9**	**10.5**	**63.2**
204E040	E27	0.0 - 0.5	--	20 ± 2.9	1.79 ± 0.39	**65.6 ± 9.2**
204E041	E28	0.0 - 0.5	0.201 ± 0.063	1.85 ± 0.29	0.123 ± 0.047	3.88 ± 0.55
204E042	E29	0.0 - 0.5	--	2.4 ± 0.36 (J)[c]	0.283 ± 0.076 (J)[c]	4.7 ± 0.66 (J)[c]
204E043	E30	0.0 - 0.5	--	1.61 ± 0.27	0.204 ± 0.070	6.76 ± 0.96
204E044		1.0 - 2.0	--	1.72 ± 0.27	0.126 ± 0.047	5.79 ± 0.80
204E045		1.0 - 2.0	--	1.37 ± 0.23	0.163 ± 0.061	5.33 ± 0.76
204E046	E31	0.0 - 0.5	--	0.97 ± 0.18	0.055 ± 0.032	1.83 ± 0.29
204E047		1.0 - 20.0	--	0.99 ± 0.17	--	1.03 ± 0.18
204E048	E32	0.0 - 0.5	--	0.96 ± 0.16	0.057 ± 0.030	1.06 ± 0.18
204E049	E33	0.0 - 0.5	0.062 ± 0.034	4.39 ± 0.62	0.283 ± 0.077	10.7 ± 1.4
204E050	E34	0.0 - 0.5	--	24.2 ± 3.4	2.1 ± 0.46	**72.5 ± 9.6**
204E051	E35	11.0 - 12.0	--	1.07 ± 0.18	0.087 ± 0.040	1.09 ± 0.19
204E052		13.0 - 14.0	--	1.06 ± 0.18	--	1.05 ± 0.18
204E053		16.0 - 17.0	--	1.03 ± 0.18	--	1.09 ± 0.19
204E054		19.0 - 20.0	--	0.97 ± 0.17	0.057 ± 0.031	0.92 ± 0.16
204E055	E36	9.0 - 10.0	--	1 ± 0.17	--	0.97 ± 0.17
204E056		11.0 - 12.0	--	1.02 ± 0.17	0.059 ± 0.030	0.91 ± 0.16
204E057		14.0 - 15.0	--	0.92 ± 0.16	--	0.95 ± 0.17
204E058		19.0 - 20.0	--	1.01 ± 0.17	--	0.87 ± 0.15
204E059		24.0 - 25.0	--	1.11 ± 0.19	--	0.98 ± 0.17
204E060		29.0 - 30.0	--	0.92 ± 0.16	0.043 ± 0.026 (LT)	1.02 ± 0.17
204E061	E37	19.0 - 20.0	--	0.93 ± 0.16	--	0.9 ± 0.16
204E062		24.0 - 25.0	--	1.07 ± 0.18	0.057 ± 0.032	1.1 ± 0.19
204E063		24.0 - 25.0	--	1.07 ± 0.18	0.069 ± 0.033	1.11 ± 0.19
204E064		29.0 - 30.0	--	1.13 ± 0.18	--	1.04 ± 0.17
204E065	E38	9.0 - 10.0	--	1 ± 0.19	0.064 ± 0.039	0.97 ± 0.19
204E065A		9.0 - 10.0	--	0.95 ± 0.18	--	0.77 ± 0.15
204E066		11.0 - 12.0	--	0.97 ± 0.18	--	0.93 ± 0.17
204E067		14.0 - 15.0	--	1.06 ± 0.20	--	0.99 ± 0.19
204E068	E39	9.0 - 10.0	--	0.95 ± 0.18	0.084 ± 0.043	0.89 ± 0.17
204E069		11.0 - 12.0	--	0.93 ± 0.18	0.059 ± 0.037	0.89 ± 0.18
204E070		14.0 - 15.0	--	1.08 ± 0.20	0.093 ± 0.045	0.99 ± 0.19
204E076	E45	0.0 - 0.5	0.46 ± 0.11 (J)[b]	1.71 ± 0.29	0.126 ± 0.055	3.46 ± 0.53
204E077	E46	0.0 - 0.5	0.353 ± 0.091 (J)[b]	1.77 ± 0.30	0.118 ± 0.053	3.56 ± 0.54
204E081	E50	0.0 - 0.5	--	0.84 ± 0.16	--	1.06 ± 0.19
204E082	E51	0.0 - 0.5	--	1.02 ± 0.18	0.098 ± 0.045	0.98 ± 0.18
204E120	E89	0.0 - 0.5	--	1.41 ± 0.24	0.177 ± 0.062	2.87 ± 0.43
204E121		1.0 2.0	--	0.94 ± 0.17	0.108 ± 0.045	1.22 ± 0.21
204E122		3.0 - 4.0	--	1.16 ± 0.19	--	1.03 ± 0.18

Table A.7-11
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 3 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels			7.62	85.9	10.5	63.2
204E123	E05	4.5 - 5.0	--	3.47 ± 0.53	0.55 ± 0.13	27 ± 3.7
204E124		6.0 - 7.0	--	1 ± 0.18	--	1.17 ± 0.20
204E125	E33	2.5 - 3.0	--	1.08 ± 0.19	--	1.18 ± 0.20
204E126		3.0 - 4.0	--	0.91 ± 0.16	0.049 ± 0.029 (LT)	1.01 ± 0.17
204E127	E90	0.0 - 0.5	--	1.41 ± 0.23	0.078 ± 0.038	2.24 ± 0.34
204E128	E92	0.0 - 0.5	--	1.83 ± 0.29	0.114 ± 0.046	4.22 ± 0.60
204E129	E91	0.0 - 0.5	--	3.08 ± 0.44	0.288 ± 0.076	8.5 ± 1.1
204E130	E93	0.0 - 0.5	--	2.64 ± 0.41	0.238 ± 0.077	6.72 ± 0.96
204E131	E94	0.0 - 0.5	--	7.2 ± 1.00	0.54 ± 0.12	20 ± 2.7
204E132	E91	1.0 - 2.0	--	1.01 ± 0.17	0.052 ± 0.029	1.33 ± 0.22
204E133		1.0 - 2.0	--	0.98 ± 0.17	0.066 ± 0.034	1.47 ± 0.24
204E134		3.0 - 4.0	--	0.95 ± 0.17	--	1.08 ± 0.19
204E135	E92	1.0 - 2.0	--	0.89 ± 0.16	--	0.87 ± 0.16
204E136		3.0 - 4.0	--	1 ± 0.17	--	0.94 ± 0.17
204E137	E90	1.0 - 2.0	--	0.99 ± 0.17	--	0.93 ± 0.16
204E138		3.0 - 4.0	--	1.04 ± 0.18	0.066 ± 0.033	1.21 ± 0.20
204E139	E93	1.0 - 2.0	--	3.44 ± 0.50	0.231 ± 0.068	8 ± 1.1
204E140		3.0 - 4.0	--	5.19 ± 0.72	0.47 ± 0.10	13.8 ± 1.8
204E141	E94	1.0 - 2.0	--	1.53 ± 0.25	0.114 ± 0.048	2.99 ± 0.45
204E142		3.0 - 4.0	--	0.95 ± 0.17	0.054 ± 0.030	1.08 ± 0.18
204E143	E27	1.0 - 2.0	--	4.61 ± 0.64	0.309 ± 0.079	11 ± 1.5
204E144		3.0 - 4.0	--	9.1 ± 1.3	0.66 ± 0.14	25.1 ± 3.4
204E145		5.5 - 6.0	--	3.43 ± 0.50	0.265 ± 0.074	8.8 ± 1.2
204E146	E95	0.0 - 0.5	--	1.92 ± 0.30	0.109 ± 0.044	3.88 ± 0.55
204E147	E96	0.0 - 0.5	--	4.78 ± 0.66	0.278 ± 0.074	12.9 ± 1.7
204E148	E97	0.0 - 0.5	--	2.82 ± 0.41	0.171 ± 0.055	6.46 ± 0.88
204E149		1.0 - 2.0	--	0.82 ± 0.15	--	0.86 ± 0.15
204E150		3.0 - 4.0	--	0.76 ± 0.15	--	0.73 ± 0.14
204E151	E34	1.0 - 2.0	--	2.55 ± 0.38	0.19 ± 0.061	5.68 ± 0.79
204E152		3.0 - 4.0	--	2.53 ± 0.38	0.209 ± 0.066	5.54 ± 0.78
204E153	E95	1.0 - 2.0	--	0.99 ± 0.17	0.05 ± 0.028 (LT)	1.14 ± 0.19
204E154		3.0 - 4.0	--	1.23 ± 0.21	0.065 ± 0.035	1.48 ± 0.24
204E155	E96	1.0 - 2.0	--	1.1 ± 0.19	--	1.45 ± 0.24
204E156		3.0 - 4.0	--	0.97 ± 0.17	0.056 ± 0.031	1.24 ± 0.21
204E157	E100	0.0 - 0.5	--	1.1 ± 0.19	0.057 ± 0.032	2.79 ± 0.41
204E158	E102	0.0 - 0.5	--	0.84 ± 0.15	0.047 ± 0.027 (LT)	1.12 ± 0.19
204E159	E15	1.0 - 2.0	--	1.13 ± 0.19	--	1.08 ± 0.19
204E160	E101	0.0 - 0.5	--	1.03 ± 0.18	0.076 ± 0.039	1.17 ± 0.20
204E161		0.0 - 0.5	--	0.86 ± 0.15	0.077 ± 0.035	1.03 ± 0.17

Table A.7-11
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 4 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels			7.62	85.9	10.5	63.2
204E162	E15	3.0 - 4.0	--	0.93 ± 0.17	0.074 ± 0.036	1.14 ± 0.19
204E163	E14	1.0 - 2.0	--	1.13 ± 0.19	0.081 ± 0.036	1.17 ± 0.19
204E164		3.0 - 4.0	--	0.95 ± 0.16	0.061 ± 0.031	1.21 ± 0.20
204E167	E102	1.0 - 2.0	--	1.08 ± 0.19	0.06 ± 0.034	1.11 ± 0.20
204E168		3.0 - 4.0	--	1.21 ± 0.20	--	1 ± 0.17
204E169	E101	1.0 - 2.0	--	1.1 ± 0.20	--	1.09 ± 0.20
204E170		3.0 - 4.0	--	0.98 ± 0.18	--	1.03 ± 0.19
204E171	E100	1.0 - 2.0	--	0.84 ± 0.16	0.071 ± 0.037	1.12 ± 0.20
204E172		3.0 - 4.0	--	1.02 ± 0.19	--	1.02 ± 0.19
204E189	E157	0.0 - 0.5	--	19 ± 5 (Y2, M3)	1.56 ± 0.39 (Y2, M3)	**64 ± 11** (Y2, M3)
204E190		0.0 - 0.5	--	15.2 ± 2.7 (M3)	1.25 ± 0.31 (M3)	55.9 ± 9.7 (M3)
204E191		1.0 - 2.0	--	1.16 ± 0.23	--	2.05 ± 0.37
204E192		3.0 - 4.0	--	1.1 ± 0.22	--	1.7 ± 0.32
204E193	E156	0.0 - 0.5	--	2.13 ± 0.4	0.146 ± 0.061	3.92 ± 0.68
204E194		1.0 - 2.0	--	1.72 ± 0.32	0.091 ± 0.045	3.14 ± 0.55
204E195		3.0 - 4.0	--	1.04 ± 0.21	--	1.11 ± 0.22
204E196	E158	0.0 - 0.5	--	3.96 ± 0.67	0.296 ± 0.088	11.2 ± 1.8
204E197		1.0 - 2.0	--	2.13 ± 0.38	0.167 ± 0.062	5.32 ± 0.89
204E198		3.0 - 4.0	--	0.91 ± 0.18	0.067 ± 0.035	1.01 ± 0.19
204E199	E153	3.0 - 4.0	--	9.4 ± 1.6	0.66 ± 0.16	25.3 ± 4.1
204E200		2.0 - 3.0	--	1.68 ± 0.3	0.079 ± 0.038	2.71 ± 0.47
204E201		5.0 - 6.0	--	1.17 ± 0.22	--	1.21 ± 0.23
204E202		9.0 - 10.0	--	1.22 ± 0.24	--	1.15 ± 0.23
204E203	E154	0.0 - 0.5	--	12.5 ± 2.1 (M3)	1.13 ± 0.26	37.7 ± 6.3
204E204		2.0 - 3.0	--	1.04 ± 0.2	0.069 ± 0.036	1.04 ± 0.2
204E205		5.0 - 6.0	--	0.84 ± 0.17	0.059 ± 0.031	0.97 ± 0.19
204E206		9.0 - 10.0	--	1.02 ± 0.2	0.073 ± 0.037	0.84 ± 0.17
204E207	E155	0.0 - 0.5	--	1.14 ± 0.22	0.063 ± 0.034	1.48 ± 0.27
204E208		2.0 - 3.0	--	1.23 ± 0.24	--	1.18 ± 0.24
204E209		5.0 - 6.0	--	1.02 ± 0.2	--	0.98 ± 0.19
204E210		9.0 - 10.0	--	1.1 ± 0.21	0.082 ± 0.04	1.13 ± 0.22
204E211		9.0 - 10.0	--	1.01 ± 0.2	--	1.01 ± 0.2
204E212	E161	0.0 - 0.5	--	21.2 ± 3.8 (Y2)	1.94 ± 0.45 (Y2)	**77 ± 14** (Y2)
204E213		2.0 - 3.0	--	13.4 ± 2.3	1.22 ± 0.28 (M3)	39 ± 6.5 (M3)
204E214		5.0 - 6.0	--	1.11 ± 0.22	--	1.09 ± 0.22
204E215		9.0 - 10.0	--	1.07 ± 0.2	0.074 ± 0.035	1.04 ± 0.2

Table A.7-11
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 05-33-01
(Page 5 of 5)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels			**7.62**	**85.9**	**10.5**	**63.2**
204E216	E162	0.0 - 0.5	--	10.8 ± 2 (M3)	0.92 ± 0.37 (M3)	31.3 ± 5.2 (M3)
204E217		2.0 - 3.0	--	2.42 ± 0.43	0.166 ± 0.064	5.17 ± 0.87
204E218		5.0 - 6.0	--	0.89 ± 0.18	0.079 ± 0.038	0.87 ± 0.17
204E219		9.0 - 10.0	--	1.1 ± 0.22	0.094 ± 0.043	0.93 ± 0.19
204E220	E163	0.0 - 0.5	--	22.2 ± 3.8 (M3)	1.98 ± 0.59 (M3)	**87 ± 14** (M3)
204E221		2.0 - 3.0	--	1.31 ± 0.25	0.07 ± 0.037	2.22 ± 0.39
204E222		5.0 - 6.0	--	1.06 ± 0.21 (M3)		1.07 ± 0.21
204E223	E164	0.0 - 0.5	--	1.78 ± 0.32	0.135 ± 0.053	4.03 ± 0.68
204E224	E165	0.0 - 0.5	--	5.9 ± 0.98	0.54 ± 0.13	16.9 ± 2.7
204E225	E166	0.0 - 0.5	--	5.03 ± 0.85	0.47 ± 0.12	18.1 ± 2.9
204E226	E150	0.0 - 0.5	--	1.1 ± 0.22	--	1.59 ± 0.3
204E227		1.0 - 2.0	--	0.82 ± 0.18	--	0.93 ± 0.2
204E228	E159	0.0 - 0.5	--	0.87 ± 0.18	--	0.91 ± 0.19
204E229		1.0 - 2.0	--	0.91 ± 0.19	--	1.07 ± 0.22
204E230		1.0 - 2.0	--	1.05 ± 0.22	0.089 ± 0.046	1.33 ± 0.26
204E231	E160	0.0 - 0.5	--	2.78 ± 0.51	0.178 ± 0.071	6.9 ± 1.2
204E232		1.0 - 2.0	--	1.22 ± 0.25	--	1.15 ± 0.23
204E233	E152	0.0 - 0.5	--	1.08 ± 0.22	0.118 ± 0.054	3.97 ± 0.69
204E234		1.0 - 2.0	--	0.91 ± 0.19	--	1.12 ± 0.23
204E235		4.0 - 5.0	--	1.08 ± 0.23 (M3)	--	1.12 ± 0.23
204E236		6.0 - 7.0	--	1.23 ± 0.25	0.084 ± 0.045	1.23 ± 0.25

[a]Based on the construction, commercial, industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.
[b]Qualifier added to laboratory data; record accepted. Duplicate precision analysis relative percent difference (relative percent difference) outside control limits.
[c]Qualifier added to laboratory data; record accepted. Spectral problems prevent accurate identification or quantitation.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
J = Estimated value
LT = Result is less than the requested minimum detectable concentration, greater than the specific minimum detectable concentration.
M3 = The requested minimum detectable concentration was not met, but the reported activity is greater than the reported minimum detectable concentration.
Y2 = Chemical yield outside default limits
-- = Not detected above minimum reporting limits

A.7.2.4.11 Explosives

Of the samples analyzed for explosives, Sample E23 exceeded the MRLs and the PALs identified in the CAIP. The analytical results are shown in Table A.7-12. Based on subsequent step-out sampling, it was determined that the explosive contamination is contained within the pit.

Table A.7-12
Soil Sample Results for Explosives
Detected Above Minimum Reporting Limits at CAS 05-33-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			HMX	RDX
Preliminary Action Levels[a]			31,000	16
204E036	E23	0.0 - 0.5	29	170

[a]Based on EPA *Region 9 Preliminary Remediation Goals* (PRGs) (EPA, 2002)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram

A.7.3 Contaminants of Concern

The COPCs were identified as COCs because they were found at concentrations exceeding PALs as identified in the CAIP. Many COCs were found to be present in concentrations exceeding PALs at various locations within CAS 05-33-01. These contaminants include RDX (Explosives), lead (TCLP metals), actinium-228, bismuth-212, lead-212, thallium-208, and thorium-234 (gamma-emitting radionuclides), plutonium-239, uranium-234, uranium-235, uranium-238, lead (metals), and chrysolite and amosite (asbestos).

