RECORD OF TECHNICAL CHANGE

Technical Change No. 1

Page 1 of 1

Date 2/26/99

Project/Job Name Industrial Sites/ Corrective Action Unit 240

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

Mary E. Todd (Name) — Senior Task Manager (Title)

Section 3.3.1:

Remove parenthetical statement from the end of the first sentence of the first paragraph as follows:

"The following field screening levels will be used for on-site field screening methods ~~(20 at each CAS)~~."

Justification:

This text was inadvertently added in the section. The "20 at each CAS" is relevant only to the development of a field screening background concentration for radiation and is covered in Section 4.1 per the Nevada Department of Environmental Protection (NDEP) comment resolution sheet included in Appendix D of the document. This change addresses the NDEP comment #2 submitted in their letter dated January 25, 1999.

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

Applicable Project-Specific Document(s):

"Corrective Action Investigation Plan for Corrective Action Unit 240: Area 25 Vehicle Washdown, Nevada Test Site, Nevada, Revision No. 0, January 1999; DOE/NV--532"

CC:

Approved By: Janet Appenzeller-Wing (signature) Date 3/12/99
Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

for Robert M. Bangerter Jr. (signature) Date 3/12/99
Runore C. Wycoff, Division Director
Environmental Restoration Division

CADDs FROM 2/97 TO 3/15/99

The dates listed here are deadlines, not necessarily the date a document was submitted.

CAU Number	CAU Description	CADD/ Characterization Report
92	Area 6 Decon Pond Facility	3/31/97
93	Area 6 Steam Cleaning Effluent Ponds (SCEPs)	12/31/96
94	Area 23 Building 650 Leachfield	11/3/97
109	Area 2 U-2bu Crater	9/30/98
332	Area 2 Photograph Development System (Photo Skid)	7/31/97
340	NTS Pesticide Release Sites	11/30/98
403	Area 3 Second Gas Station Underground Storage Tank (TTR	6/2/97
404	Roller Coaster Lagoons and Trench (TTR)	3/31/97
412	Clean Slate I Plutonium Dispersion (TTR)	7/31/97
417	Central Nevada Test Area - Surface	10/30/98
423	Area 3 Underground Discharge Point, Building 0360 (TTR)	6/30/98
424	Area 3 Landfill Complexes (TTR)	3/31/98
426	Cactus Spring Waste Trenches (TTR)	4/30/97
427	Area 3 Septic Waste Systems 2, 6 (TTR)	7/31/98
438	Area 12 E-Tunnel Mesa Mud Pits	9/30/98
439	Area 12 N-Tunnel Mesa Mud Pits	9/30/98
440	Area 12 T-Tunnel Mesa Mud Pits	9/30/98
453	Area 9 UXO Landfill (TTR)	4/30/98
470	Area 12 Mud Pit and Soil Staining on Rainier Mesa	9/30/98

INTERNATIONAL
TECHNOLOGY
CORPORATION

RECORD OF TECHNICAL CHANGE

Technical Change No. 2 | Page 1 of 2

Project/Job No. 776712.01010100 | Date 3/16/99

Project/Job Name Industrial Sites/ Corrective Action Unit 240

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

Dustin Wilson | Task Manager
(Name) | (Title)

The changes specified in this Record of Technical Change apply to Section 4.4 and Figure 4-2 of the *Corrective Action Investigation Plan for Corrective Action Unit 240: Area 25 Vehicle Washdown Nevada Test Site, Nevada*, Revision No. 0, January 1999; DOE/NV--532. These changes are necessary to allow the collection of soil samples using a backhoe at Corrective Action Site (CAS) 25-07-02. This collection method will be used in the gravel sump at this CAS because the gravel within the sump is deeper than originally anticipated.

Section 4.4, paragraph 1, add the following sentence after sentence 2:
"A backhoe may also be used to collect samples from 0 to 0.3 m (0 to 1 ft) bgs (surface samples) and from 0.3 to 0.6 m (1 to 2 ft) bgs (near-surface samples) within the gravel sump at the F and J Roads Pad."

Section 4.4, paragraph 3, change sentence 1 to read:
"A total of 12 surface and near-surface locations will be sampled using the direct-push or backhoe methods at ..."

Section 4.4, paragraph 3, change bullet 3 to read:
"One sample location near the center of the eastern side of the gravel sump"

Figure 4-2
Replace with the attached Figure 4-2 which shows the approximate sampling locations in the gravel sump.