A.7.4 Nature and Extent of Contamination

Radiological contamination exceeding unrestricted release criteria is limited to a few areas and is bounded by sample locations that have had samples analyzed and determined to contain concentrations below action levels. The sample locations are bounded both laterally and vertically. Asbestos was found in the lining of two steel-lined pits and covering steel frames located in two burn pits. Organic and inorganic contamination (with the exception of the asbestos) exceeding unrestricted release criteria is limited to two pits with defined boundaries and one steel-lined pit. The other

contaminants that exceed PALs are either gamma-emitting radionuclides or isotopic uranium and are found in two primary locations in the CAS. Most of the radionuclide contamination is attributable to a single plume that emanates from a single point (E27). The contamination is deepest directly below a pipe discharge area and gets progressively shallower the further from the apparent source point. One sample tested positive for beryllium, but is bounded laterally with step-out sampling. The beryllium concentration was below PALs, but exceeded NTS concentration limits as a potential inhalation hazard (E29).

A.7.5 Revised Conceptual Site Model

No variations to CSM were identified.

A.8.0 Explosive Storage Bunker (CAS 05-99-02)

The Explosive Storage Bunker is a small (approximately 25 ft^2) wooden shed. The shed is built into a small hillside on the edge of Cane Spring Wash (Figure A.8-1). The structure is believed to have been used for conventional ammunition or explosives storage. More detail is provided in the CAIP (NNSA/NV, 2002a).

A.8.1 Corrective Action Investigation

The six investigation and QA samples collected during investigation activities conducted at CAS 05-99-02 are listed in Table A.8-1. The sample locations are shown in Figure A.8-1. The specific CAI activities conducted to meet CAIP requirements at CAS 05-99-02 are described in Table A.2-1.

A.8.1.1 Deviations

There were no deviations from the investigation activities specified in the CAIP for CAS 05-99-02.

A.8.2 Investigation Activities

The following subsections provide details of the inspection and sampling of the bunker and surrounding soils, FSRs, and sample selection and analysis.

A.8.2.1 Bunker Interior Inspection

In order to fully assess the potential for soil contamination at CAS 05-99-02, the investigation team first inspected the bunker for possible chemical and radiological releases. Any material found within the bunker was noted and removed as part of the housekeeping activities.

The Explosive Storage Bunker (CAS 05-99-02) is a small, wooden shed built into the side of a small hill. The dirt floor is approximately 5 by 5 ft (Figure A.8-1). No equipment or evidence of a release was observed in the bunker. However, prior to the investigation, a wooden box labeled “Explosives” and filled with soil was investigated by an explosives ordnance technician. No explosives were found in the box and it was removed from the site.

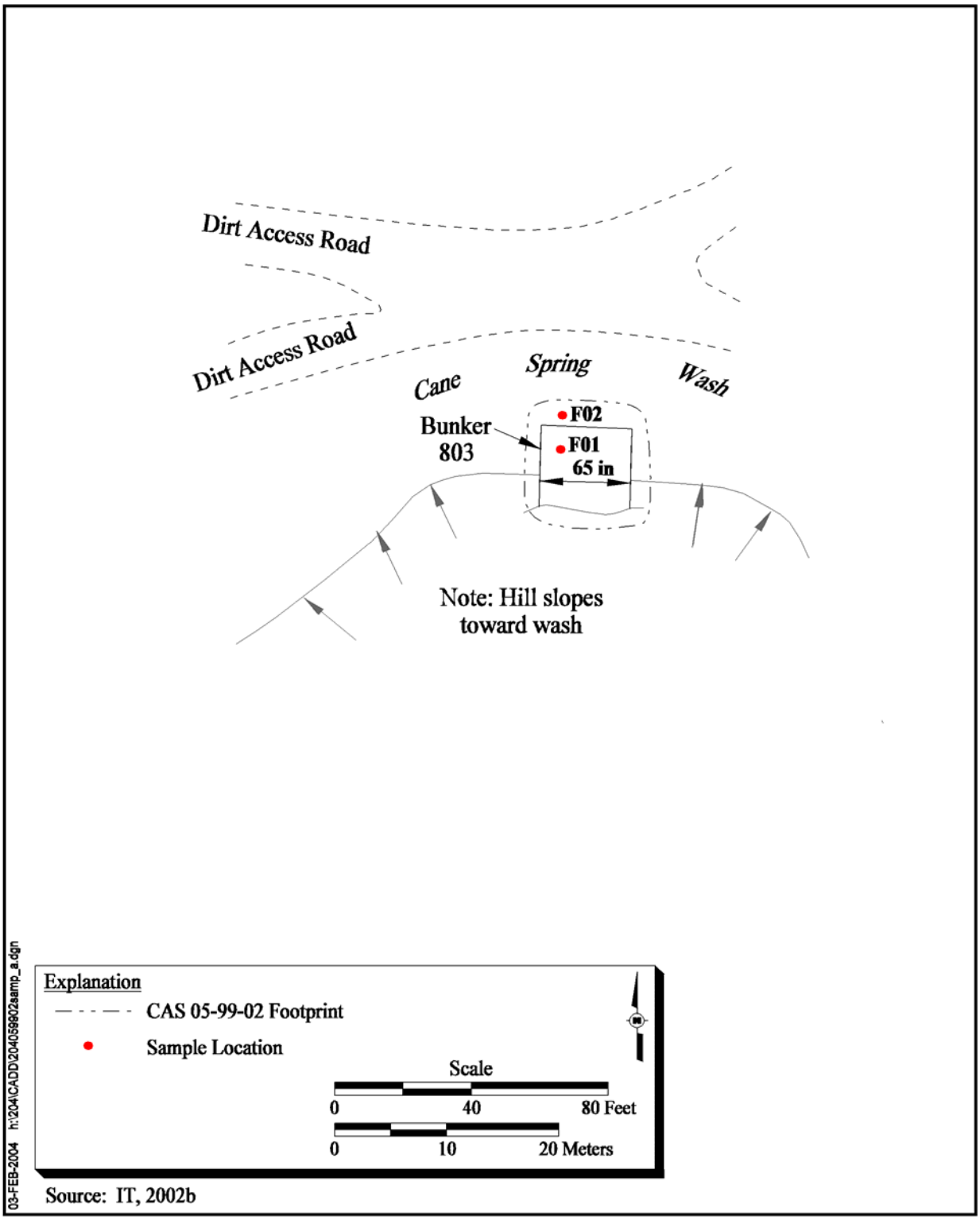

Figure A.8-1
CAS 05-99-02, Sampling Locations

Table A.8-1
Samples Collected at CAS 05-99-02

Sample Number	Location	Sample Matrix	Depth (ft bgs)	Purpose	Analyses					
					Total VOCs, Total SVOCs, Total RCRA Metals,	Total Beryllium	PCB	Explosives	Zinc	Warfarin
204F001	F01	Soil	0.0 - 0.5	SC, Lab QC	X	X	X	X	X	X
204F002	F02	Soil	0.0 - 0.5	SC	X	X	X	X	X	X
204F003		Soil	0.0 - 0.5	Field Duplicate of #204F002	X	X	X	X	X	X
204F301	NA	Water	NA	Trip Blank	VOCs only					
204F302	NA	Water	NA	Field Blank	X	X	X	X	X	X
204F303	NA	Water	NA	Trip Blank	VOCs only					

ft bgs = Feet below ground surface
QC = Quality control
SC = Site characterization

A.8.2.2 Radiological Survey

A radiological walk-over survey of the ground surface within the CAS 05-99-02 boundary was conducted in addition to a radiological survey of the interior of the bunker that included collecting swipe samples and direct meter readings of swipe sample locations.

A.8.2.2.1 Radiological Survey Results

A radiological survey was conducted on the interior of the Explosive Storage Bunker. See Figure A.8-2 for swipe sample locations and Table A.8-2 for swipe sample data. After analysis of swipe samples, no sample was found to contain contamination above established levels for unrestricted release.

A.8.2.3 Waste Characterization

After visual inspection of CAS 05-99-02 and its surroundings, no waste characterization activities were deemed necessary.

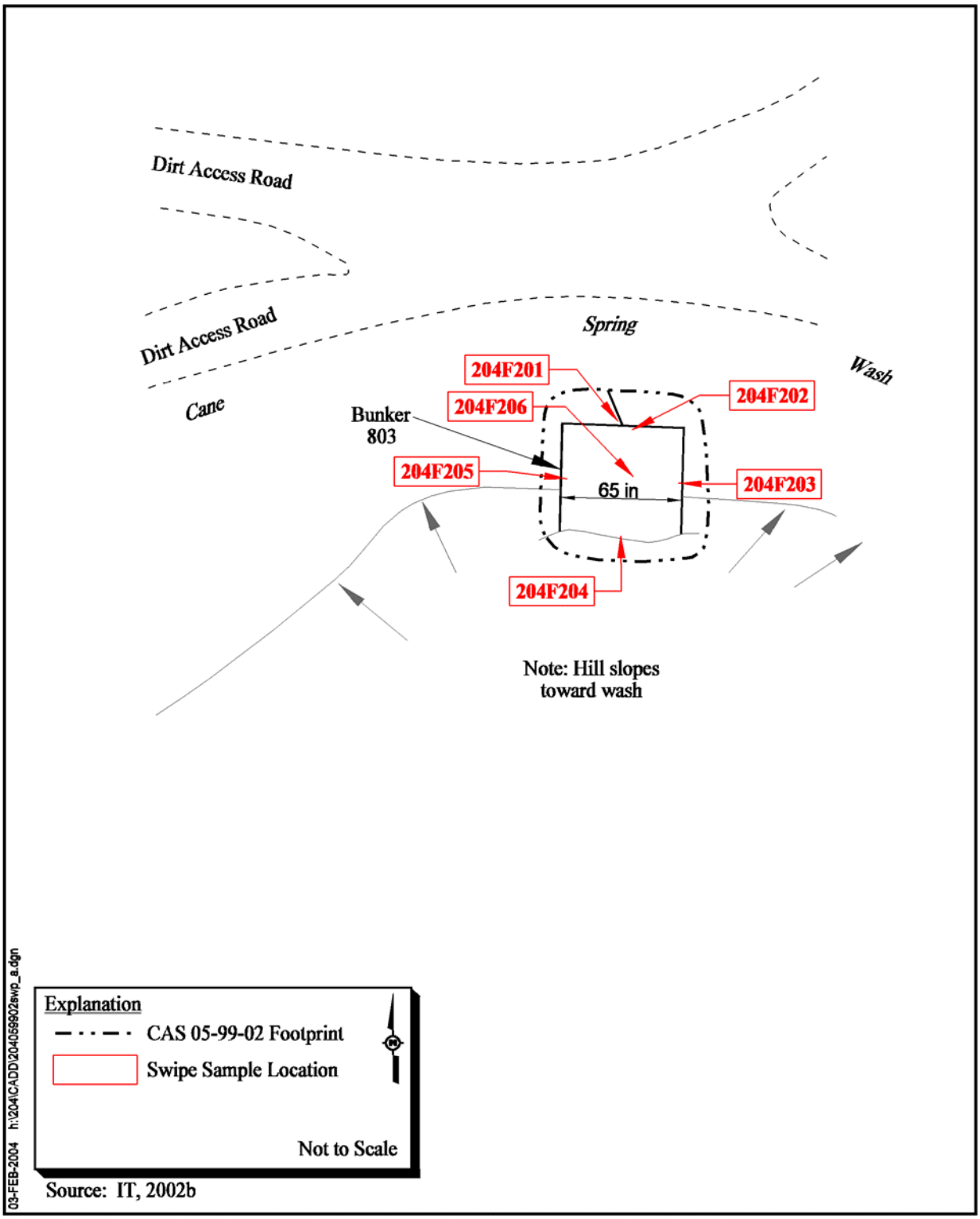

Figure A.8-2
CAS 05-99-02, Radiological Swipe Sample Locations, Bunker Interior

Table A.8-2
Swipe Sample Analysis for CAS 05-99-02

Swipe Sample Analysis				Radiological Survey		Dose rate (microrem/hr)
Sample ID #	Alpha Activity (dpm)	Beta Activity (dpm)	Comments	Gross Fixed + Removable		
				Beta/Gamma (dpm/100cm^2)	Alpha (dpm/100 cm^2)	
204F201	-0.33	8.96	1-Door	1,250	0	15
204F202	-0.33	6.66	2-N Wall	1,398	6.3	15
204F203	3.01	3.94	3-E Wall	1,401	2.6	15
204F204	-0.33	-0.23	4-S Wall	1,146	2.6	15
204F205	3.01	-2.95	5-W Wall	1,081	0	15
204F206	-0.33	-0.23	6-Ceiling	1,104	9.8	15

ID = Identification
NA = Not applicable
dpm = Disintegrations per minute
cm^2 = Square centimeters

A.8.2.4 Site Characterization

Two soil samples and one duplicate were taken from locations F01 and F02 (Figure A.8-1) and analyzed for total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO) total beryllium, PCBs, explosives, zinc, and warfarin content.

A.8.2.4.1 Site Characterization Sample Analyses

The parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.8-1 lists the sample-specific analytical parameters. The analytical results of soil samples with concentrations exceeding corresponding MRLs or PALs (NNSA/NV, 2002a) at CAS 05-99-02 are summarized in the following sections.

Radioanalysis of CAS 05-99-02 samples were deemed unnecessary after the walk-over and radiological surveys were conducted.

A.8.2.4.2 Total Volatile Organic Compounds

Of the 3 samples analyzed for total VOCs, all three exceed the MRLs for acetone and two for methylene chloride, but neither of the samples exceeded the PALs identified in the CAIP. The analytical results are shown in Table A.8-3.

Table A.8-3
Soil Sample Results for Total VOCs Detected
Above Minimum Reporting Limits at CAS 05-99-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)	
			Acetone	Methylene Chloride
Preliminary Action Levels[a]			6,000,000	21,000
204F001	F01	0.0 - 0.5	23 (J)	42 (B)
204F002	F02	0.0 - 0.5	100 (J)	--
204F003		0.0 - 0.5	59 (J)	54 (B)

[a]Based on EPA, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2002)

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
B = Analyte found in both sample and associated blank
J = Estimated value. Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.

A.8.2.4.3 Total Semivolatile Organic Compounds

Of the 3 samples analyzed for total SVOCs, none exceeded the MRLs or the PALs identified in the CAIP.

A.8.2.4.4 Total RCRA Metals

Of the three samples analyzed for total RCRA metals, three exceed the MRLs for beryllium and one exceeded the MRL for selenium, but none of the samples exceeded the PALs identified in the CAIP. The Be concentrations are within the ranges seen throughout the NTS. The analytical results are shown in Table A.8-4.

A.8.2.4.5 PCBs

Of the samples analyzed for PCBs, none exceeded the MRLs or the PALs identified in the CAIP.

Table A.8-4
Soil Sample Results for Metals Detected
Above Minimum Reporting Limits at CAS 05-99-22

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Beryllium	Selenium
Preliminary Action Levels[a]			**1,900**	**5,100**
204F001	F01	0.0 - 0.5	0.6 (J)	--
204F002	F02	0.0 - 0.5	0.53 (J)	0.5 (B)
204F003		0.0 - 0.5	0.52 (J)	--

[a]Based on EPA *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2002)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
B = Value less than the instrument detection limit, but greater than or equal to the contract required detection limit.
J = Estimated value. Qualifier added to laboratory data; record accepted. Serial dilution %D outside control limits. Matrix effects may exist.

A.8.2.4.6 Explosives

Of the samples analyzed for explosives, none exceeded the MRLs or the PALs identified in the CAIP.

A.8.2.4.7 Zinc

Of the samples analyzed for zinc, none exceeded the MRLs or the PALs identified in the CAIP.

A.8.2.4.8 Warfarin

Of the samples analyzed for Warfarin, none exceeded the MRLs or the PALs identified in the CAIP.

A.8.3 Contaminants of Concern

After analysis of the samples, no COCs were present.

A.8.4 Nature and Extent of Contamination

Swipe samples and soil samples were collected and analyzed, revealing no contamination. With no contamination present, the nature and extent of contamination does not apply.

A.8.5 Revised Conceptual Site Model

No variations to the CSM were identified.

A.9.0 Waste Management

Corrective Action Unit 204 integrated waste minimization into the field activities. Investigation-derived waste was segregated to the greatest extent possible. Controls were in place to minimize the use of hazardous materials and the unnecessary generation of hazardous and/or mixed waste. Decontamination activities were planned and executed to minimize the volume of rinsate generated.

Potentially hazardous waste generated during the investigation was placed in steel 55-gallon drums and labeled as "Hazardous Waste - Pending Analysis." Two HWAAs and nine Satellite Accumulation Areas (SAAs) were established to manage the waste at the investigation areas. The amount, type, and source of waste placed into each drum were recorded in waste management logbooks at each location.

A.9.1 Characterization

The waste streams include decontamination rinse water, disposable personal protection equipment (PPE), field-screening equipment, disposable sampling equipment, contaminated soil, and sample screening waste. The types, amounts, and disposal of the wastes are detailed in the following subsections. Newly generated wastes such as rinsate, PPE/sampling debris (plastic/glass) have been characterized based on the associated soils samples and knowledge of the waste generating process. For waste drums not directly sampled yet characterized, they were characterized based on process knowledge and analytical results of the corresponding soil samples. No listed constituents are identified at this CAU; therefore, the waste characterization is based on its characteristic properties. Analytical results for each drum of waste or associated samples were reviewed to ensure compliance with federal regulations, state regulations, DOE directives/policies, guidance, waste disposal criteria, and Stoller-Navarro Joint Venture (SNJV) SQPs. Analytical data were reviewed through Tier I, II, and III validation.

A.9.2 Waste Streams

Newly generated IDW was segregated into the following waste streams:

- PPE and disposable sampling equipment
- Decontamination rinsate

- Debris includes wood, sampling equipment, plastic sheeting, glass/plastic sample jars, sampling scoops, aluminum foil, and bowls
- Hydrocarbon solids (e.g., soil, wood, PPE/plastic)
- Bunker cleanup
- Spent acetone (from RDX screening kit)
- Soil containing depleted uranium pellets

A.9.3 IDW Generated

A total of 24 drums of IDW were generated during the investigation. These drums include the following:

- Eight drums were characterized as sanitary PPE/plastic, bunker cleanup, etc. Pickup and disposal request for this waste stream is intended for the industrial waste landfill.
- One drum was characterized as hydrocarbon PPE/plastic. Pickup and disposal request for this waste stream is intended for the hydrocarbon landfill.
- Twelve drums were characterized as sanitary rinsate waste from the decontamination process. Pickup and disposal requests for eight of these drums are intended for the sanitary lagoon. The remaining four drums are intended for the Bilby Sump, or if solid, for the industrial landfill.
- Two drums of known DU were generated to manage them as low-level radioactive waste (LLW). Pickup and disposal request for this waste stream is intended for the radiological waste management facility (RWMF).
- One SAA for storage of RDX test kit materials containing spent acetone associated with the investigation is hazardous. Pickup and disposal request for this waste stream is intended for the treatment, storage, and disposal facility (TSDF).
- Additional waste (e.g., decontamination pad liners) may be generated during completion of waste management activities and closure of HWAAs.

A.9.3.1 Waste Management Samples

Waste management samples were collected from drummed waste, as necessary, to facilitate full characterization of the waste for disposal. Select drums of rinsate were sampled, based on analytical results from associated media samples, to determine the concentrations of chemical constituents and/or radiological isotopes present in the associated IDW.

A.10.0 Quality Assurance

This section contains a summary of QA/QC measures implemented during the sampling and analysis activities conducted in support of the CAU 204 corrective action investigation. The following sections discuss the data validation process, QC samples, and nonconformances. The evaluation of the DQOs is presented in Appendix B.

Laboratory analyses were conducted for samples used in the decision-making process to provide a quantitative measurement of any COPCs present. Rigorous QA/QC was implemented for all laboratory samples including documentation, verification, and validation of analytical results, and affirmation of DQO requirements related to laboratory analysis. Detailed information regarding the QA program is contained in the Industrial Sites QAPP (NNSA/NV, 2002b).

A.10.1 Data Validation

Data validation was performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002b) and approved protocols and procedures. All laboratory data from samples collected and analyzed for CAU 204 were evaluated for data quality according to the EPA Functional Guidelines (EPA, 1994 and 1999). These guidelines are implemented in a tiered process and are presented in Section A.10.1.1 through Section A.10.1.3. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results passed data validation criteria. Documentation of the data qualifications resulting from these reviews is retained in project files as a hard copy and electronic media.

One hundred percent of the data analyzed as part of this investigation were subjected to Tier I and Tier II evaluations. A Tier III evaluation was performed on five percent of the data analyzed.

A.10.1.1 Tier I Evaluation

Tier I evaluation for chemical and radiochemical analysis examines, but is not limited to:

- Sample count/type consistent with chain of custody
- Analysis count/type consistent with chain of custody
- Correct sample matrix

- Significant problems stated in cover letter or case narrative
- Completeness of certificates of analysis
- Completeness of Contract Laboratory Program (CLP) or CLP-like packages
- Completeness of signatures, dates, and times on chain of custody
- Condition-upon-receipt variance form included
- Requested analyses performed on all samples
- Date received/analyzed given for each sample
- Correct concentration units indicated
- Electronic data transfer supplied
- Results reported for field and laboratory QC samples
- Whether or not the deliverable met the overall objectives of the project

A.10.1.2 Tier II Evaluation

Tier II evaluation for chemical and radiochemical analysis examines, but is not limited to the following.

Chemical:

- Correct detection limits achieved
- Sample date, preparation date, and analysis date for each sample
- Holding time criteria met
- Quality control batch association for each sample
- Cooler temperature upon receipt
- Sample pH for aqueous samples, as required
- Detection limits properly adjusted for dilution, as required
- Blank contamination evaluated and applied to sample results/qualifiers
- Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries (%R) and relative percent differences (RPDs) evaluated and applied to laboratory results/qualifiers
- Field duplicate RPDs evaluated using professional judgement and applied to laboratory results/qualifiers
- Laboratory duplicate RPDs evaluated and applied to laboratory results/qualifiers
- Surrogate %R evaluated and applied to laboratory results/qualifiers
- Laboratory control sample %R evaluated and applied to laboratory results/qualifiers
- Initial and continuing calibration evaluated and applied to laboratory results/qualifiers
- Internal standard evaluation
- Mass spectrometer tuning criteria

- Organic compound quantitation
- Inductively coupled plasma interference check sample evaluation
- Graphite furnace atomic absorption quality control
- Inductively coupled plasma serial dilution effects
- Recalculation of 10 percent of laboratory results from raw data

Radioanalytical:

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

A.10.1.3 Tier III

The Tier III review is an independent examination of the Tier II evaluation. The Tier III review duplicates the Tier II review for a limited number of samples (typically 5 percent) by an independent agency and includes the following additional evaluations.

Chemical:

- Recalculation of all laboratory results from raw data

Radioanalytical:

- QC sample results (e.g., calibration source concentration, %R, and RPD) verified
- Radionuclides and their concentration validated, as appropriate, considering their decay schemes, half-lives, and process knowledge and history of the facility and site
- Each identified line in the spectra verified against emission libraries and calibration results
- Independent identification of spectra lines, area under the peaks, and quantification of radionuclide concentration in a random number of sample results

A Tier III review of at least five percent of the sample analytical data was performed by TechLaw, Inc., of Lakewood, Colorado. Tier II and Tier III results were compared and where differences were noted, data were reviewed and changes made accordingly.

A.10.2 Field Quality Control Samples

A total of 32 trip blanks, 4 equipment rinsate blanks, 7 field blanks, 1 source blank, 7 MS/MSDs, and 18 field duplicates were collected and submitted for laboratory analysis as listed in the sample tables of Section A.3.0 through A.8.0. The blanks and duplicates were assigned individual sample numbers and sent to the laboratory "blind." Additional samples were selected by the laboratory to be analyzed as laboratory duplicates. Documentation related to the collection and analyses of these samples is retained in project files. The minimum requirements set forth in the Industrial Sites QAPP (NNSA/NV, 2002b) and the CAIP (NNSA/NV, 2002a) for collecting field QC samples were met.

Field blanks, source blanks, and equipment rinsate blanks were analyzed for the parameters listed in the sample tables in Section A.3.0 through Section A.8.0. Trip blanks were only analyzed for VOCs. There were no environmental samples rejected or deemed unusable based on the results of field-collected blank analytical data.

Field duplicate samples were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in the sample tables in Section A.3.0 through Section A.8.0. The review and discussion of field duplicates and MS/MSD results as they apply to precision and/or accuracy is presented in Appendix B.

A.10.2.1 Laboratory Quality Control Samples

Analysis of surrogate spikes (for organic analyses), method blanks, preparation blanks (for chemical analyses), initial and continuing calibration blanks (for total metals), and laboratory control samples were performed for each sample delivery group (SDG) by Paragon Analytics, Inc. and DATACHEM Laboratories for asbestos analyses. The results of these analyses (excluding asbestos) were used to qualify associated environmental sample results according to EPA Functional Guidelines (EPA, 1994 and 1999). Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

One laboratory duplicate analysis for metals was performed for each SDG that reported total metals. The duplicate results are compared to the original sample results to provide a measure of analytical laboratory precision. A more detailed discussion of the laboratory QC samples as they relate to precision and accuracy is presented in Appendix B.

A.10.3 Field Nonconformances

A total of seven field nonconformances were identified during the CAU 204 investigation. All nonconformances were discovered and corrected. Data quality was not impacted.

A.10.4 Laboratory Nonconformances

Laboratory nonconformances are generally due to inconsistencies in analytical instrumentation operation, sample preparations, extractions, missed holding times, and fluctuations in internal standard and/or calibration results. All nonconformances have been accounted for in the data qualification process and discussed in Appendix B in reference to rejected data. Documentation of these results is retained in project files.

A.11.0 Summary

Analytes detected in soil samples during the CAI were evaluated against PALs to determine the nature and extent of COCs for CAU 204. Assessment of the data generated from CAI activities indicates the PALs were exceeded in soil samples at several CAU 204 CASs.

CAS 01-34-01, Underground Inst. House Bunker Summary

The evaluation of data collected from CAS 01-34-01 investigation showed that the paint used on the walls contains lead and the stain on the cement contains TPH (DROs) and PCBs.

CAS 02-34-01, Instrument Bunker Summary

The evaluation of data collected from CAS 02-34-01 investigation showed that the paint used on the walls contains lead and the stain on the cement contains TPH (DROs).

CAS 03-34-01, Underground Bunker Summary

The evaluation of data collected from CAS 03-34-01 investigation showed that the paint used on the walls contains lead and the stain on the cement contains TPH (DROs), and PCBs.

CAS 05-18-02, Chemical Explosives Storage Summary

The evaluation of data collected from CAS 05-18-02 investigation showed that the paint used on the walls contains lead and stains on the concrete contain TPH (DROs), and PCBs. Evaluation of the exterior samples revealed radioactive contamination on a large area to a depth of about one foot affecting a volume of soil approximated at 1,360 yd^3.

CAS 05-33-01, Kay Blockhouse Summary

Data obtained from samples of the interior of Kay Blockhouse revealed that the walls of the bunker and washed-in soil contain no contamination. Data gathered from the analysis of the samples from the exterior of Kay Blockhouse and the surrounding environs revealed that many of the activities conducted at the site have left radioactive contamination in two primary locations, asbestos in four

separate locations, and lead in three separate locations. The radioactive contamination is assumed to affect approximately 560 yd^3 of soil and ranges in depths a the top foot.

CAS 05-99-02, Explosive Storage Bunker Summary

Samples taken from inside and outside the doorway of the storage bunker as well as the results from the walk-over survey revealed no contamination above PALs as defined in the CAIP.

A.12.0 References

ASTM, see American Society for Testing and Materials.

Alderson, S.L., IT Corporation. 1999. Memorandum to D. Wilson (SAIC), "Response to State of Nevada Division of Environmental Protection Comments Concerning Corrective Action Units (CAUs) 261, 266, and 500," 27 August. Las Vegas, NV.

American Society for Testing and Materials. 1995. *Standard Test Method for Strontium-90 in Water,* ASTM D 5811-95. West Conshohocken, PA.

American Society for Testing and Materials. 1997a. *Standard Test Method for Isotopic Uranium in Water by Radiochemistry*, ASTM D 3972-97. West Conshohocken, PA.

American Society for Testing and Materials. 1997b. *Standard Test Method for Plutonium in Water*, ASTM D 3865-97. West Conshohocken, PA.

American Society for Testing and Materials. 2000a. *Standard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy,* ASTM C 1001-90. West Conshohocken, PA.

American Society for Testing and Materials. 2000b. *Standard Test Method for Radiochemical Determination of Uranium in Soil by Alpha Spectroscopy,* ASTM C 1000-90. West Conshohocken, PA.

BN, see Bechtel Nevada.

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

CFR, see *Code of Federal Regulations*.

Code of Federal Regulations. 2003a. Title 40 CFR 141.66, "Maximum Contaminant Levels for Radionuclides." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2003b. Title 40 CFR 260-282, "Hazardous Waste Management." Washington, DC: U.S. Government Printing Office.

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

EPA, see U.S. Environmental Protection Agency.

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

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

Hale, G.J., D.A. Trudeau, and C.J. Savard. 1995. *Water-Level Data from Wells and Test Holes Through 1991, and Potentiometric Contours as of 1991 for Yucca Flat, Nevada Test Site, Nye County, Nevada,* USGS WRIR-95-4177. Carson City, NV: U.S. Geological Survey.

Holmes & Narver, Inc. 1957a. Engineering drawing 001-300-E4 entitled, "Electrical Lighting Plan." Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957b. Engineering drawing 001-300-E6 entitled, "Air Conditioning Electrical Plan," 4 November. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957c. Engineering drawing 001-300-M1 entitled, "Structure 300 Air Conditioning Ductwork Sleeve Layout and Details," 4 November. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957d. Engineering drawing 001-300-S1 entitled, "Structure No 300, Area - 1, Plan & Section," 31 October. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957e. Engineering drawing 002-300-E3 entitled, "Equipment Room Electrical Plan & Sections," 18 November. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957f. Engineering drawing 002-300-M1 entitled, "Structure 300 Air Conditioning Ductwork Sleeve Layout & Details," December. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957g. Engineering drawing 002-300-S12 entitled, "Modifications & Additions Floor Plans & Details," 24 September. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957h. Engineering drawing 002-300-S13 entitled, "Modifications & Additions Structural Plan & Sections," 24 September. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957i. Engineering drawing 003-300-E1 entitled, "Structure No. 300 Area T-3 Electrical Plan & Det.," 15 October. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957j. Engineering drawing 003-300-M4 entitled, "Structure 3-300 Intake and Exhaust Duct Cover Plan & Details," 21 December. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1957k. Engineering drawing 003-300-S6 entitled, "Modification to Structure No. 300," 26 November. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1958. Engineering drawing BD.2-300-1 entitled, "Plan & Section," 1 April. Mercury, NV: Archives and Records Center.

Holmes & Narver, Inc. 1959. Engineering drawing BD.1-300-1 entitled, "Plan & Section," 12 June. Las Vegas, NV.

Holmes & Narver, Inc. 1960. *Facilities Brochure of the Nevada Test Site for the Atomic Energy Commission.* Las Vegas, NV.

Holmes & Narver, Inc. 1990. *Nevada Site Development Plan, Nevada Test Site Building Inventory,* September. Las Vegas, NV.

IT, see IT Corporation.

IT Corporation. 2002a. *Site-Specific Health and Safety Plan for CAU 204, Storage Bunker, Nevada Test Site, Nevada*. Las Vegas, NV.

IT Corporation. 2002b. CAU 204 Field Forms for CASs 05-18-02, 05-33-01, and 05-99-02, 12 February. Las Vegas, NV.

LANL, see Los Alamos National Laboratory.

Los Alamos National Laboratory. 1984. *The Nevada Test Site - Electrical Experience Associated with Blockhouse Recording with Emphasis on Alpha Measurements*, June. Prepared by J. Malik. Los Alamos, NM.

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

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurement.

NDEP, see Nevada Division of Environmental Protection.

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

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

Nevada Administrative Code. 2003. NAC 445A, "Water Controls." Carson City, NV.

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. 1997a. *Class II Solid Waste Disposal Site for Municipal and Industrial Solid Waste, Area 23 of the NTS*, Permit SW 13 097 04. Carson City, NV.

Nevada Division of Environmental Protection. 1997b (as amended in August 2000). *Class III Solid Waste Disposal Site for Hydrocarbon Burdened Soils, Area 6 of the NTS*, Permit SW 13 097 02. Carson City, NV.

Nevada Division of Environmental Protection. 1997c (as amended in August 2000). *Class III Solid Waste Disposal Site; U10C, Area 9 of the NTS*, Permit SW 13 097 03. Carson City, NV.

REECo, see Reynolds Electrical & Engineering Co., Inc.

RSN, see Raytheon Services Nevada.

Raytheon Services Nevada. Date Unknown a. Engineering drawing JS-002-300-E2 entitled, "Bunker 2-300 Counterproliferation Power Plan." Las Vegas, NV.

Raytheon Services Nevada. Date Unknown b. Engineering drawing JS-002-300-M2 entitled, "Bunker 2-300 Counterproliferation Floor Plan." Las Vegas, NV.

Reynolds Electrical & Engineering Co., Inc. 1961. Engineering drawing FR-10-C1 entitled, "Proposed Layout Plan Sugar Bunker Facilities," 11 May. Las Vegas, NV.

Shaw, see Shaw Environmental, Inc.

Shaw Environmental, Inc. 2003a. *Field Instruction for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada*. Las Vegas, NV.

Shaw Environmental, Inc. 2003b. Field site drawing from the Field Activity Daily Log, May to June. Las Vegas, NV.

Shott, G.J., V. Yucel, M.J. Sully, L.E. Barker, S.E. Rawlinson, and B.A. Moore. 1997. *Performance Assessment/Composite Analysis for the Area 3 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Rev. 2.0. Las Vegas, NV.

Silas Mason Co. 1956. Engineering drawing FRK-S2 entitled, "Structural Plan Kay Blockhouse," 5 December. Mercury, NV: Archives and Records Center.

USGS, see U.S. Geological Survey.

U.S. Atomic Energy Commission. 1953. *Technical Structures and Operations,* 14 March. Las Vegas, NV.

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

U.S. Department of Energy. 1997. *Environmental Measurements Laboratory Procedures Manual*, HASL-300, 28th Edition, Vol. 1. New York, NY.

U.S. Department of Energy. 1999. *Nevada Test Site Resource Management Plan*, DOE/NV--518. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002a. *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada,* DOE/NV--866. 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, Nevada Operations Office. 1996. *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada,* DOE/EIS 0243. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 2000. *NV/YMP Radiological Control Manual,* Rev. 4, DOE/NV/11718-079. Prepared by Bechtel Nevada. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 2001. *Nevada Test Site Guide*, November, DOE/NV--715. Las Vegas, NV.

US Ecology and Atlan-Tech. 1992. *Environmental Monitoring Report for the Proposed Ward Valley, California, Low-Level Radioactive Waste (LLRW) Facility.* Auburn, CA.

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

U.S. Environmental Protection Agency. 1994. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4. Washington, DC.

U.S. Environmental Protection Agency. 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846 CD ROM PB97-501928GEI, which contains updates for 1986, 1992, 1994, and 1996. Washington, DC.

U.S. Environmental Protection Agency. 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-99/008. Washington, DC.

U.S. Environmental Protection Agency. 2002. *Region 9 Preliminary Remediation Goals (PRGs)*. Prepared by S.J. Smucker. San Francisco, CA.

U.S. Geological Survey. 1975. *Hydrogeologic and Hydrochemical Framework, South Central Great Basin Nevada-California, with Special Reference to the Nevada Test Site,* U.S. Geological Survey Professional Paper 712-C. Prepared by I.J. Winograd and W. Thordarson. Denver, CO.

Appendix B

Data Assessment for Corrective Action Unit 204, Storage Bunkers, Nevada Test Site, Nevada

B.1.0 Data Assessment

This appendix provides an assessment of the CAU 204 investigation results to determine whether the data collected met the DQOs and can support their intended use in the decision-making process. This assessment includes a reconciliation of the data with the general CSMs established for this project.

The following sections provide an evaluation of the DQIs in determining the degree of acceptability or usability of the reported data for the decision-making process.