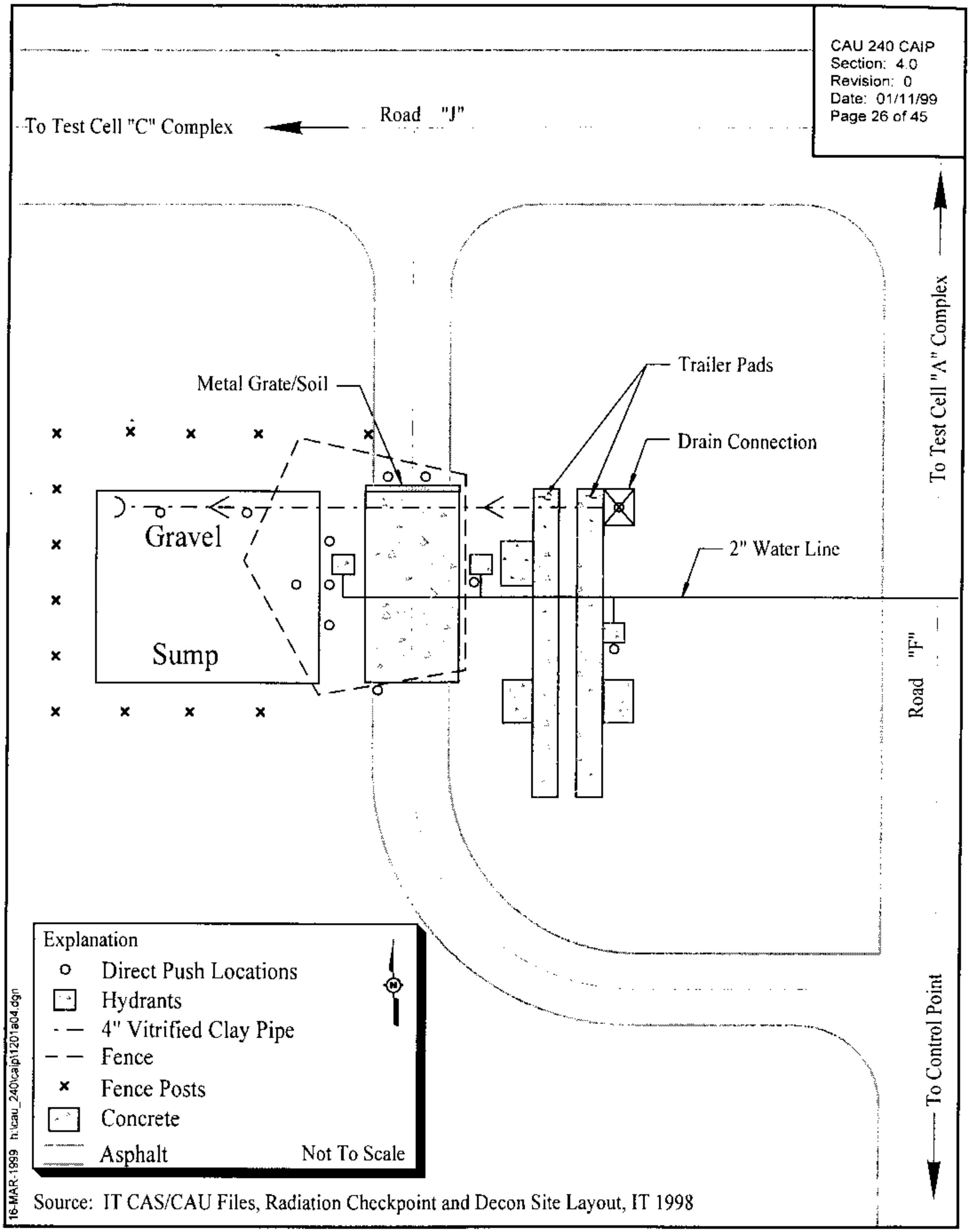
The project time will be (Increased)(Decreased)(Unchanged) by approximately 1 day.