B.1.1 Precision

Precision is a measure of agreement among a replicate set of measurements of the same property under similar conditions. This agreement is expressed as the RPD between duplicate measurements (EPA, 1996). The RPD is determined by dividing the difference between the replicate measurement values by the average measurement value and multiplying the result by 100, or:

$$RPD = |100 \times [\{(a_1 - a_2)/(a_1 + a_2)/ 2\}]|$$

where:

a_1 = The sample value
a_2 = The duplicate sample value

Determinations of precision can be made for field samples, laboratory duplicates, or both. For field samples, duplicates are collected simultaneously with a sample from the same source under similar conditions in separate containers. The duplicate sample is 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 portions of an existing sample. Typically, other laboratory duplicate QC samples include MSD and laboratory control sample duplicate (LCSD) samples.

The variability in the results from the analysis of field duplicates is generally greater than the variability in the results of laboratory duplicates. This higher variability for field duplicates results from the increased potential to introduce factors influencing the analytical results during sampling, sample preparation, containerization, handling, packaging, preservation, and environmental conditions before the samples reach the laboratory. Laboratory QC samples only assess the variability of results introduced by sample handling and preparation in the laboratory and by the analytical procedure, which also impacts field duplicates. In addition, the variability in duplicate results is expected to be greater for soil samples than water samples, primarily due to the inherent heterogeneous nature of soil samples despite sample preparation methods that include mixing to improve sample homogeneity.

B.1.1.1 Precision for Chemical Analysis

The RPD criteria used for assessment of laboratory sample duplicate precision for analytical results of samples collected at CAU 204 were established as follows:

- Inorganic analysis RPD criteria is obtained from the EPA's *Contract Laboratory Functional Guidelines for Inorganic Data Review* (EPA, 1994).
- Organic analysis RPD criteria is established by the laboratory to evaluate precision for MSD and LCSD analyses.

The control limits are evaluated at the laboratory on a quarterly basis by monitoring the historical data and performance for each method. No review criteria for organic field duplicate RPD comparability have been established; therefore, the laboratory MSD RPD criteria is applied for precision evaluation of field duplicates.

Precision values for organic and inorganic analysis that are within the established control criteria indicate that analytical results for associated samples are valid. Laboratory duplicate RPD values that are outside the criteria for organic analysis 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. Inorganic laboratory duplicate RPD values outside the established control criteria do result in the qualification of associated analytical results as estimated. Field duplicate RPD values that are outside the criteria for organic and inorganic analyses do not result in the qualification of analytical data. Out of control RPD values do not necessarily indicate that the data is not useful for the purpose

intended; however, it is an indication data precision should be considered for the overall assessment of the data quality and potential impact on data application in meeting project site characterization objectives. Method-specific precision as RPD is determined by taking the number of measurements within criteria, dividing that by the number of measurements analyzed, and multiplying by 100.

For the purpose of determining data precision of sample analyses for CAU 204, all water and soil samples, including field QC samples (e.g., trip blanks, equipment rinsate samples, field blanks) were evaluated and incorporated into the precision calculation.

Precision for the measurement of target compounds or analytes collected at CAU 204 was determined for RCRA metals, beryllium, zinc, VOCs, SVOCs, TPH-DROs and TPH-GRO, explosives, pesticides, PCBs, and warfarin.

Table B.1-1 provides the field and laboratory duplicate precision analysis results.

B.1.1.2 Precision for Radiochemical Analysis

The precision of radiochemical measurements is evaluated by measuring two aliquots of a sample and comparing the results. A laboratory duplicate is measured with every batch of samples analyzed by the laboratory. Field duplicate data is available when two aliquots of a sample are submitted to the laboratory for analysis. Laboratory control sample duplicates are measured by the laboratory when there is an insufficient sample to measure a duplicate of a field sample. The MSDs, also used to evaluate precision, are performed by the laboratory upon request. No MSDs were included in CAU 204.

The duplicate precision is evaluated using the RPD or normalized difference (ND). The RPD is applicable when both the sample and its duplicate have concentrations of the target radionuclide exceeding five times their minimum detectable concentration. This excludes many measurements because the samples contain nondetectable or low levels of the target radionuclide. In situations where the RPD does not apply, duplicate results are evaluated using the normalized difference which is expressed by:

$$\text{Normalized Difference} = \frac{S - D}{\sqrt{(TPU_S)^2 + (TPU_D)^2}}$$

Table B.1-1
Chemical Precision Measurements for CAU 204

	ORGANICS								INORGANICS	
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	Explosives	Pesticides	Warfarin	Metals*	Mercury
Matrix Spike Duplicate (MSD) Precision										
Total Number of MSD Measurements	75	121	15	12	18	154	0	4	98	15
Total Number of RPDs within Criteria	70	121	15	12	18	154	0	4	96	14
MSD Percent Precision	93.33	100	100	100	100	100	NA	100	97.96	93.33
Laboratory Control Sample Duplicate (LCSD) Precision										
Total Number of LCSD Measurements	120	176	17	19	34	224	12	4	148	17
Total Number of RPDs within Criteria	120	176	17	19	34	224	12	4	148	17
LCSD Percent Precision	100	100	100	100	100	100	100	100	100	100
Field Sample Duplicate (FD) Precision										
Total Number of FD Measurements	483	426	5	5	42	84	0	1	57	7
Total Number of RPDs within Criteria	472	426	5	4	42	84	0	1	53	5
FD Percent Precision	97.72	100	100	80	100	100	NA	100	92.98	71.43
Laboratory Sample Duplicate (Lab-Dup) Precision										
Total Number of Lab-Dup Measurements	NA	NA	NA	NA	NA	NA	NA	NA	98	15
Total Number of RPDs within Criteria	NA	NA	NA	NA	NA	NA	NA	NA	95	15
Lab-Dup Percent Precision	NA	NA	NA	NA	NA	NA	NA	NA	**96.94**	**100**

* Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Selenium, Silver, Zinc

NA = Not applicable

Where:

S = Sample result
D = Duplicate Result
TPU_S = 2F total propagated uncertainty of the sample
TPU_D = 2F total propagated uncertainty of the duplicate
F = Standard deviation

The control limit for the ND is -2 to 2, which represent a confidence level of 95 percent. Depending on the sample concentration, only one duplicate evaluation needs to be performed.

Samples are qualified based on laboratory prepared duplicates, but not field duplicates or MSDs.

A duplicate comparison that is outside control limits does not necessarily indicate that the data is not useful for the purpose intended; however, it is an indication data precision should be considered for the overall assessment of the data quality and potential impact on data application in meeting project site-characterization objectives.

For the purpose of determining data precision of sample analyses for CAU 204, all water and soil duplicates were evaluated and incorporated into Tables B.1-2 and B.1-3.

The isotopic gamma analysis provides results for 22 radionuclides. Only two or three of these radionuclides are usually present in sufficient concentration to allow the determination of their RPDs. The duplicate data for the remaining radionuclides is compared using the ND. The isotopic plutonium analysis gives results for Pu-238 and Pu-239/240; the isotopic uranium for U-234, U-235, and U-238; the isotopic thorium for Th-228, Th-230, and Th-232, and the Sr-90 analysis gives a result for Sr-90.

Laboratory field precision tests were performed for gamma spectroscopy, Sr-90, isotopic uranium, and isotopic plutonium. All the measurements were within the control limits except for the two normalized difference and two RPD comparisons for the gamma measurement. Also the RPD was outside the control limit for a Sr-90, U-238, and Pu-239 analysis. The results (of the field samples measured with these duplicates) were qualified as estimated.

Table B.1-2
Laboratory Duplicate Precision

	Gamma	Isotopic Uranium	Isotopic Plutonium	Strontium-90	Isotopic Thorium	Tritium	Gross Alpha	Gross Beta
Relative Percent Difference								
Number Performed	83	91	2	7	4	0	0	0
Number Within Limits	81	90	1	6	4	0	0	0
Percent Within Limits	98	99	50	86	100	NA	NA	NA
Normalized Difference								
Number Performed	907	55	39	16	0	1	1	1
Number Within Limits	905	55	39	16	0	1	1	1
Percent Within Limits	100	100	100	100	NA	100	100	100

NA = Not applicable

Table B.1-3
Field Duplicate Precision

	Gamma Spectroscopy	Isotopic Uranium	Strontium-90	Isotopic Plutonium
Relative Percent Difference				
Number Performed	27	32	0	0
Number Within Limits	27	32	0	0
Percent Within Limits	100	100	NA	NA
Normalized Difference				
Number Performed	281	10	6	10
Number Within Limits	280	10	6	10
Percent Within Limits	100	100	100	100

NA = Not analyzed

The comparisons of field duplicates are included in Table B.1-3. All of the field duplicate comparisons were within the control limits except for one ND comparison of a gamma radionuclide. Samples were not qualified based on field duplicate performance.

B.1.1.3 Precision Summary

Overall, the precision for CAU 204 measurements were within DQI specifications. The results of the duplicate comparison of the field and laboratory duplicates (LDs) for chemical analyses are provided in Table B.1-1. Of the 1,110 precision tests performed on field duplicates (FDs), 1,092 or 98.38 percent were within control limits. Of the 1,396 precision tests for LDs, LCSD, and MSDs, 1,385 or 99.21 percent were within control limits. More importantly, individual precision summaries for the designated analyses as shown in the individual tables were also within control limits.

The results of LDs for radiochemical analyses, including laboratory spike and matrix spike RPDs, are provided in Table B.1-2. Of the 1,207 precision tests performed for LDs and MS/MSDs, 1,200 or 99.42 percent were within control limits. The results of the duplicate comparison of the FDs for radiochemical analyses are provided in Table B.1-3. Of the 366 precision tests performed on the FDs, 365 or 99.73 percent were within the control limits.

In summary, precision for CAU 204 should be considered to be within acceptable limits for evaluation of the resulting data, thereby achieving established DQOs.

B.1.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations.

B.1.2.1 Accuracy for Chemical Analysis

Accuracy is determined by analyzing a reference material of known pollutant concentration or by reanalyzing a sample to which a material of known concentration or amount of pollutant has been added (spiked). Accuracy is expressed as percent recovery (% R) for the purposes of evaluating the quality of data reported for CAU 204.

Matrix spike samples are prepared by adding a known concentration of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used to determine the laboratory's overall efficiency by comparing the percent recovered to the known true value. For example, a sample that is spiked with 10 ppm of a known analyte should produce a reported result of 10 ppm greater than the value of the sample itself. Consequently, the accuracy for this analysis would be reported as 100 percent. Matrix spike recoveries within the specified criteria for organic and inorganic analyses indicate the laboratory is operating within established controls and producing valid, quality results. Matrix spike results outside the control limits for organic analyses may not result in qualification of the data. An assessment of the entire analytical process is performed to determine the quality of the data and whether qualification is necessary.

Laboratory Control Samples (LCSs) are generated to provide accuracy of analytical methods and laboratory performance. They are prepared, extracted (as required by method), analyzed and reported once per SDG, per matrix. For organic analyses, laboratory control limits are used to evaluate the accuracy of all analyses. The control limits are evaluated at the laboratory quarterly by monitoring the historical data and performance for each method. The acceptable limits for inorganic analyses are established in the EPA *Contract Laboratory Functional Guidelines for Inorganic Data Review* (1994). Sample results within established control ranges for organic and inorganic analyses show that the analytical method is accurate and the data provided are valid.

Surrogates (System Monitoring Compounds) are used to assess the method performance for each sample analyzed for organic analyses. Control limits established by the laboratory are used to evaluate the accuracy of the surrogate recoveries. Factors beyond the laboratory's control, such as sample matrix effects, can cause the measured values to be outside of the established criteria. Therefore, the entire sampling and analytical process must be evaluated when determining the quality of the analytical data provided.

Table B.1-4 identifies the number of matrix spike, laboratory control, and surrogate measurements performed for CAU 204. The table presents the total number of measurements analyzed, the number of measurements within the specified criteria, and the percent-accuracy of each method. Method specific accuracy is determined by taking the number of measurements within criteria, dividing that

Table B.1-4
Laboratory Accuracy Measurements for CAU 204

	ORGANICS								INORGANICS	
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	EXPLOSIVES	PESTICIDES	WARFARIN	METALS*	MERCURY
Matrix Spike (MS) Accuracy										
Total Number of MS Measurements	150	242	30	24	36	322	0	8	196	30
Total Number of MS Measurements within criteria	109	234	30	22	36	315	0	8	186	28
MS Percent Accuracy	72.67	96.69	100	91.67	100	97.83	NA	100	94.90	93.33
Laboratory Control Sample (LCS) Accuracy										
Total Number of LCS Measurements	240	352	34	38	68	448	24	8	296	34
Total Number of LCS Measurements within Criteria	240	351	34	38	68	447	24	8	296	34
LCS Percent Accuracy	100	99.72	100	100	100	99.78	100	100	100	100
Surrogate Accuracy										
Total Number of Measurements Analyzed	10,419	7,455	98	98	714	1,346	63	NA	NA	NA
Total Number of Measurements Not Affected by Out-of-Control Surrogates	10,005	7,375	98	98	630	1,346	0	NA	NA	NA
Surrogate Percent Accuracy	96.03	98.93	100	100	88.24	100	0	NA	NA	NA

*Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Selenium, Silver, Zinc

NA = Not applicable

by the total number of measurements analyzed, and multiplying by 100. For organic analyses, each sample had surrogates analyzed; therefore, the number of surrogates is significantly greater than the number of matrix spike and laboratory control samples.

The matrix spike accuracy results for organic analyses in Table B.1-4 includes the total number of matrix spike measurements per analysis and the number of matrix spike measurements within criteria. All samples for organic analyses within the associated SDG are not qualified, only the native sample in which the spike was added. Inorganic matrix spike results outside of the established control criteria do result in data qualified as estimated for all the samples in that batch. However, only the analyte(s) outside of control require(s) qualification.

Table B.1-5 includes the total number of LCS measurements per analysis and the number of LCS measurements within criteria. Laboratory control samples within the specified criteria for organic and inorganic analyses indicate the laboratory is producing valid data. Laboratory control samples outside of the established criteria result in the qualification of inorganic data and may result in the qualification of organic data. For organic analyses, an evaluation of the overall analytical process is performed to determine if data qualification is necessary. Inorganic LCS recoveries outside of established controls require data to be qualified for the individual analyte out of control. If the LCS criteria are not met, the laboratory performance and method accuracy are in question.

Surrogates reported within established control criteria indicate good laboratory method performance and the absence of matrix influences on the samples and result in quality, valid data. Table B.1-6 includes the total number of sample measurements performed for each method and the total number of sample measurements qualified for surrogate recoveries exceeding criteria. The estimated organic data in this CAU do not necessarily indicate the data is not useful. Data qualification is one factor to be considered in the overall assessment of the data quality and the impact to the project's objectives.

Accuracy for the measurement of target analytes collected at CAU 204 was determined for RCRA metals, beryllium, zinc, VOCs, SVOCs, TPH-DROs and TPH-GRO, explosives, pesticides, PCBs, and warfarin.

For the purpose of determining data accuracy of sample analysis for CAU 204, all water and soil samples including field QC samples (i.e., trip blanks, equipment rinsate samples, field blanks) were evaluated and incorporated into the accuracy calculation.

Surrogate % Accuracy for pesticides was 0 percent. Only three samples were submitted for Pesticides analysis and were estimated for surrogate % exceeding criteria.

B.1.2.2 Accuracy for Radiochemical Analysis

Laboratory control samples and MS samples are used to determine the accuracy of radioanalytical measurements. The LCS is prepared by adding a known concentration of the radionuclide being measured to a sample that does not contain radioactivity (i.e., distilled water). This sample is analyzed with the field samples using the same sample preparation, reagents, and analytical methods employed for the samples. One LCS is prepared with each batch of samples for analysis by a specific measurement. The MS samples are prepared by adding a known concentration of the target radionuclide to a specified field sample with a measured concentration.

The accuracy of the LCS determination is expressed as a percent recovery by the following:

$$\% \text{ Recovery (\%R)} = \frac{\text{Amount of Analyte Measured}}{\text{Amount of Analyte Added}} \times 100$$

The accuracy of the MS determination is expressed as a percent recovery by the following**:**

$$\% \text{ Recovery (\%R)} = \frac{\text{MS Result \& Sample Result}}{\text{Amount of Analyte Added}} \times 100$$

If the LCS recoveries are outside acceptable control limits, qualifiers will be added to the field samples analyzed with the LCS.

Table B.1-5 contains the number of laboratory control samples, including soil and water matrices, measured for each radiochemical measurement for CAU 204. Each LCS measured by gamma

Table B.1-5
Laboratory Control Sample (LCS) Accuracy

	Gamma	Isotopic Uranium	Isotopic Plutonium	Strontium-90	Gross Alpha	Gross Beta	Tritium	Isotopic Thorium
Total Number	124	81	18	25	1	1	1	3
Total Number within Criteria	124	81	18	25	1	1	1	3
LCS Percent Accuracy	100	100	100	100	100	100	100	100

spectroscopy contains four radionuclides, while the isotopic uranium contains two and the Sr-90, isotopic plutonium, isotopic thorium, tritium, gross alpha and gross beta LCSs contain one radionuclide. The percent accuracy for the procedure is determined as the number of LCS measurements that are within the control limits divided by the total number LCS analyses, multiplied by 100.

Laboratory control samples within the specified criteria for radiological analyses indicate the laboratory is producing valid data. If the LCS criteria are not met, the laboratory performance and method accuracy are in question. Radiological LCS recoveries outside of established controls require data to be qualified for the individual radionuclide out of control.

The LCS recoveries were within the control limits for all analyses.

There was one MS measurement in CAU 204, which was for tritium. This result, listed in Table B.1-6 was within the control limit.

Since all accuracy tests were within limits, no samples were qualified based on accuracy.

Table B.1-6
Laboratory Matrix Spike (MS) Accuracy

	Tritium
Total Number	1
Total Number within Criteria	1
MS Percent Accuracy	100

B.1.2.3 Accuracy Summary

Overall accuracy for CAU 204 was within acceptable limits. Surrogate recoveries, which gauge the accuracy of individual sample results for specified chemical analyses, were within acceptable accuracy ranges (82 percent or better). Acceptable MS recovery results were 94 percent or better for chemical and radiochemical analyses except for VOCs, which was 72.67 percent and TPH GRO, which was 91.67 percent. The percentage of acceptable LCS recoveries was 100 percent for all chemical analyses indicating that the lower TPH-GRO matrix spike recoveries were likely the result of matrix interferences and not an analytical problem. Radioanalytical LCS recoveries were 100 percent.

In summary, accuracy results for CAU 204 should be considered acceptable and meet DQO requirements.

B.1.3 Completeness

Completeness is defined as the acquisition of sufficient data of the appropriate quality to satisfy DQO decision data requirements. A measure of completeness is the amount of data that are judged to be valid. Percent completeness for sample analyses was determined by dividing the total number of samples analyzed (per method) by the total number of samples sent to the lab and multiplied by 100. Percent completeness for measurement usability (not rejected) was determined by dividing the total number of non-rejected measurements by the total number measurements (per method) and multiplied by 100. All measurements for completeness include re-analyses. Tables B.1-7 and B.1-8 contain results of completeness per analytical method.

The specified sampling locations were used as planned and all samples were collected as specified in the CAU 204 CAIP (NNSA/NV, 2002).

In accordance with the CAU 204 CAIP (Table 6-1), 80 percent of CAS-specific noncritical and 100 percent of CAS-specific critical parameters had valid results.

Table B.1-7
Chemical Completeness for CAU 204

Completeness Parameters	ORGANICS								INORGANICS	
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	Explosives	Pesticides	Warfarin	Metals*	Mercury
Sample Analysis Completeness										
Total Samples Sent to Laboratory	145	102	98	98	102	96	3	7	129	112
Total Samples Analyzed	145	102	98	98	102	96	3	7	129	112
Total Samples not Analyzed by the Laboratory	0	0	0	0	0	0	0	0	0	0
Percent Completeness	100	100	100	100	100	100	100	100	100	100
Measurement Usability Completeness										
Total Measurements **	10,419	7,455	98	98	714	1,346	63	7	913	112
Total Measurements Rejected - Field	0	0	0	0	0	0	0	0	0	0
Total Measurements Rejected - Lab/Matrix	177	158	0	0	0	0	0	0	0	0
Percent Completeness	98.30	97.88	100	100	100	100	100	100	100	100

* Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Selenium, Silver, Zinc
** Measurements include reanalyses

Table B.1-8
Radiological Completeness for CAU 204

Completeness Parameters	HASL300	ISOU	SR7500	UGTAISOPU	EPA 906.0	SM7110	ISOTH
Sample Analysis Completeness							
Total Samples Sent to Laboratory	302	303	119	94	4	4	5
Total Samples Analyzed	302	303	119	94	4	4	5
Total Samples not Analyzed by the Laboratory	0	0	0	0	0	0	0
Percent Completeness	100	100	100	100	100	100	100
Measurement Usability Completeness							
Total Measurements*	6,644	909	119	188	4	8	15
Total Measurements Rejected - Field	0	0	0	0	0	0	0
Total Measurements Rejected - Lab/Matrix	3	0	0	0	0	0	0
Percent Completeness	99.95	100	100	100	100	100	100

*Measurements include reanalyses

B.1.3.1 Completeness Summary

As shown in Table B.1-7 and Table B.1-8, completeness objectives for this CAU have been achieved. Completeness for chemical analyses were 98 percent or better. Completeness for radiochemical analyses were 99 percent or better. Rejected data have been thoroughly reviewed and questions concerning these data have been addressed on a CAS-by-CAS basis in Section B.1.4. The rejected data have been determined to have no affect on closure decisions for this CAU. Overall, measurements and sampling completeness criteria have been satisfied for the CAU 204 CAI.

B.1.4 Rejected Data

Underground Inst. House Bunker (CAS 01-34-01) Rejected Data

Table B.1-9 contains the rejected analytical results per analytical method for CAS 01-34-01. Several SVOC results were rejected from the concrete analytical results in 204A501 due to potential existing matrix effects and because surrogate recoveries were less than 10 percent. Two of the analytical results were also rejected because the calibration verification criteria were not met. The results of this analysis were being used to verify that contaminants were present. The usable results from the

Table B.1-9
CAU 204 Rejected Data for CAS 01-34-01

Sample Number	Laboratory Method	Parameter	Sample Matrix
204A501	SW8270	2,3,4,6-Tetrachlorophenol	Concrete
204A501	SW8270	2,4,5-Trichlorophenol	Concrete
204A501	SW8270	2,4,6-Trichlorophenol	Concrete
204A501	SW8270	2,4-Dichlorophenol	Concrete
204A501	SW8270	2,4-Dimethylphenol	Concrete
204A501	SW8270	2,4-Dinitrophenol	Concrete
204A501	SW8270	2-Chlorophenol	Concrete
204A501	SW8270	2-Methylphenol	Concrete
204A501	SW8270	2-Nitrophenol	Concrete
204A501	SW8270	4,6-Dinitro-2-Methylphenol	Concrete
204A501	SW8270	4-Chloro-3-Methylphenol	Concrete
204A501	SW8270	4-Methylphenol	Concrete
204A501	SW8270	4-Nitrophenol	Concrete
204A501	SW8270	Benzoic Acid	Concrete
204A501	SW8270	Pentachlorophenol	Concrete
204A501	SW8270	Phenol	Concrete

analysis show that SVOCs are present. Therefore, these rejected data are not necessary to verify the presence of SVOCs.

Instrument Bunker (CAS 02-34-01) Rejected Data

Table B.1-10 contains the rejected results per analytical method for CAS 02-34-01. Several SVOC results were rejected in concrete sample 204B501 due to potential existing matrix effects and because surrogate recoveries were less than 10 percent. Two of the analytical results also were rejected because the calibration verification criteria were not met. The results of this analysis were being used to verify that contaminants were present and as a waste characterization sample. The usable results from the analysis show that SVOCs are present. Therefore, these rejected data are not needed to verify the presence of SVOCs.

Underground Bunker (CAS 03-34-01) Rejected Data

All analytical results for CAS 03-34-01 are considered usable.

Table B.1-10
CAU 204 Rejected Data for CAS 02-34-01

Sample Number	Laboratory Method	Parameter	Sample Matrix
204B501	SW8270	2,3,4,6-Tetrachlorophenol	Concrete
204B501	SW8270	2,4,5-Trichlorophenol	Concrete
204B501	SW8270	2,4,6-Trichlorophenol	Concrete
204B501	SW8270	2,4-Dichlorophenol	Concrete
204B501	SW8270	2,4-Dimethylphenol	Concrete
204B501	SW8270	2,4-Dinitrophenol	Concrete
204B501	SW8270	2-Chlorophenol	Concrete
204B501	SW8270	2-Methylphenol	Concrete
204B501	SW8270	2-Nitrophenol	Concrete
204B501	SW8270	4,6-Dinitro-2-Methylphenol	Concrete
204B501	SW8270	4-Chloro-3-Methylphenol	Concrete
204B501	SW8270	4-Methylphenol	Concrete
204B501	SW8270	4-Nitrophenol	Concrete
204B501	SW8270	Benzoic Acid	Concrete
204B501	SW8270	Pentachlorophenol	Concrete
204B501	SW8270	Phenol	Concrete

Chemical Explosives Storage (CAS 05-18-02) Rejected Data

Table B.1-11 contains the rejected results for each analytical method used for CAS 05-18-02. Acetone in the soil samples 204D001, 002, 005, 007, and 009 had an average and relative response factor of <0.05. The other acceptable analysis for acetone was just above detection and these samples were right at detection levels. Therefore, the presence of acetone is considered very low and not a COC. Several SVOC results were rejected in concrete sample 204D502 due to potential existing matrix effects, the surrogate recovery exceeded the lower limit, and the internal response showed extremely low counts. The results of this analysis were being used to verify the presence contaminants. The usable results from the analysis show that SVOCs are present. Therefore, these rejected data are not needed to verify the presence of SVOCs. Several SVOC results were rejected in soil samples 204D004 and 008. The results were rejected due to the internal area response showing an extremely low count possibly due to matrix effects. Because the SVOC concentrations in the nonrejected sample for CAS 05-18-02 had very low concentrations and were well below the PAL,

Table B.1-11
CAU 204 Rejected Data for CAS 05-18-02
(Page 1 of 3)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204D001	SW8260	Acetone	Soil
204D002	SW8260	Acetone	Soil
204D005	SW8260	Acetone	Soil
204D007	SW8260	Acetone	Soil
204D009	SW8260	Acetone	Soil
204D003	SW8270	Benzo(A)Pyrene	Soil
204D003	SW8270	Benzo(B)Fluoranthene	Soil
204D003	SW8270	Benzo(G,H,I)Perylene	Soil
204D003	SW8270	Benzo(K)Fluoranthene	Soil
204D003	SW8270	Dibenzo(A,H)Amthracene	Soil
204D003	SW8270	Indeno(1,2,3-CD)Pyrene	Soil
204D004	SW8270	3,3'-Dichlorobenzidine	Soil
204D004	SW8270	Benzo(A)Anthracene	Soil
204D004	SW8270	Benzo(B)Fluoranthene	Soil
204D004	SW8270	Benzo(G,H,I)Perylene	Soil
204D004	SW8270	Benzo(K)Fluoranthene	Soil
204D004	SW8270	Benzo(A)Pyrene	Soil
204D004	SW8270	Butyl Benzyl Phthalate	Soil
204D004	SW8270	Chrysene	Soil
204D004	SW8270	Di-N-Octyl Phthalate	Soil
204D004	SW8270	Dibenzo(A,H)Amthracene	Soil
204D004	SW8270	Indeno(1,2,3-CD)Pyrene	Soil
204D004	SW8270	Pyrene	Soil
204D005	SW8270	2,4-Dinitrophenol	Soil
204D006	SW8270	2,4-Dinitrophenol	Soil
204D007	SW8270	2,4-Dinitrophenol	Soil
204D008	SW8270	2,4-Dinitrophenol	Soil
204D008	SW8270	3,3'-Dichlorobenzidine	Soil
204D008	SW8270	Benzo(A)Anthracene	Soil
204D008	SW8270	Bis(2-Ethylhexyl)Phthalate	Soil
204D008	SW8270	Butyl Benzyl Phthalate	Soil
204D008	SW8270	Chrysene	Soil
204D008	SW8270	Di-N-Octyl Phthalate	Soil
204D008	SW8270	Pyrene	Soil
204D009	SW8270	2,4-Dinitrophenol	Soil

Table B.1-11
CAU 204 Rejected Data for CAS 05-18-02
(Page 2 of 3)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204D010	PAI713R8	Americium-241	Soil
204D502	SW8260	Trans-1,3-Dichloropropene	Concrete
204D502	SW8260	1,2-Dibromo-3-Chloropropane	Concrete
204D502	SW8260	Methyl Tertiary Butyl Ether	Concrete
204D502	SW8260	Trans-1,2-Dichloroethene	Concrete
204D502	SW8260	Trichlorotrifluoroethane	Concrete
204D502	SW8260	1,1,1,2-Tetrachloroethane	Concrete
204D502	SW8260	1,1,2,2-Tetrachloroethane	Concrete
204D502	SW8260	Cis-1,2-Dichloroethene	Concrete
204D502	SW8260	Trichlorofluoromethane	Concrete
204D502	SW8260	Cis-1,3-Dichloropropene	Concrete
204D502	SW8260	Dichlorodifluoromethane	Concrete
204D502	SW8260	1,2,3-Trichloropropane	Concrete
204D502	SW8260	1,2,4-Trichlorobenzene	Concrete
204D502	SW8260	1,2,4-Trimethylbenzene	Concrete
204D502	SW8260	1,3,5-Trimethylbenzene	Concrete
204D502	SW8260	1,1,1-Trichloroethane	Concrete
204D502	SW8260	1,1,2-Trichloroethane	Concrete
204D502	SW8260	1,2,3-Trichlorobenzene	Concrete
204D502	SW8260	Bromodichloromethane	Concrete
204D502	SW8260	Carbon Tetrachloride	Concrete
204D502	SW8260	Dibromochloromethane	Concrete
204D502	SW8260	1,4-Dichlorobenzene	Concrete
204D502	SW8260	2,2-Dichloropropane	Concrete
204D502	SW8260	Hexachlorobutadiene	Concrete
204D502	SW8260	1,2-Dichlorobenzene	Concrete
204D502	SW8260	1,2-Dichloropropane	Concrete
204D502	SW8260	1,3-Dichlorobenzene	Concrete
204D502	SW8260	1,3-Dichloropropane	Concrete
204D502	SW8260	Bromochloromethane	Concrete
204D502	SW8260	P-Isopropyltoluene	Concrete
204D502	SW8260	1,1-Dichloropropene	Concrete
204D502	SW8260	Tetrachloroethene	Concrete
204D502	SW8260	1,1-Dichloroethane	Concrete
204D502	SW8260	1,1-Dichloroethene	Concrete

Table B.1-11
CAU 204 Rejected Data for CAS 05-18-02
(Page 3 of 3)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204D502	SW8260	1,2-Dichloroethane	Concrete
204D502	SW8260	Isopropylbenzene	Concrete
204D502	SW8260	Sec-Butylbenzene	Concrete
204D502	SW8260	1,2-Dibromoethane	Concrete
204D502	SW8260	Tert-Butylbenzene	Concrete
204D502	SW8260	4-Chlorotoluene	Concrete
204D502	SW8260	N-Propylbenzene	Concrete
204D502	SW8260	Trichloroethene	Concrete
204D502	SW8260	Carbon Disulfide	Concrete
204D502	SW8260	Dibromomethane	Concrete
204D502	SW8260	N-Butylbenzene	Concrete
204D502	SW8260	Vinyl Chloride	Concrete
204D502	SW8260	2-Chlorotoluene	Concrete
204D502	SW8260	Chlorobenzene	Concrete
204D502	SW8260	Chloromethane	Concrete
204D502	SW8260	Vinyl Acetate	Concrete
204D502	SW8260	1-Chlorohexane	Concrete
204D502	SW8260	Bromobenzene	Concrete
204D502	SW8260	Bromomethane	Concrete
204D502	SW8260	Chloroethane	Concrete
204D502	SW8260	Iodomethane	Concrete
204D502	SW8260	Naphthalene	Concrete
204D502	SW8260	Chloroform	Concrete
204D502	SW8260	Bromoform	Concrete
204D502	SW8260	Benzene	Concrete
204D502	SW8260	Styrene	Concrete
204D502	SW8260	Toluene	Concrete
204D502	SW8270	Pyrene	Concrete
204D502	SW8270	Chrysene	Concrete
204D502	SW8270	3,3'-Dichlorobenzidine	Concrete
204D502	SW8270	Butyl Benzyl Phthalate	Concrete
204D502	SW8270	Benzo(K)Fluoranthene	Concrete
204D502	SW8270	Di-N-Octyl Phthalate	Concrete
204D502	SW8270	Benzo(A)Anthracene	Concrete
204D502	SW8270	Benzo(A)Pyrene	Concrete

there is virtually no concern that SVOC concentrations for these samples would even approach the PAL for the rejected results. The result for americium (Am)-241 in sample 204D010 was rejected because the spectral identification is tentative. No Am-241 results were detected above minimum reporting limits in any of the usable gamma-spectroscopy results; therefore, this analyte is not likely to be present. Any corrective action associated with the Am-241 will include the location with the rejected results. Therefore, these rejected data are considered acceptable data gaps because they do not affect closure decision for CAS 05-18-02.

Kay Blockhouse (05-33-01) Rejected Data

Table B.1-12 contains the rejected results for each analytical method used for CAS 05-33-01. Acetone in many samples had an average and relative response factor of <0.05. All samples registering the presence of acetone were identified as estimated values and were far below PAL values. Therefore, the presence of acetone is not considered to affect the closure decision. Several SVOC results were rejected due to potential existing matrix effects and the internal response showed extremely low counts. Samples from associated sample locations detect no SVOCs present. Other samples are rejected due to an average and relative response factor of <0.05. The reason for these samples being rejected is because all results are at or very near detection. Therefore, these rejected data are considered acceptable data gaps because they do not affect the closure decision. One sample has rejected data for Cobalt (Co)-60 and another for aluminium (Al)-26 because the spectral identification is tentative. The Co-60 and Al-26 is found nowhere else throughout the CAS. Other samples from the same sample locations collected from varying depths showed no indication of these parameters. Because no other analyses suggest that these items may exist and the spectral identification is tentative, these rejected samples are considered acceptable because they do not affect the closure decision.

Explosive Storage Bunker (05-99-02) Rejected Data

All analytical results for CAS 05-99-02 are considered usable.