Applicable Project-Specific Document(s):
Corrective Action Investigation Plan for Corrective Action Unit 240: Area 25 Vehicle Washdown Nevada Test Site, Nevada, Revision No. 0, January 1999; DOE/NV--532

CC:

Approved By: Janet Appenzeller-Wing Date 3/15/99
Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

for Robert M. Bangerter Jr. Date 3/15/99
Runore C. Wycoff, Division Director
Environmental Restoration Division



Source: IT CAS/CAU Files, Radiation Checkpoint and Decon Site Layout, IT 1998

Figure 4-2
Sample Locations CAS 25-07-02 Vehicle Washdown Area (F and J Roads Pad)
Area 25 Nevada Test Site

Nevada
Environmental
Restoration
Project

DOE/NV--532

Corrective Action Investigation Plan for Corrective Action Unit 240: Area 25 Vehicle Washdown Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

January 1999

Environmental Restoration
Division

U.S. Department of Energy
Nevada Operations Office

Available to the public from -

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Available electronically at ***http://www.doe.gov/bridge.*** Available 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
(423) 576-8401

DOE/NV-532

CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 240: AREA 25 VEHICLE WASHDOWN NEVADA TEST SITE, NEVADA

DOE Nevada Operations Office
Las Vegas, Nevada

Controlled Copy No.: __

Revision No.: 0

January 1999

CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 240:
AREA 25 VEHICLE WASHDOWN
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 1/8/99

Janet Appenzeller-Wing, Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 1/8/99

Runore C. Wycoff, Division Director
Environmental Restoration Division

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

List of Figures

List of Tables

List of Acronyms and Abbreviations

ALARA	As low as reasonably achievable
bgs	Below ground surface
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	*Code of Federal Regulations*
cm	Centimeter(s)
COPC	Contaminant(s) of potential concern
CPSA	Central Propellant Support Area
CSA	Central Support Area
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DOT	U.S. Department of Transportation
DQO	Data quality objective(s)
E-MAD	Engine Maintenance and Disassembly
EPA	U.S. Environmental Protection Agency
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field Screening Level(s)
ft	Foot (feet)
HASP	Health and safety plan
IDW	Investigation-derived waste
in.	Inch(es)
IT	IT Corporation

List of Acronyms and Abbreviations (Continued)

km	Kilometer(s)
LLW	Low-level radioactive waste
m	Meter(s)
MARSSIM	*Multiagency Radiation Survey and Site Investigation Manual*
mi	Mile(s)
MS/MSD	Matrix spike/matrix spike duplicate
NaI	Sodium Iodide
NDEP	Nevada Department of Environmental Protection
NEPA	*National Environmental Policy Act*
NRDS	Nuclear Rocket Development Station
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
PAL	Preliminary Action Level(s)
PCB	Polychlorinated biphenyl(s)
PID	Photoionization Detector
PPE	Personal protective equipment
ppm	Part(s) per million
PRG	Preliminary remediation goal(s)
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	Quality control
RADSAFE	Radiological Safety
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical & Engineering Company, Inc.

List of Acronyms and Abbreviations *(Continued)*

R-MAD	Reactor Maintenance and Disassembly
SSHASP	Site-specific health and safety plan
SVOC	Semivolatile organic compound(s)
TID	Tamper-indicating device(s)
TPH	Total petroleum hydrocarbon
TRU	Transuranic
VOC	Volatile organic compound(s)

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 240, the Area 25 Vehicle Washdown, has been developed in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the U.S. Department of Energy, Nevada Operations Office; the Nevada Division of Environmental Protection; and the U.S. Department of Defense. Corrective Action Unit 240 consists of the following three Corrective Action Sites:

- Corrective Action Site 25-07-01, Vehicle Washdown Area
- Corrective Action Site 25-07-02, Vehicle Washdown Area
- Corrective Action Site 25-07-03, Vehicle Washdown Station

Two of the Corrective Action Sites were used to decontaminate reactor parts (F and J Roads Pad), vehicles and equipment associated with Area 25 operations and animals associated with the Beagle Experiment (RADSAFE Pad) (Sorom, 1998).

Based on the site history collected to support the Data Quality Objectives process, contaminants of potential concern vary for the Corrective Action Sites but generally include volatile organic compounds, semivolatile organic compounds, *Resource Conservation and Recovery Act* metals, polychlorinated biphenyls, petroleum hydrocarbons, and radionuclides such as strontium-90, cesium-137, and isotopic uranium and plutonium. A conceptual site model for the Corrective Action Unit was developed as follows:

- Liquid waste associated with decontamination activities may have been released to the soils at two of the Corrective Action Sites (F and J Roads Pad and RADSAFE Pad).

- Gases and liquid gases associated with gas sampling activities may have been released to the soils at one of the Corrective Action Sites (Propellant Pad).

- Lateral extent of contaminants of potential concern is limited to the proximity of the site components.

- Vertical extent of contaminants of potential concern is unknown, but expected to be limited due to former intermittent use and because there are no current driving forces and there are low precipitation rates.