B.1.5 Representativeness

The DQO process as identified in Appendix A of the CAIP was used to address sampling and analytical requirements for CAU 204. During this process, appropriate locations were selected that

Table B.1-12
CAU 204 Rejected Data for CAS 05-33-01
(Page 1 of 4)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204E002	SW8260	Acetone	Soil
204E003	SW8260	Acetone	Soil
204E004	SW8260	Acetone	Soil
204E005	SW8260	Acetone	Soil
204E006	SW8260	Acetone	Soil
204E007	SW8260	Acetone	Soil
204E010	SW8260	Acetone	Soil
204E011	SW8260	Acetone	Soil
204E012	SW8260	Acetone	Soil
204E015	SW8260	Acetone	Soil
204E017	SW8260	Acetone	Soil
204E018	SW8260	Acetone	Soil
204E020	SW8260	Acetone	Soil
204E021	SW8260	Acetone	Soil
204E022	SW8260	Acetone	Soil
204E024	SW8260	Acetone	Soil
204E025	SW8260	Acetone	Soil
204E026	SW8260	Acetone	Soil
204E027	SW8260	Acetone	Soil
204E028	SW8260	Acetone	Soil
204E030	SW8260	Acetone	Soil
204E031	SW8260	Acetone	Soil
204E032	SW8260	Acetone	Soil
204E035	SW8260	Acetone	Soil
204E036	SW8260	Acetone	Soil
204E037	SW8260	Acetone	Soil
204E040	SW8260	Acetone	Soil
204E044	SW8260	Acetone	Soil
204E045	SW8260	Acetone	Soil
204E047	SW8260	Acetone	Soil
204E049	SW8260	Acetone	Soil
204E054	SW8260	Acetone	Soil
204E055	SW8260	Acetone	Soil

Table B.1-12
CAU 204 Rejected Data for CAS 05-33-01
(Page 2 of 4)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204E051	SW8260	1,2-Dibromo-3-Chloropropane	Soil
204E051	SW8260	1,1,2,2-Tetrachloroethane	Soil
204E051	SW8260	1,2,3-Trichlorobenzene	Soil
204E051	SW8260	1,2,3-Trichloropropane	Soil
204E051	SW8260	1,2,4-Trichlorobenzene	Soil
204E051	SW8260	1,2,4-Trimethylbenzene	Soil
204E051	SW8260	1,3,5-Trimethylbenzene	Soil
204E051	SW8260	Hexachlorobutadiene	Soil
204E051	SW8260	P-Isopropyltoluene	Soil
204E051	SW8260	1,2-Dichlorobenzene	Soil
204E051	SW8260	1,3-Dichlorobenzene	Soil
204E051	SW8260	1,4-Dichlorobenzene	Soil
204E051	SW8260	Tert-Butylbenzene	Soil
204E051	SW8260	Sec-Butylbenzene	Soil
204E051	SW8260	N-Butylbenzene	Soil
204E051	SW8260	2-Chlorotoluene	Soil
204E051	SW8260	4-Chlorotoluene	Soil
204E051	SW8260	N-Propylbenzene	Soil
204E051	SW8260	Naphthalene	Soil
204E051	SW8260	Bromobenzene	Soil
204E056	SW8260	Acetone	Soil
204E057	SW8260	Acetone	Soil
204E058	SW8260	Acetone	Soil
204E059	SW8260	Acetone	Soil
204E062	SW8260	Acetone	Soil
204E063	SW8260	Acetone	Soil
204E064	SW8260	Acetone	Soil
204E065	SW8260	Acetone	Soil
204E066	SW8260	Acetone	Soil
204E067	SW8260	Acetone	Soil
204E068	SW8260	Acetone	Soil
204E069	SW8260	Acetone	Soil
204E070	SW8260	Acetone	Soil

Table B.1-12
CAU 204 Rejected Data for CAS 05-33-01
(Page 3 of 4)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204E184	SW8260	Acetone	Soil
204E186	SW8260	Acetone	Soil
204E188	SW8260	Acetone	Soil
204E181	SW8260	Acetone	Soil
204E187	SW8260	Acetone	Soil
204E185	SW8260	Acetone	Soil
204E183	SW8260	Acetone	Soil
204E182	SW8260	Acetone	Soil
204E180	SW8260	Acetone	Soil
204E026	SW8270	2,4-Dinitrophenol	Soil
204E020	SW8270	2,4-Dinitrophenol	Soil
204E021	SW8270	2,4-Dinitrophenol	Soil
204E022	SW8270	2,4-Dinitrophenol	Soil
204E023	SW8270	2,4-Dinitrophenol	Soil
204E024	SW8270	2,4-Dinitrophenol	Soil
204E025	SW8270	2,4-Dinitrophenol	Soil
204E027	SW8270	2,4-Dinitrophenol	Soil
204E028	SW8270	2,4-Dinitrophenol	Soil
204E029	SW8270	2,4-Dinitrophenol	Soil
204E030	SW8270	2,4-Dinitrophenol	Soil
204E031	SW8270	2,4-Dinitrophenol	Soil
204E032	SW8270	2,4-Dinitrophenol	Soil
204E033	SW8270	2,4-Dinitrophenol	Soil
204E034	SW8270	2,4-Dinitrophenol	Soil
204E035	SW8270	2,4-Dinitrophenol	Soil
204E042	SW8270	Benzo(K)Fluoranthene	Soil
204E042	SW8270	Benzo(B)Fluoranthene	Soil
204E042	SW8270	Benzo(G,H,I)Perylene	Soil
204E042	SW8270	Dibenzo(A,H)Anthracene	Soil
204E042	SW8270	Indeno(1,2,3-CD)Pyrene	Soil
204E042	SW8270	Benzo(A)Pyrene	Soil
204E049	SW8270	Benzo(A)Pyrene	Soil
204E049	SW8270	Indeno(1,2,3-CD)Pyrene	Soil

Table B.1-12
CAU 204 Rejected Data for CAS 05-33-01
(Page 4 of 4)

Sample Number	Laboratory Method	Parameter	Sample Matrix
204E049	SW8270	Dibenzo(A,H)Anthracene	Soil
204E049	SW8270	Benzo(K)Fluoranthene	Soil
204E049	SW8270	Benzo(B)Fluoranthene	Soil
204E049	SW8270	Benzo(G,H,I)Perylene	Soil
204E065	SW8270	Hexachlorocyclopentadiene	Soil
204E066	SW8270	Hexachlorocyclopentadiene	Soil
204E067	SW8270	Hexachlorocyclopentadiene	Soil
204E068	SW8270	Hexachlorocyclopentadiene	Soil
204E069	SW8270	Hexachlorocyclopentadiene	Soil
204E070	SW8270	Hexachlorocyclopentadiene	Soil
204E076	SW8270	2,4-Dinitrophenol	Soil
204E076	SW8270	Hexachlorocyclopentadiene	Soil
204E077	SW8270	Hexachlorocyclopentadiene	Soil
204E077	SW8270	2,4-Dinitrophenol	Soil
204E013	PAI713R8	Cobalt-60	Soil
204E022	PAI713R8	Aluminum-26	Soil
204E302	SW8260	Acetone	Liquid

enabled the samples collected to be representative of the area being evaluated. In many cases, both a biased and random sampling approach was proposed in order to provide the most conservative evaluation possible. Biased sampling in this case was performed to ensure sampling of suspected or known contamination. This was performed on a CAS-by-CAS basis. In addition, analytical requirements were specified in order to ensure appropriate methods were selected for COPCs. This was performed to address the concerns of all stakeholders and project personnel. The DQO approach was based upon process knowledge gained during the preliminary assessment. Samples were collected and analyzed as planned with the completeness issues discussed above. In addition, QC blanks were used as a way of measuring outside factors that could impact sample results. No data were qualified due to QC blanks. Therefore, the analytical data acquired during the CAU 204 corrective action investigation are considered representative of site contamination.

B.1.6 Comparability

Field sampling, as described in the CAU 204 CAIP (NNSA/NV, 2002), was performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved analytical methods and procedures per DOE were used to analyze, report, and validate the data. These are comparable to other methods used not only in industry and government practices, but most importantly are comparable to other investigations conducted for the NTS. Therefore, datasets within this project are considered comparable to other datasets generated using these same standardized DOE procedures, thereby meeting DQO requirements.

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

B.1.7 Reconciliation of Conceptual Site Model(s) to the Data

This section provides a reconciliation of the data collected and analyzed during this investigation with the CSMs established in the DQO process.

B.1.7.1 Conceptual Site Models

Three CSMs were developed for the CAU 204 CASs as presented in the CAIP (NNSA/NV, 2002). The CSMs were based on historical information and existing process knowledge. Each CSM is discussed in the following sections. In one instance, all three CSMs apply to a particular CAU 204 CAS.

B.1.7.1.1 Interior Bunker Release Conceptual Site Model

This section describes CSM elements for the CAU 204 CASs designed as instrumentation or storage bunkers. The following CASs are included in this category:

- 01-34-01, Underground Inst. House Bunker
- 02-34-01, Instrument Bunker
- 03-34-01, Underground Bunker
- 05-18-02, Chemical Explosives Storage
- 05-33-01, Kay Blockhouse

The source of potential contamination for the CASs listed above is associated with the potential releases of contaminants stored or confined to the interior of the bunkers to the surrounding surface soil. Therefore, the general CSM included soil potentially impacted by surface release of effluent. The mechanisms for this type of release include both designed and accidental releases. This model assumed that any contamination would be concentrated in the soil located immediately beneath and adjacent to the system component (e.g., doors, ventilation equipment, pipes). The extent of underlying soil impact is expected to be variable and is dependent upon the volume of effluent released, system design, geologic conditions, nature of COPCs, and other factors. The CSM and system configurations were consistent with those provided in the CAIP (NNSA/NV, 2002).

B.1.7.1.2 Surface Debris/Burn Area Conceptual Site Model

This section describes CSM elements for the CAU 204 CASs designed as instrumentation or storage bunkers. The following CASs are included in this category:

- 01-34-01, Underground Inst. House Bunker[a]
- 02-34-01, Instrument Bunker[a]
- 03-34-01, Underground Bunker[a]
- 05-18-02, Chemical Explosives Storage
- 05-33-01, Kay Blockhouse
- 05-99-01, Explosive Storage Bunker

[a]The CSM may apply to this CAS, depending upon site conditions.

The source of potential contamination for the CASs listed above is associated with the potential contamination of surrounding soil with debris or the contaminants associated with the burning of items or equipment in aboveground pits or burn areas. The mechanisms for this type of release include both designed and accidental releases. This model assumes that any contamination would migrate away from the release point either downward in the case of contaminants solubolized by and migrating with a liquid, migrating from surface runoff, or solid contaminant being liberated and moving with either blowing wind or some similar method of motility. The higher concentration of contaminants would be located in the immediate vicinity of the suspected release and would decrease with distance, both horizontally and vertically. The extent of underlying and surrounding soil impact is expected to be variable and is dependent upon the volume of contaminant released, system design,

geologic conditions, nature of COPCs, and other factors. The CSM and system configurations were consistent with those provided in the CAIP (NNSA/NV, 2002).

B.1.7.1.3 Subsurface Debris/Burn Area Conceptual Site Model

This section describes CSM elements for the CAU 204 CASs designed as instrumentation or storage bunkers. The following CASs are included in this category:

- 01-34-01, Kay Blockhouse

The source of potential contamination for the CASs listed above is associated with the potential contamination of surrounding soil with the contaminants associated with the burning of items or equipment in subsurface burn pits. The mechanisms for this type of release include both designed and accidental releases. This model assumes that any contamination would migrate away from the release point either downward in the case of contaminants solubolized by and migrating with a liquid. The higher concentration of contaminants would be located in the immediate vicinity of the suspected release and would decrease with distance, both horizontally and vertically. The extent of underlying and surrounding soil impact is expected to be variable and is dependent upon the volume of contaminant released, system design, geologic conditions, nature of COPCs, and other factors. The CSM and system configurations were consistent with those provided in the CAIP (NNSA/NV, 2002).

B.1.7.2 Contaminant Nature and Extent

The presence of contamination was identified by sample results showing COPC soil concentrations exceeding the PALs identified in the CAIP, thereby defining COCs at the CASs. In general, soil sample results demonstrated that the vertical and lateral extent of COCs was limited to the physical boundaries of the CSMs defined in the CAIP (NNSA/NV, 2002). Field screening was conducted and samples were collected at locations to bound contaminated areas with results below action levels. This confirmed that the extent of contamination was limited to regions defined by the CAS-specific CSMs. The CAS-specific investigation findings, analytical results, and descriptions of site conditions are presented in Appendix A.

B.1.8 Conclusions

Samples were collected and analyzed as planned and within acceptable performance limits, except where noted.

B.2.0 References

EPA, see U.S. Environmental Protection Agency.

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Corrective Action Investigation Plan for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada*, December Rev. 0, DOE/NV--866. Las Vegas, NV.

U.S. Environmental Protection Agency. 1994. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,* EPA 540-R-94/013. Washington, DC.

U.S. Environmental Protection Agency. 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition, CD-ROM PB97-5019286EI. Washington, DC.

Appendix C

Cost Estimates for CAU 204: Storage Bunkers, Nevada Test Site, Nevada

(15 Pages)

BECHTEL NEVADA

EST ID: CAU 204 — **COST ESTIMATE PROPOSAL DATA SHEET** — **Date: 16-Mar-04**

CAS 01-34-01 - Underground Instrument House Bunker

TO: Al Wickline **FROM:** Kathryn Umbarger

SUBJECT: CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS

ESTIMATOR: Charles Denson **REF #:**

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 01-34-01, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 01-34-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO) described as an Underground Instrument House Bunker, Building 1-300. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL

III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Underground Instrument House Bunker. It consists of an underground 1,920 square-foot concrete structure with a concrete floor 1.7 feet thick. The bunker has three rooms and includes an air conditioning system, dehydrator, telephone, signal facilities, electric heating system and a hoist. A ventilation system leads to the outside of the bunker. Most of the instrumentation has been removed. Lead-based paint was used to paint the interior walls of the bunker and a stain on the floor contains both polychlorinated biphenyls (PCBs) and total petroleum hydrocarbon (TPH) contamination. No radiological contaminants are present inside or outside the bunker in concentrations exceeding the preliminary action levels (PALs). The recommended alternative for this CAS is the Clean Closure alternative.

Under Alternative I No further action.

Under Alternative II (Clean Closure), the proposed remedial action are as follows: Removal or affixing of lead-based paint and floor stains; packaging and labeling removed lead-based paint and floor stain material; analysis and evaluation of removed material and management of waste. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

Under Alternative III (Close in Place with Administrative Controls), the scope includes closing and securing entrances to the bunker and adjacent side bunker, the installation of fencing with appropriate signage around the soil-contaminated area, and the administrative activities and costs associated with use restriction.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative II: Clean Closure

- Scrape and remove loose lead-based paint on walls and ceilings, and remove portions of concrete flooring harboring stains.
- Affix the lead-based paint.
- Package and label the removed lead-based paint and floor stain material.
- Analyze and evaluate the removed materials for lead, PCBs, and TPH to determine appropriate waste disposal.
- Perform waste management, transportation, and disposal.

Alternative III: Closure in Place with Administrative Controls

- Install appropriate administrative controls (i.e. postings, signs, existing fence, etc.).
- Develop and document appropriate use restrictions.

BECHTEL NEVADA

EST ID: CAU 204 — COST ESTIMATE PROPOSAL DATA SHEET — Date: 16-Mar-04

CAS 01-34-01 - Underground Instrument House Bunker

TO: Al Wickline — FROM: Kathryn Umbarger

ASSUMPTIONS:

General:

- All constituent of concern (COCs) at the site have been identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 01-34-01 is not a beryllium legacy site and will not require IH support.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are currently unknown and have not been provided.
- Work to be performed by BN during a "normal" workday. Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- Dimensions, measurements, and analytical data provided by the Characterization Contractor accurately represent site conditions.

Alternative II (Clean Closure):

- Assumes hazardous waste will be disposed of at NTS but that TPH levels do not exceed their action levels of 100 parts per million (ppm).
- Assumes that PCB stains on the concrete floor do not exceed the Toxic Substances Control Act (TSCA) action levels of 50 ppm.
- Assumes that a biological survey already has been done and will not be needed again.
- Assumes that site conditions do not require a radiological work permit (RWP) based on past surveys and that an RCT is not required.
- Assumes no further action for the exterior of the bunker.
- Scope includes the removal and disposal of a maximum of five 55-gallon drums of waste materials.
- Assumes contamination ends at CAS boundary.
- Assumes removal activities will occur Monday thru Thursday and only shipping of waste will occur on Fridays or weekends.

Alternative III (Close in Place with Administrative Controls)

- Assumes that all entrances to the bunker will be secured via installation of a hasp and lock and that interior of bunker will not be cleaned up.
- Assumes that fencing and postings must be prepared and posted to the effect that no admittance is permitted without first addressing the interior contamination (lead, PCBs, possible hanta virus and TPH).
- Assumes administrative controls including surveys for use restriction.
- Assumes no further action for the exterior of the bunker.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 Final Rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$155,005**
Alternative III:	**Closure in Place with Administrative Controls**	**$17,945**

REVIEW / CONCURRENCE:

Project Manager — Date: 3/17/04

Estimating — Date: 3/17/04

Project Controls — Date: 3/17/04

BECHTEL NEVADA

EST ID: CAU 204
CAS 02-34-01 - Instrument Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

SUBJECT: **CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS**

ESTIMATOR: Charles Denson

REF #:

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 02-34-01, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 02-34-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO) described as an Instrument Bunker, Building 2-300. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION
II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Underground Instrument House Bunker. It consists of an underground 1,920 square-foot concrete structure with a concrete floor 1.7 feet thick. The bunker has four rooms and includes a photo processing room, an air conditioning system, dehydrator, telephone and signal facilities, electric heating system and a hoist. A ventilation system leads to the outside of the bunker. Most of the instrumentation has been removed. Lead-based paint was used to paint the interior walls of the bunker and a stain on the floor contains both polychlorinated biphenyls (PCBs) and total petroleum hydrocarbon (TPH) contamination. No radiological contaminants are present inside or outside the bunker in concentrations exceeding the preliminary action levels (PALs). The recommended alternative for this CAS is the Clean Closure alternative.

Under Alternative I No further action.

Under Alternative II (Clean Closure), the proposed remedial action are as follows: Removal or affixing of lead-based paint and floor stains; packaging and labeling removed lead-based paint and floor stain material; analysis and evaluation of removed material and management of waste. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

Under Alternative III (Close in Place with Administrative Controls), the scope includes closing and securing entrances to the bunker and adjacent side bunker, the installation of fencing with appropriate signage around the soil-contaminated area, and the administrative activities and costs associated with use restriction.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative II: Clean Closure

- Scrape and remove loose lead-based paint on walls and ceilings, and remove portions of concrete flooring harboring stains.
- Affix the lead-based paint.
- Package and label the removed lead-based paint and floor stain material.
- Analyze and evaluate the removed materials for lead, PCBs, and TPH to determine appropriate waste disposal.
- Perform waste management, transportation, and disposal.

Alternative III: Closure in Place with Administrative Controls

- Install appropriate administrative controls (i.e. postings, signs, existing fence, etc.).
- Develop and document appropriate use restrictions.

BECHTEL NEVADA

EST ID: CAU 204
CAS 02-34-01 - Instrument Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

ASSUMPTIONS:

General:

- All constituents of concern (COCs) at the site have been identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 02-34-01 is not a beryllium legacy site and will not require IH support.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are currently unknown and have not been provided.
- Work to be performed by BN during a "normal" workday. Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- Dimensions, measurements, and analytical data provided by the characterization contractor accurately represent site conditions.

Alternative II (Clean Closure):

- Assumes hazardous waste will be disposed of at NTS but that TPH levels do not exceed their action levels of 100 parts per million (ppm).
- Assumes that PCB stains on the concrete floor do not exceed the Toxic Substances Control Act (TSCA) action levels of 50 ppm.
- Assumes that a biological survey already has been done and will not be needed again.
- Assumes that site conditions do not require a radiological work permit (RWP) based on past surveys and that an RCT is not required.
- Assumes no further action for the exterior of the bunker.
- Scope includes the removal and disposal of a maximum of five 55-gallon drums of waste materials.
- Assumes contamination ends at CAS boundary.
- Assumes removal activities will occur Monday thru Thursday and only shipping of waste will occur on Fridays or weekends.