- Depth to groundwater at the nearest well is approximately 317 meters (1,040 feet); groundwater impacts are not expected.

- Future use of the site is assumed to be light industrial and industrial.
- Potential exposure pathways are limited to ingestion, inhalation, and dermal contact.

A more detailed conceptual site model is presented in Section 3.0 of this Corrective Action Investigation Plan and Section A.2.0 of Appendix A. The conceptual model serves as the basis for the sampling strategy.

The technical approach for investigating this Corrective Action Unit consists of the following activities:

- Perform video camera surveys to evaluate condition of piping and to locate components of the Corrective Action Unit.
- Collect surface and near-surface samples using a direct-push method.
- Conduct field screening to direct sampling activities and provide a qualitative assessment of conditions.
- Sample step-out locations as required to define extent of contaminants of potential concern.
- Conduct laboratory analysis of environmental samples for contaminants of potential concern specific to individual Corrective Action Sites.
- Conduct trenching or drilling to locate site components or to investigate vertical extent of contaminants of potential concern beyond the limits of the direct-push method, if required.

Field screening methods will be used to detect volatile organics and radionuclides. Samples will be collected for laboratory analysis at each sample location. Additional sampling and analytical details are presented in Section 4.0, and details of the waste management strategy are included in Section 5.0 of this Corrective Action Investigation Plan.

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

1.0 Introduction

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

This CAIP contains the environmental sample collection objectives and the criteria for conducting site investigation activities at CAU 240, Area 25 Vehicle Washdown, which is located on the Nevada Test Site (NTS). The NTS is approximately 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 240 is comprised of the following CASs:

- CAS 25-07-01, Vehicle Washdown Area (hereafter referred to as the Propellant Pad), consisting of the following components in addition to potentially contaminated soils: concrete pad, emergency shower pad, box hydrant and hose rack, and leaking water faucet. Although utilities (power and water) were disconnected from Building 4839 and a Facility Closure Inspection was performed by Bechtel Nevada in December 1996 (BN, 1996), the faucet was observed to be leaking during an IT site visit performed on September 28, 1998.

- CAS 25-07-02, Vehicle Washdown Area (hereafter referred to as the F and J Roads Pad), consisting of the following components in addition to potentially contaminated soils: concrete pad, gravel sump, concrete trailer pads, sewer pipe and drain connection, and metal grate.

- CAS 25-07-03, Vehicle Washdown Station (hereafter referred to as the Radiological Safety [RADSAFE] Pad), consisting of the following components in addition to potentially contaminated soils: concrete pad, metal grates, asbestos cement drain pipe, dry well, and cleanout.

All three CASs are located in Area 25 of the NTS (Figure 1-2). The Propellant Pad is located in the Central Support Area (CSA) at the Central Propellant Storage Area east of Building 4839

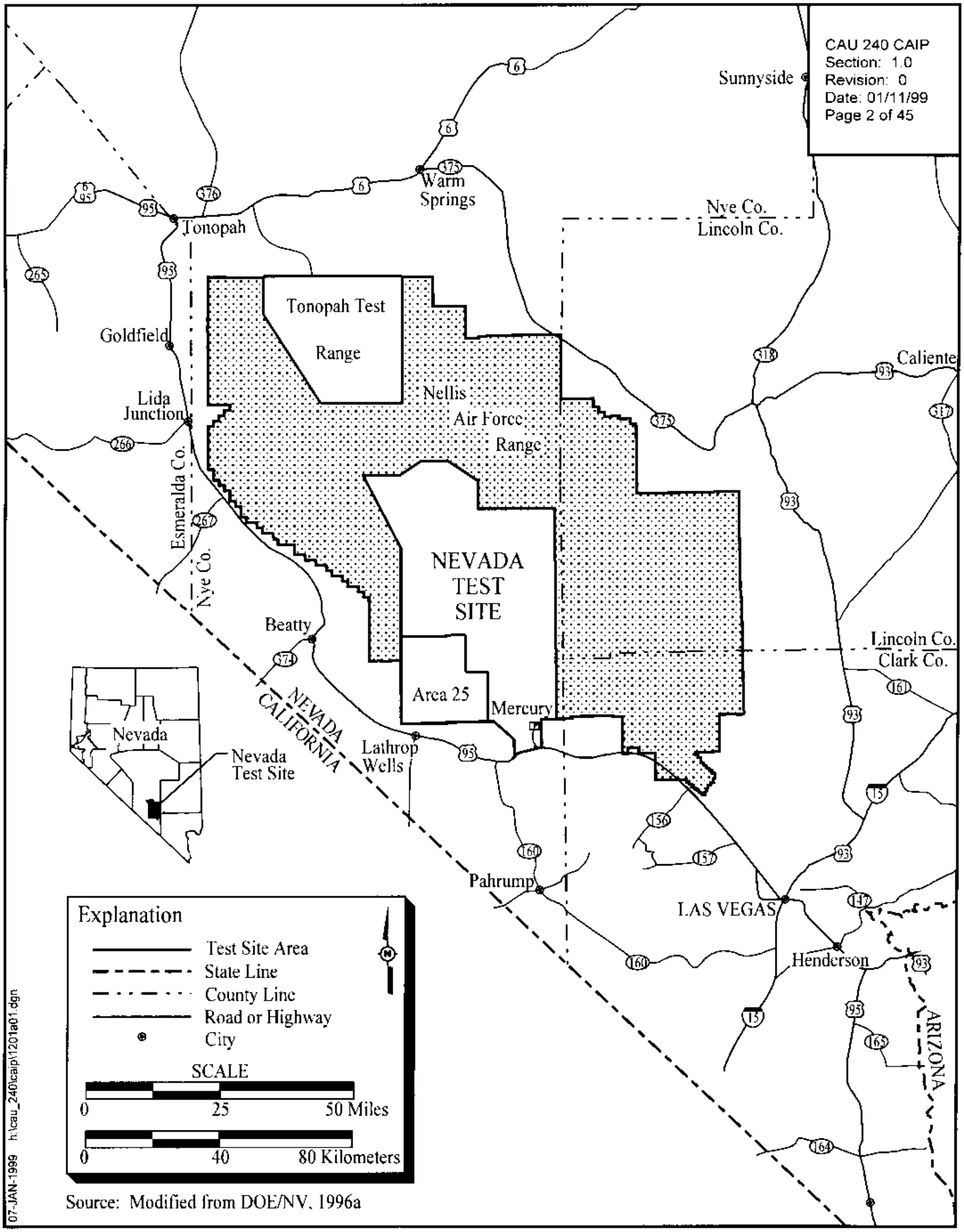
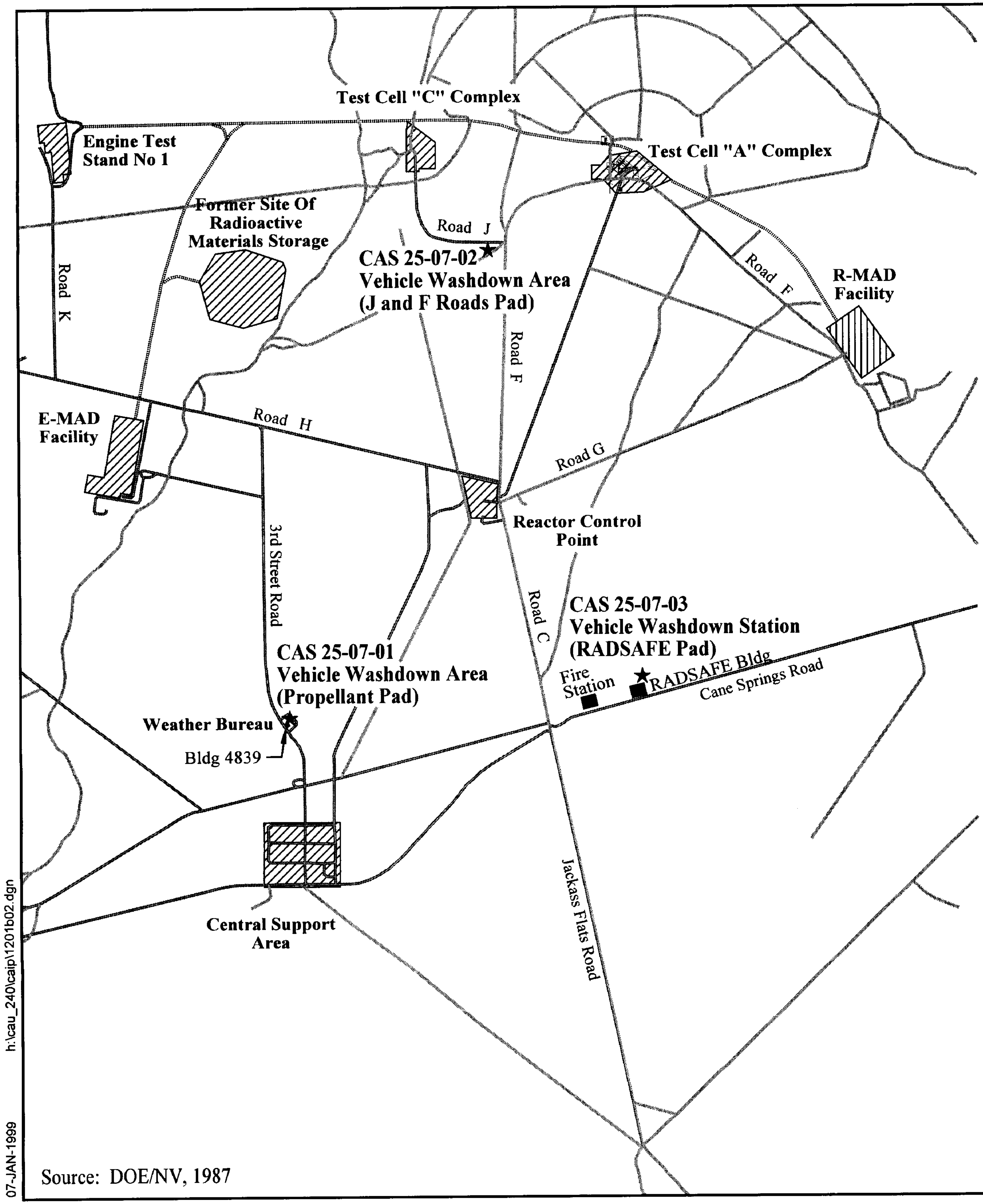
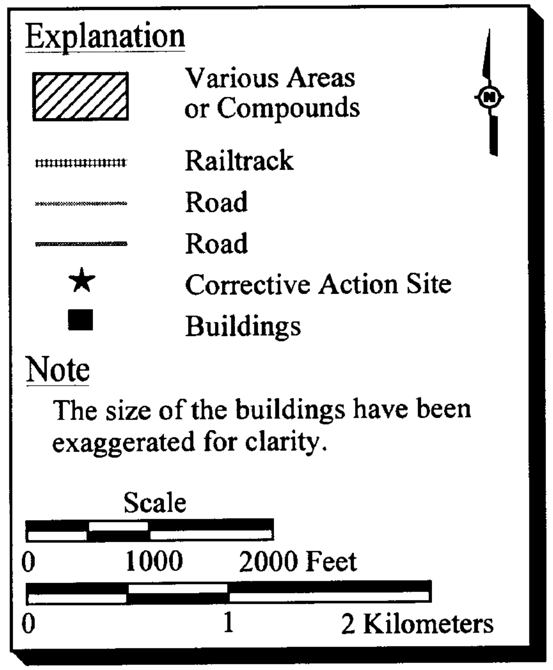