Alternative III (Close in Place with Administrative Controls)

- Assumes that all entrances to the bunker will be secured via installation of a hasp and lock and that interior of bunker will not be cleaned up.
- Assumes that fencing and postings must be prepared and posted to the effect that no admittance is permitted without first addressing the interior contamination (lead, PCBs, possible hanta virus and TPH).
- Assumes administrative controls including surveys for use restriction.
- Assumes no further action for the exterior of the bunker.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY2004 Final rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$155,005**
Alternative III:	**Closure in Place with Administrative Controls**	**$17,945**

REVIEW / CONCURRENCE:

Project Manager — Date: 3-17-04

Estimating — Date: 3-17-04

Project Controls — Date: 3/17/04

BECHTEL NEVADA

EST ID: CAU 204
CAS 03-34-01 - Instrument Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

SUBJECT: CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS

ESTIMATOR: Charles Denson

REF #:

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 03-34-01, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 03-34-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO) described as an Underground Bunker, Building 3-300. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL

III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Underground Instrument House Bunker. It consists of an underground 1,160 square-foot concrete structure with a concrete floor 1.7 feet thick. The bunker has four rooms and includes an air conditioning system, sump pump, two compressors, signal facilities and an exterior hoist. A ventilation system leads to the outside of the bunker. Most of the instrumentation has been removed. Lead-based paint was used to paint the interior walls of the bunker and a stain on the floor contains both polychlorinated biphenyls (PCBs) and total petroleum hydrocarbon (TPH) contamination. No radiological contaminants are present inside or outside the bunker in concentrations exceeding the preliminary action levels (PALs). The recommended alternative for this CAS is the Clean Closure alternative.

Under Alternative I No further action.

Under Alternative II (Clean Closure), the proposed remedial action are as follows: Removal or affixing of lead-based paint and floor stains; packaging and labeling removed lead-based paint and floor stain material; analysis and evaluation of removed material and management of waste. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

Under Alternative III (Close in Place with Administrative Controls), the scope includes closing and securing entrances to the bunker and adjacent side bunker, the installation of fencing with appropriate signage around the soil-contaminated area, and the administrative activities and costs associated with use restriction.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative II: Clean Closure

- Scrape and remove loose lead-based paint on walls and ceilings, and remove portions of concrete flooring harboring stains.
- Affix the lead-based paint.
- Package and label the removed lead-based paint and floor stain material.
- Analyze and evaluate the removed materials for lead, PCBs, and TPH to determine appropriate waste disposal.
- Perform waste management, transportation, and disposal.

Alternative III: Closure In Place with Administrative Controls

- Install appropriate administrative controls (i.e. postings, signs, existing fence, etc.).
- Develop and document appropriate use restrictions.

BECHTEL NEVADA

EST ID: CAU 204
CAS 03-34-01 - Instrument Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

ASSUMPTIONS:

General:

- All constituents of concern (COCs) at the site have been identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 03-34-01 is not a beryllium legacy site and will not require IH support.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are currently unknown and have not been provided.
- Work to be performed by BN during a "normal" workday. Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- Dimensions, measurements, and analytical data provided by the characterization contractor accurately represent site conditions.

Alternative II (Clean Closure):

- Assumes hazardous waste will be disposed of at NTS but that TPH levels do not exceed their action levels of 100 parts per million (ppm).
- Assumes that PCB stains on the concrete floor do not exceed the Toxic Substances Control Act (TSCA) action levels of 50 ppm.
- Assumes that a biological survey already has been done and will not be needed again.
- Assumes that site conditions do not require a radiological work permit (RWP) based on past surveys and that an RCT is not required.
- Assumes no further action for the exterior of the bunker.
- Scope includes the removal and disposal of a maximum of five 55-gallon drums of waste materials.
- Assumes contamination ends at CAS boundary.
- Assumes removal activities will occur Monday thru Thursday and only shipping of waste will occur on Fridays or weekends.

Alternative III (Close in Place with Administrative Controls)

- Assumes that all entrances to the bunker will be secured via installation of a hasp and lock and that interior of bunker will not be cleaned up.
- Assumes that fencing and postings must be prepared and posted to the effect that no admittance is permitted without first addressing the interior contamination (lead, PCBs, possible hanta virus and TPH).
- Assumes administrative controls including surveys for use restriction.
- Assumes no further action for the exterior of the bunker.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY2004 Final rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$155,005**
Alternative III:	**Closure in Place with Administrative Controls**	**$17,945**

REVIEW / CONCURRENCE:

Project Manager — Date: 3-17-04

Estimating — Date: 3-17-04

Project Controls — Date: 3/17/04

BECHTEL NEVADA

EST ID: CAU 204 — **COST ESTIMATE PROPOSAL DATA SHEET** — Date: 16-Mar-04

CAS 05-18-02 - Chemical Explosives Storage (Sugar Bunker)

TO: Al Wickline **FROM:** Kathryn Umbarger

SUBJECT: CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS

ESTIMATOR: Charles Denson **REF #:**

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 05-18-02, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 05-18-02 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL

III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Sugar Bunker, a small adjacent bunker, two cellar units that are attached to the south end of the Sugar Bunker and an area of ~ two acres surrounding the bunker. The interior of the bunker is painted with lead-based paint; two stains on the floor contain both polychlorinated biphenyls (PCBs) and total petroleum hydrocarbons (TPH). No radiation contaminants are present inside the bunker exceeding preliminary action levels (PALs). Outside the bunker, depleted uranium and thorium has been reported in the soil at concentrations greater than PALs.

Under Alternative I No further action.

Under Alternative II (Clean Closure), the types and amounts of materials requiring remedial action are as follows: 9,500 cubic yards (cy) radioactively contaminated soil under the current PALs (Option A) or 1,360 cy under the new PALs (Option B). DOE has requested that removal and remediation be conducted using the new PALs. Removal of miscellaneous debris is also included. Each alternative was evaluated with knowledge of rad waste at the surface and sub-surface of the soil. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

Under Alternative III (Close in Place with Administrative Controls), the scope includes closing and securing entrances to the bunker and adjacent side bunker, the installation of fencing with appropriate signage around the soil-contaminated area, and the administrative activities and costs associated with use restriction.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative II: Clean Closure

- Excavate and remove approximately ~ 12,000 cy (includes 9,500 cy + 25 % expansion factor) (Option A) or ~1700 cy (includes 1,360 cy + 25 % expansion factor (Option B) radiation-impacted soils at and surrounding the exterior of Sugar Bunker to the CAS boundary.
- Conduct a radiation survey and verify or refine the boundaries of the radioactively-impacted area for fencing and signage purposes.
- Collect 20 verification samples at the excavations.
- Backfill the excavated area to natural existing grade with clean fill material and restore as needed.
- Perform waste management, transportation, and disposal.

Alternative III: Closure in Place with Administrative Controls

- Install appropriate administrative controls (i.e. postings, signs, existing fence, etc.).

BECHTEL NEVADA

EST ID: CAU 204 — **COST ESTIMATE PROPOSAL DATA SHEET** — Date: 16-Mar-04

CAS 05-18-02 - Chemical Explosives Storage (Sugar Bunker)

TO: Al Wickline **FROM:** Kathryn Umbarger

ASSUMPTIONS:

General:

- All constituents of concern (COCs) at the site have been identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 05-18-02 is a beryllium legacy site and will require IH support (beryllium sampling and monitoring).
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation and may be affected by weather events prior to completing the corrective actions.
- Work to be performed by BN during a "normal" workday. Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- A soil borrow area is located within one mile of the site.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

Alternative II (Clean Closure):

- Field work consists of radiation survey, stomp and tromp, demarcation of radioactive materials area (RMA) and installation of appropriate fencing, removal of contaminated soil, haul and dispose at appropriate landfills; collection of verification soil samples from base of excavation and analysis for COC; backfilling of excavation with clean fill and regrading/restoration of area.
- Assumes removal of surface debris (e.g. wood, asphalt, construction rubble) under housekeeping activities.
- Assumes rad waste to be disposed at NTS.
- Assumes mixed waste (if any) will go to Area 3, bulk waste LLW disposal.
- Scope includes excavation and disposal of up to a maximum of ~ 12,000 cy contaminated soil (includes 25% expansion factor) under current PALS (Option A), or ~ 1,700 cy contaminated soil under new PALs (Option B).
- Excavation of soils may impact utility corridors containing sewer lines, communications lines, and electrical lines. BN will need to confirm this before proceeding with activities. Assumes that any abandoned utilities will be excavated and disposed and will not be replaced, and that sewer lines will not contain any sewage as this will not fit the waste profile.
- Assume preexisting fencing will be used. Additional fencing will be 2- or 3-wire fencing. Existing EZ fencing may need to be moved, based on OSHA and BN excavation safety requirements and location of contaminated soil. This may require additional utility surveys prior to moving these items. Location and depth of soil to be excavated may impact existing chain link fence. Cost not included in this estimate as field conditions remain as yet unknown.
- Assumes contamination ends at CAS boundary.
- A maximum five 20-cy rolloffs, provided by a subcontractor, will be required for transportation of impacted soil to the disposal facility(ies). Assumes that the rolloffs will be mobilized to the site. Assumes one workday for each rolloff to be filled, and one day of excavation activities followed by additional sampling and identification of other areas to be excavated. Assumes excavation activities will occur Monday thru Thursday and only shipping of waste will occur on Fridays or weekends.
- Provides for backfill of excavation with ~ 12,000 (Option A) or ~1,700 cy (Option B) of clean fill that will be obtained from a local borrow pit. Assumes that 6 end dump trucks will be available for transporting the clean fill to the site, and that an operator will be needed at each end of the operation (i.e., at the borrow pit and at the site).

Alternative III (Close in Place with Administrative Controls)

- Assumes that entrances to bunker, adjacent side bunker will be secured and that interior of bunkers will not be cleaned up.
- Assumes that fencing and postings will be needed for the entire CAS due to potential for rad contamination.
- Assumes administrative controls including surveys for use restriction.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY2004 Final rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure (Option A)**	**$1,114,101**
Alternative II:	**Clean Closure (Option B)**	**$503,680**
Alternative III:	**Closure in Place with Administrative Controls**	**$159,631**

BECHTEL NEVADA

EST ID: CAU 204 — **COST ESTIMATE PROPOSAL DATA SHEET** — **Date: 16-Mar-04**

CAS 05-18-02 - Chemical Explosives Storage (Sugar Bunker)

TO: Al Wickline **FROM:** Kathryn Umbarger

REVIEW / CONCURRENCE:

Project Manager — Date: 3/17/04

Estimating — Date: 3/17/04

Project Controls — Date: 3/17/04

BECHTEL NEVADA

EST ID: CAU 204
CAS 05-99-02 - Explosive Storage Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

SUBJECT: CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS

ESTIMATOR: Charles Denson **REF #:**

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 05-99-02, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 05-99-02 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO) and described as Bunker 803, Explosive Storage Bunker. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION
II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Explosive Storage Bunker, CAS 05-99-02. It consists of a wooden storage shed with a dirt floor and is approximately 25 square feet in area. It is built into the side of the Springs Wash and was reportedly used to store conventional explosives. There were no contaminants identified at the CAS. Consequently, the recommended alternative is one of No Further Action (Alternative I) and that the bunker be dismantled and removed with the land restored to its natural setting as a housekeeping measure. This is the basis of this estimate.

There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred. An estimate is provided for the cost of dismantling the bunker and restoring the land to its natural setting.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Demolish Bunker and Restore Land:

- No beryllium impact expected.
- No constituent pf potential concern (COPCs) present.
- Restoration of cavity left by dismantling of bunker and return to natural condition by backfilling with clean fill taken from Area 5 (free).
- No radiation hazard.
- Level D modified PPE.
- No further action at this CAS after demolition/removal of instrument bunker.

ASSUMPTIONS:

General:

- No constituents of concern (COCs) at the site were identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 05-99-02 is not a beryllium legacy site.
- No heat stress - no work in summer.
- Equipment will remain operational to support the planned/scheduled completion of demolition and restoration.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- A soil borrow area is located within one mile of the site.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

Alternative I (No Further Action):

- Housekeeping field work consists of demolition of existing bunker, removal of wooden debris, backfilling of open depression area with clean fill material, soil compaction testing, waste management and restoration to natural setting.
- Assumes removal of surface debris (e.g. wood, asphalt, construction rubble) under housekeeping activities.
- Assumes sanitary/solid waste disposal.
- Excavation of soils may impact utility corridors containing sewer lines, communications lines, and electrical lines. BN will need to confirm this before proceeding with activities. Assumes that any abandoned utilities will be excavated and disposed and will not be replaced, and that sewer lines will not contain any sewage as this will not fit the waste profile.
- Assumes excavation activities will occur Monday thru Thursday and only shipping of waste will occur on Fridays or weekends.
- Provides for backfill of excavation with clean fill that will be obtained from a local borrow pit. Assumes that one end dump trucks will be available for transporting the clean fill to the site, and that an operator will be needed at each end of the operation (i.e., at the borrow pit and at the site).

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 Final rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action / Bunker Demolition and Disposal (Housekeeping)**	**$153,692**
Alternative II:	**Clean Closure**	**$0**
Alternative III:	**Closure in Place with Administrative Controls**	**$0**

BECHTEL NEVADA

EST ID: CAU 204
CAS 05-99-02 - Explosive Storage Bunker

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

REVIEW / CONCURRENCE:

3/17/04
Project Manager — Date

03/17/04
Estimating — Date

3/17/04
Project Controls — Date

BECHTEL NEVADA

EST ID: CAU 204
CAS 05-33-01 - Kay Blockhouse

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

SUBJECT: CADD Alternative Cost Estimates for CAU-204 Area 5 - Storage Bunkers, NTS

ESTIMATOR: Charles Denson

REF #:

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

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 05-33-01, which is included within Corrective Action Unit (CAU) 204. CAU 204 CAS 05-33-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only.

SCOPE:

Provide site closure using one of the following alternatives:
I) NO FURTHER ACTION
II) CLEAN CLOSURE BY EXCAVATION AND REMOVAL
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Kay Blockhouse; two nearby burn pits with steel frames; one burn pit with a soil berm; two open pits; two steel-lined subsurface pits; one berm with embedded piping; one berm with piping debris; a berm area with a large concrete bloc; and one open pit with a concrete foundation at the north end. The Kay Blockhouse is constructed of concrete with a wooden door. The entire area within the CAS is approximately 10 acres. Radiation and lead contamination have impacted the soils in selected areas at levels that exceed their respective preliminary action levels (PALs). The steel-lined pits are lined with asbestos and the frames in the burn pits with steel frame are insulated with asbestos. One of the steel-lined pits contains TCLP lead and another pit contains metallic lead. Various radioactive contaminants are in soils in the bottom of the steel lined pits.

Under Alternative I No further action.

Under Alternative II (Clean Closure), the types and amounts of materials requiring remedial action are as follows: ~4,000 cubic yards (cy) radioactively contaminated soil under the current PALs (Option A) or ~575 cy under the new PALs (Option B). DOE has requested that removal and remediation be conducted using the new PALs, which is the basis of this estimate. Removal of miscellaneous debris is also included. Each alternative was evaluated with knowledge of potential hazardous and rad waste at the surface and sub-surface of the soil. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database.

Under Alternative III (Close in Place with Administrative Controls), the scope includes closing and securing entrances to the bunker and adjacent side bunker, the installation of fencing with appropriate signage around the soil-contaminated area, and the administrative activities and costs associated with use restriction.

Alternative II: Clean Closure
- Excavate and remove approximately 720 cy (includes 25 % expansion factor) of rad- and lead-impacted soils at Areas E21, E23, E24, E27 and E29.
- Stabilize friable asbestos in steel-lined pits at E23 and E24 along edges of pit.
- Remove friable asbestos from framing at E07 and E08.
- Collapse entrance to Kay Blockhouse bunker at E29.
- Collect ~20 verification samples at the excavations.
- Backfill the excavated area to natural existing grade with clean fill material and restore as needed.
- Waste management, transportation, and disposal.

Alternative III: Closure in Place with Administrative Controls
- Install appropriate administrative controls (i.e. postings, signs, existing fence, etc.).
- Develop and document appropriate use restrictions.

BECHTEL NEVADA

EST ID: CAU 204 — COST ESTIMATE PROPOSAL DATA SHEET — Date: 16-Mar-04

CAS 05-33-01 - Kay Blockhouse

TO: Al Wickline — FROM: Kathryn Umbarger

ASSUMPTIONS:

General:

- All constituents of concern (COCs) at the site have been identified during the site investigation and analytical data accurately represent site conditions and waste characteristics.
- CAS 05-33-01 is a beryllium legacy site and will require IH support (beryllium sampling and monitoring).
- No heat stress - no work in summer
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation and may be affected by weather events prior to completing the corrective actions.
- Work to be performed by BN during a "normal" workday. Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies that may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate includes costs for preparation of required project plans, permits, reports, and project management.
- A soil borrow area is located within one mile of the site.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

Alternative II (Clean Closure):

- Field work consists of stabilization of friable asbestos at E23 and E24; removal and disposal of friable asbestos at E07 and E08; removal of lead- and rad-contaminated soil at E21, E23, E24, E27 & E29; haul and dispose at appropriate landfills; collection of verification soil samples from base of excavation and analysis for COCs (except E23 & E24); backfilling of excavation with clean fill; general housekeeping (debris removal and disposal); and regrading or restoration of area.
- Assumes that asbestos to be stabilized will be accomplished using binding materials mixed with liquid, poured into voids between concrete, asbestos and metal liners, and affixed.
- No verification samples to be collected from bottom of steel-lined pits (E23 and E24).
- Assumes removal of surface debris (e.g. wood, asphalt, construction rubble) under housekeeping activities.
- Assumes mixed waste (lead/rad, beryllium/rad) will go to Area 3, bulk waste LLW disposal.
- Scope includes excavation of up to a maximum of ~*730* cy contaminated soil (includes 25% expansion factor) from E21, E23, E24, E27, and E29.
- Excavation of soils may impact utility corridors containing sewer lines, communications lines, and electrical lines. BN will need to confirm this before proceeding with activities. Assumes that any abandoned utilities will be excavated and disposed and will not be replaced, and that sewer lines will not contain any sewage as this will not fit the waste profile.
- Existing EZ fencing may need to be moved, based on OSHA and BN excavation safety requirements and location of contaminated soil. This may require additional utility surveys prior to moving these items. Location and depth of soil to be excavated may impact existing chain link fence. Cost not included in this estimate as field conditions remain as yet unknown.
- Assumes that fencing and postings will be needed for selected areas within the CAS due to potential for radiation contamination.
- A maximum five roll offs, provided by a subcontractor, will be required for transportation of impacted soil to the disposal facility(ies). Assumes that the rolloffs will be mobilized to the site. Assumes one workday for each rolloff to be filled, and one day of excavation activities followed by additional sampling and identification of other areas to be excavated. Assumes excavation activities will occur Monday through Thursday and only shipping of waste will occur on Fridays or weekends.
- Provides for backfill of excavation with ~ 1,000 cy of clean fill that will be obtained from a local borrow pit. Assumes that five end dump trucks will be available for transporting the clean fill to the site, and that an operator will be needed at each end of the operation (i.e., at the borrow pit and at the site).