Figure 1-1
Nevada Test Site and Tonopah Test Range



Corrective Action Unit	FFACO Corrective Action Site	CAS Description
240	25-07-01	Vehicle Washdown Area
240	25-07-02	Vehicle Washdown Area
240	25-07-03	Vehicle Washdown Station



Source: DOE/NV, 1987

Figure 1-2
CAU 240, Area 25 Vehicle Washdown, Nevada Test Site

h:\cau_240\caip\1201b02.dgn

07-JAN-1999

(Figure 1-3). This CAS was used as a sampling location to test gases and liquid gases such as hydrogen (the most common), propane, helium, nitrogen, and oxygen. The F and J Roads Pad is located at the southwest corner of the intersections of F Road and J Road (Figure 1-4). Vehicles and disassembled engine and reactor parts coming from the nearby Nuclear Rocket Development Station facilities, including Test Cell A and Test Cell C, were screened for radioactive contamination, and then decontaminated on the vehicle washdown pad. The RADSAFE Pad is located north of Building 3152, the RADSAFE building (Figure 1-5). Vehicles and parts associated with the Area 25 reactors and dogs from the Beagle Experiment were decontaminated at this vehicle washdown station.

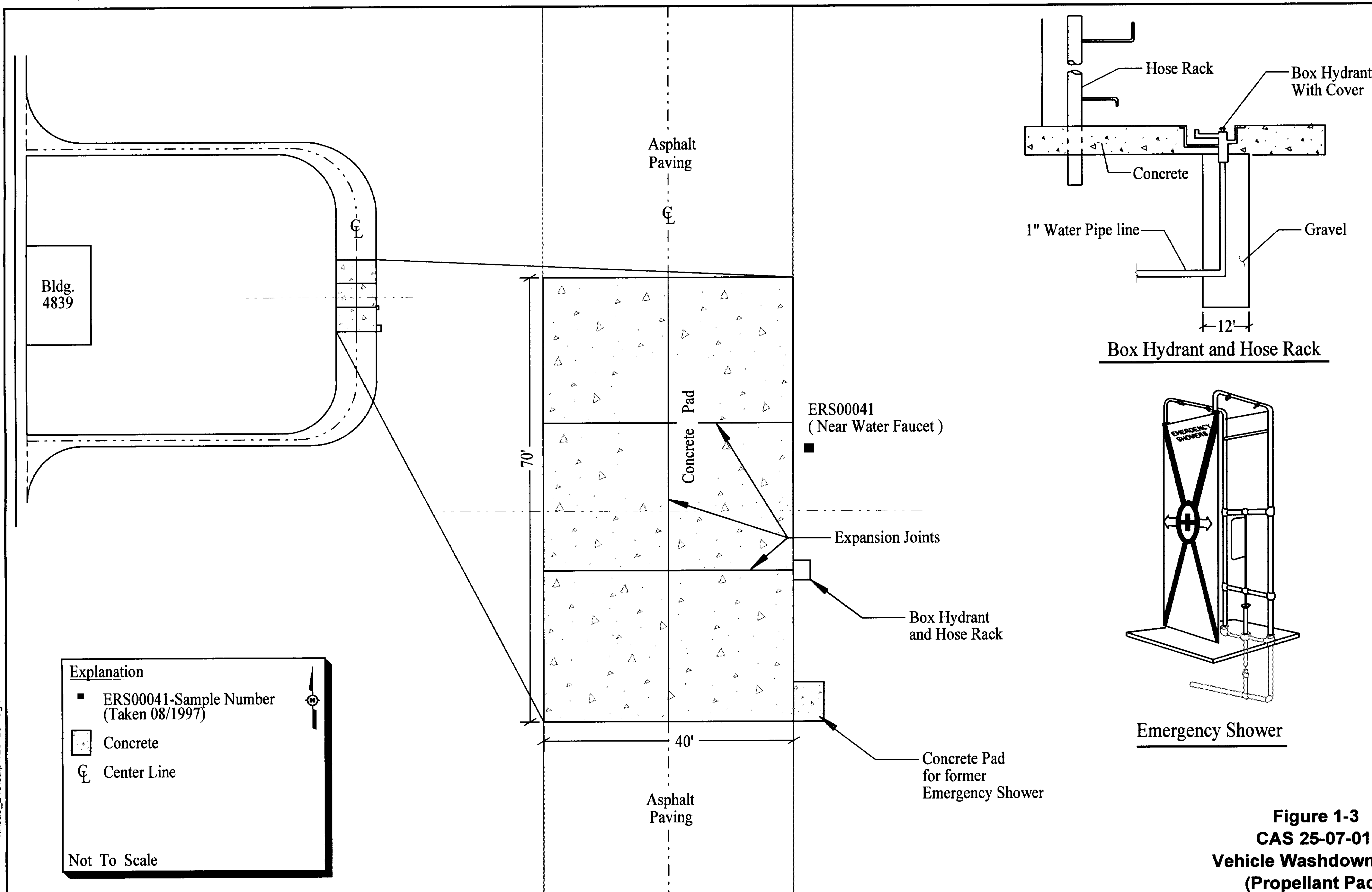
The surface and subsurface soils at this CAU may have been impacted by volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and/or radionuclides (such as strontium-90 [F and J Roads Pad], cesium-137, and isotopic uranium and plutonium) associated with decontamination activities.

1.1 Purpose

This CAIP presents a plan to investigate the nature and extent of contaminants of potential concern (COPCs) at CAU 240. The purpose of the corrective action investigation described in this CAIP is to:

- Identify the presence and nature of COPCs.
- Determine the vertical and lateral extent of COPCs.
- Provide sufficient information and data to develop and evaluate appropriate corrective actions for each of the CAS.

This CAIP was developed using the U.S. Environmental Protection Agency's (EPA) Data Quality Objectives (DQOs) (EPA, 1994c) process to clearly define the goals for collecting environmental data, to determine data uses, and to design a data collection program that will satisfy these uses. A DQO scoping meeting was held prior to preparation of this plan; a brief summary of the DQOs is presented in Section 3.4. A more detailed summary of the DQO process and results is included in Appendix A.