Alternative III (Close in Place with Administrative Controls)

- Assumes that entrances to bunkers will be secured and that interior of bunkers will not be cleaned up.
- Assumes that fencing and postings will be needed in selected areas of the CAS due to potential for rad and beryllium contamination.
- Assumes administrative controls including surveys for use restriction.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY2004 Final rates (Rev 2) effective 12/29/03 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$968,653**
Alternative III:	**Closure in Place with Administrative Controls**	**$89,224**

BECHTEL NEVADA

EST ID: CAU 204
CAS 05-33-01 - Kay Blockhouse

COST ESTIMATE PROPOSAL DATA SHEET

Date: 16-Mar-04

TO: Al Wickline

FROM: Kathryn Umbarger

REVIEW / CONCURRENCE:

Project Manager — Date: 3/17/04

Estimating — Date: 3/17/04

Project Controls — Date: 3/17/04

Appendix D

Sample Location Coordinates for CAU 204: Storage Bunkers Nevada Test Site, Nevada

D.1.0 Sample Location Coordinates

Sample location coordinates were collected May 21 through June 30, 2003, with additional sample location coordinates being collected November 11 through November 13, 2003, using a Trimble GPS, Model TSCI. These coordinates identify the field sampling locations (e.g., northing, easting, elevation) and points of interest at each CAS in CAU 204.

D.1.1 Underground Inst. House Bunker (CAS 01-23-01)

Since no site characterization samples were taken after field screening, points of interest at CAS 01-34-01 are identified as the CAS corner points and shown on Figure A.3-1. The corresponding coordinates for CAS 01-34-01 corner point locations are listed in Table D.1-1.

Table D.1-1
Locations of Interest for CAS 01-34-01

Northing	Easting	CAS Location
4101072	580757	NE Corner
4101062	580621	NW Corner
4100985	580756	SE Corner
4101010	580621	SW Corner

D.1.2 Instrument Bunker (CAS 02-34-01)

Sample locations at CAS 02-34-01 are shown on Figure A.4-1. The corresponding coordinates for CAS 02-34-01 sample locations are listed in Table D.1-2.

Table D.1-2
Sample Location Coordinates and Locations of Interest for CAS 02-34-01

Northing	Easting	CAS Location
4110511	579282	B01
4110511	579274	B02
4110525	579302	B03
4110506	579259	B04

D.1.3 Underground Bunker (CAS 03-34-01)

Since no site characterization samples were taken after field screening, points of interest at CAS 03-34-01 are identified as the CAS corner points and shown on Figure A.5-1. The corresponding coordinates for CAS 03-34-01 corner point locations are listed in Table D.1-3.

Table D.1-3
Locations of Interest for CAS 03-34-01

Northing	Easting	CAS Location
4100431	586198	NE Corner
4100439	586106	NW Corner
4100394	586198	SE Corner
4100401	586106	SW Corner

D.1.4 Chemical Explosives Storage (CAS 05-18-02)

Sample locations at CAS 05-18-02 are shown on Figure A.6-1. The corresponding coordinates for CAS 05-18-02 sample locations are listed in Table D.1-4.

D.1.5 Kay Blockhouse (CAS 05-33-01)

Sample locations at CAS 05-33-01 are shown on Figure A.7-1. The corresponding coordinates for CAS 05-33-01 sample locations are listed in Table D.1-5.

D.1.6 Explosive Storage Bunker (CAS 05-99-02)

Sample locations and pertinent points (locations) of interest at CAS 05-99-02 are shown on Figure A.8-1. The GPS coordinates for the corners of the CAS are listed in Table D.1-6.

Table D.1-4
Sample Locations for CAS 05-18-02 (Sugar Bunker)

Latitude	Longitude	Northing	Easting	HAE (meters)	Location	Vertical Precision	Horizontal Precision
36.83947	-115.9596	4077369	592771	956.619	D01	9.7	5.9
36.83917	-115.9596	4077335	592364	957.663	D02	9.7	5.9
36.8389	-115.9597	4077307	592758	957.316	D03	9.6	5.9
36.83944	-115.9599	4077364	592748	953.468	D04	7.6	5.6
36.83919	-115.96	4077337	592736	953.608	D05	7.5	5.6
36.83929	-115.9595	4077349	592781	956.196	D06	9.7	5.9
36.83985	-115.9599	4077409	592743	954.889	D07	8.5	5.8
N/A	N/A	N/A	N/A	N/A	D08	N/A	N/A
N/A	N/A	N/A	N/A	N/A	D09	N/A	N/A
N/A	N/A	N/A	N/A	N/A	D10	N/A	N/A
36.839583	-115.9598	4077378	592753	958.329	D11	8.8	N/A
36.839475	-115.9599	4077366	592744	957.513	D12	8.9	N/A
36.839218	-115.9599	4077337	592735	957.614	D13	8.8	N/A
36.838888	-115.9599	4077301	592734	959.585	D14	12.1	N/A
36.838833	-115.9598	4077296	592753	959.65	D15	12.2	N/A
36.838895	-115.9596	4077302	592772	958.871	D16	12.5	N/A
36.839155	-115.9595	4077331	592780	958.863	D17	12.7	N/A
36.839484	-115.9593	1077368	592793	959.12	D18	12.9	N/A
36.839616	-115.9593	4077382	592796	959.453	D19	13.1	N/A
N/A	N/A	4077320	592740	961.267	D30	N/A	N/A
N/A	N/A	4077339	592745	964.334	D31	N/A	N/A
N/A	N/A	4077352	592745	963.758	D32	N/A	N/A
N/A	N/A	4077364	592754	964.313	D33	N/A	N/A
N/A	N/A	4077374	592749	965.766	D34	N/A	N/A
N/A	N/A	4077375	592761	962.677	D35	N/A	N/A
N/A	N/A	4077387	592756	963.198	D36	N/A	N/A
N/A	N/A	4077367	592783	964.322	D37	N/A	N/A
N/A	N/A	4077352	592770	963.602	D38	N/A	N/A
N/A	N/A	4077330	592751	964.792	D39	N/A	N/A
N/A	N/A	4077299	592758	962.016	D40	N/A	N/A
N/A	N/A	4077324	592773	963.399	D41	N/A	N/A

N/A = Not Available

Table D.1-5
Sample Locations for CAS 05-33-01 (Kay Blockhouse)
(Page 1 of 3)

Latitude	Longitude	Northing	Easting	HAE (meters)	Location	Vertical Precision	Horizontal Precision
36.82655	-115.9655	4075928	592259	958.063	WB	0.5	0.3
36.82696	-115.9641	4075975	592379	956.522	E01	0.5	0.3
36.82701	-115.9641	4075981	592381	955.875	E02	0.5	0.3
36.82694	-115.9641	4075973	592386	955.286	E03	0.5	0.3
36.82708	-115.9641	4075988	592381	957.37	E04	0.5	0.3
36.82709	-115.9641	4075989	592386	956.462	E05	0.5	0.3
36.82716	-115.964	4075996	592387	955.736	E06	0.5	0.3
36.82705	-115.9639	4075985	592399	956.391	E07	0.5	0.3
36.82698	-115.9637	4075977	592415	955.386	E08	0.5	0.3
36.82653	-115.9641	4075927	592382	955.287	E09	0.5	0.4
36.82691	-115.9635	4075969	592438	954.455	E10	0.5	0.4
36.82696	-115.9634	4075976	592441	955.555	E11	0.5	0.3
36.82648	-115.9648	4075921	592318	955.763	E12	0.5	0.3
36.82654	-115.9648	4075928	592321	955.326	E13	0.5	0.3
36.82642	-115.9653	4075913	592278	956.173	E14	0.5	0.3
36.82642	-115.9654	4075914	592270	956.294	E15	0.5	0.3
36.82673	-115.9646	4075949	592341	956.257	E16	0.5	0.3
36.82672	-115.9645	4075948	592351	955.865	E17	0.5	0.3
36.82665	-115.9644	4075940	592355	956.465	E18	0.5	0.3
36.82666	-115.9645	4075941	592346	956.696	E19	0.5	0.3
36.82646	-115.9651	4075918	592295	956.341	E20	0.5	0.3
36.82649	-115.9651	4075922	592294	957.606	E21	0.5	0.3
36.8265	-115.9654	4075922	592265	957.852	E22	0.5	0.3
36.82669	-115.9644	4075945	592354	956.289	E23	0.5	0.3
36.82666	-115.9638	4075942	592414	955.678	E24	0.5	0.4
36.82592	-115.9646	4075859	592340	955.25	E25	0.5	0.3
36.8257	-115.9645	4075835	592345	954.538	E26	0.5	0.3
36.82561	-115.9645	4075825	592352	954.724	E27	0.5	0.3
36.82559	-115.9642	4075823	592379	952.901	E28	0.5	0.3
36.8255	-115.9646	4075812	592338	953.923	E29	0.6	0.4

Table D.1-5
Sample Locations for CAS 05-33-01 (Kay Blockhouse)
(Page 2 of 3)

Latitude	Longitude	Northing	Easting	HAE (meters)	Location	Vertical Precision	Horizontal Precision
36.8271	-115.9641	4075990	592383	957.153	E30	0.5	0.3
36.82712	-115.964	4075992	592395	956.211	E31	0.5	0.3
36.82614	-115.9653	4075883	592276	957.265	E32	0.4	0.3
36.82607	-115.9639	4075876	592401	955.468	E33	0.5	0.3
36.82546	-115.9643	4075808	592364	954.982	E34	0.5	0.3
36.82666	-115.9637	4075942	592416	954.706	E35	0.5	0.4
36.82664	-115.9638	4075939	592408	955.253	E36	0.5	0.4
36.82677	-115.9644	4075953	592356	956.114	E37	0.5	0.3
36.82666	-115.9639	4075942	592398	955.14	E38	0.5	0.4
36.82671	-115.9638	4075947	592408	953.94	E39	0.5	0.4
369.8255	-115.9646	4075812	592340	953.88	E40	0.6	0.4
36.82548	-115.9646	4075810	592338	953.487	E41	0.6	0.4
36.82547	-115.9647	4075809	592334	954.344	E42	0.6	0.4
36.82551	-115.9647	4075814	592333	953.885	E43	0.4	0.3
N/A	N/A	N/A	N/A	N/A	E44	N/A	N/A
36.82551	-115.9646	4075813	592337	9530193	E45	0.6	0.4
N/A	N/A	N/A	N/A	N/A	E46	N/A	N/A
N/A	N/A	N/A	N/A	N/A	E47	N/A	N/A
N/A	N/A	N/A	N/A	N/A	E48	N/A	N/A
N/A	N/A	N/A	N/A	N/A	E49	N/A	N/A
36.82712	-115.9641	4075992	592382	949.33	E89	10.3	6
36.82605	-115.9638	4075874	592411	948.413	E90	10.5	6
36.82614	-115.9638	4075884	592408	948.593	E91	10.5	6
36.82608	-115.9639	4075877	592399	948.848	E92	10.5	6
36.82565	-115.9644	4075829	592355	951.299	E93	10.4	5.9
36.82559	-115.9644	4075822	592354	951.12	E94	10.4	5.9
36.82546	-115.9644	4075809	592359	951.764	E95	10.4	5.9
36.82549	-115.9643	4075912	592363	951.077	E96	10.4	5.9
36.82545	-115.9643	4075807	592368	951.983	E97	10.4	5.9
36.82656	-115.9651	4075929	592294	948.903	E98	9.9	5.9

Table D.1-5
Sample Locations for CAS 05-33-01 (Kay Blockhouse)
(Page 3 of 3)

Latitude	Longitude	Northing	Easting	HAE (meters)	Location	Vertical Precision	Horizontal Precision
36.82649	-115.9650	4075922	592301	948.715	E99	10	5.9
36.92646	-115.9652	4075918	592287	948.719	E100	9.7	5.9
36.82639	-115.9652	4075910	592281	948.283	E101	8.5	5.8
36.82649	-115.9653	4075921	592274	948.594	E102	8.5	5.8
36.82651	-115.9641	4075925	592382	948.251	E103	10.2	5.9
36.82651	-115.9641	4075925	592385	948.542	E104	10.2	5.9
N/A	N/A	4075891	592407	959.069	E150	N/A	N/A
N/A	N/A	4075995	592391	960.903	E152	N/A	N/A
N/A	N/A	4075820	592357	956.638	E153	N/A	N/A
N/A	N/A	4075822	592355	956.137	E154	N/A	N/A
N/A	N/A	4075817	592359	956.151	E155	N/A	N/A
N/A	N/A	4075812	592371	957.185	E156	N/A	N/A
N/A	N/A	4075814	592373	956.334	E157	N/A	N/A
N/A	N/A	4075807	592370	956.995	E158	N/A	N/A
N/A	N/A	4075922	592285	958.347	E159	N/A	N/A
N/A	N/A	4075925	592289	960.331	E160	N/A	N/A
N/A	N/A	4075837	592361	956.413	E161	N/A	N/A
N/A	N/A	4075841	591365	957.723	E162	N/A	N/A
N/A	N/A	4075845	592369	958.558	E163	N/A	N/A
N/A	N/A	4075815	592385	955.476	E164	N/A	N/A
N/A	N/A	4075809	592381	955.394	E165	N/A	N/A
N/A	N/A	4075849	592373	958.058	E166	N/A	N/A

N/A Not available

Table D.1-6
Locations of Interest for CAS 05-99-02

Northing	Easting	CAS Location
4078076	580678	NE Corner
4078077	586068	NW Corner
4078066	586078	SE Corner
4078067	586068	SW Corner

Appendix E

Project Organization for CAU 204: Storage Bunkers, Nevada Test site, Nevada

E.1.0 Project Organization

The Project Manager is Janet Appenzeller-Wing and her telephone number is (702) 295-0461.

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

Appendix F

NDEP Comments

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Decision Document for Corrective Action Unit 204: Storage Bunkers, Nevada Test Site, Nevada	2. Document Date: February 2004
3. Revision Number: 0	4. Originator/Organization: Stoller-Navarro
5. Responsible NNSA/NV ERP Project Mgr.: Janet Appenzeller-Wing	6. Date Comments Due: March 3, 2004
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No.: NDEP	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1)		NDEP reviewed the Draft Corrective Action Decision Document for Corrective Action Unit 204 and had no written comments to this document.		

Distribution

* Provide a copy in distribution of Rev. 0 and subsequent revisions, if applicable. Copies of only the NDEP-approved document will be distributed to others.

	Copies
Terri Maize State of Nevada Bureau of Federal Facilities Division of Environmental Protection 1771 E. Flamingo Rd., Suite 121-A Las Vegas, NV 89119	1 (Controlled)*
State of Nevada Bureau of Federal Facilities Division of Environmental Protection 333 W. Nye Lane, Room 138 Carson City, NV 89706-0851	1 (Controlled)*
D.R. Elle State of Nevada Bureau of Federal Facilities Division of Environmental Protection 1771 E. Flamingo Rd., Suite 121-A Las Vegas, NV 89119	1 (Controlled)*
Shirley Doty Environmental Restoration Division U.S. Department of Energy National Nuclear Security Administration Nevada Site Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Controlled)*
Kevin Cabble Environmental Restoration Division U.S. Department of Energy National Nuclear Security Administration Nevada Site Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)

	Copies
Sabine Curtis Environmental Restoration Division U.S. Department of Energy National Nuclear Security Administration Nevada Site Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Jeffrey L. Smith Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*
Kathy Umbarger Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)
David Swanson Assistant Project Administrator Nye County Department of Natural Resources & Federal Facilities 1210 E. Basin Road, Suite #6 Pahrump, NV 89060	1 (Uncontrolled)* 1 (Uncontrolled, electronic copy)
FFACO Support Office Stoller-Navarro 7710 W. Cheyenne, Bldg. 3 Las Vegas, NV 89129	1 (Controlled)*
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)
U.S. Department of Energy Office of Scientific and Technical Information P.O. Box 62 Oak Ridge, TN 37831-0062	1 (Uncontrolled, electronic copy)

	Copies
Southern Nevada Public Reading Facility c/o Nuclear Testing Archive P.O. Box 98521, M/S 400 Las Vegas, NV 89193-8521	1 (Controlled)* 1 (Uncontrolled)*
Manager, Northern Nevada FFACO Public Reading Facility c/o Nevada State Library & Archives Carson City, NV 89701-4285	1 (Uncontrolled)*
Chair Community Advisory Board 2721 Losee Rd – Suite D North Las Vegas, NV 89130	1 (Uncontrolled)*
Alfred Wickline Stoller-Navarro Joint Venture 7710 W. Cheyenne, Bldg. 3 Las Vegas, NV 89129	1 (Uncontrolled)*
Steve Felton Stoller-Navarro Joint Venture 7710 W. Cheyenne, Bldg. 3 Las Vegas, NV 89129	1 (Uncontrolled)*
Stoller-Navarro Joint Venture Central Files 7710 W. Cheyenne, Bldg. 3 Las Vegas, NV 89129	1 (Uncontrolled)*