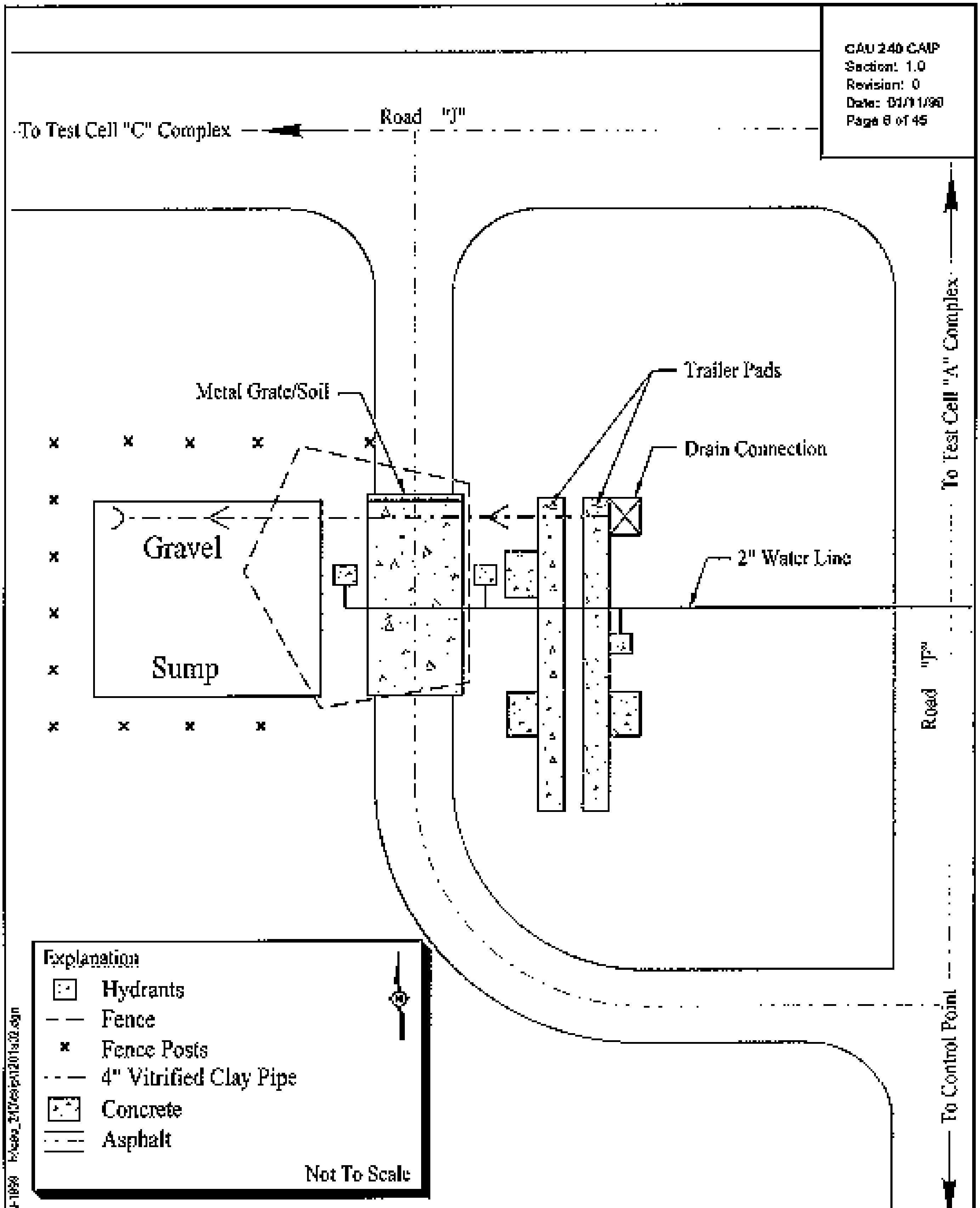


Source: Space Nuclear Propulsion Office Drawing NRDS-SF-P18/C-2 LH, Sampling Facility Civil & Piping Details, 1965

Figure 1-3
CAS 25-07-01,
Vehicle Washdown Area
(Propellant Pad),
Area 25,
Nevada Test Site

h:\cau_240\caip\1201b04.dgn

08-JAN-1999



Source: IT CAS/CAU Files, Radiation Checkpoint and Decon Site Layout, IT 1998

Figure 1-4
CAS 25-07-02, Vehicle Washdown Area (F and J Roads Pad), Area 25 Nevada Test Site

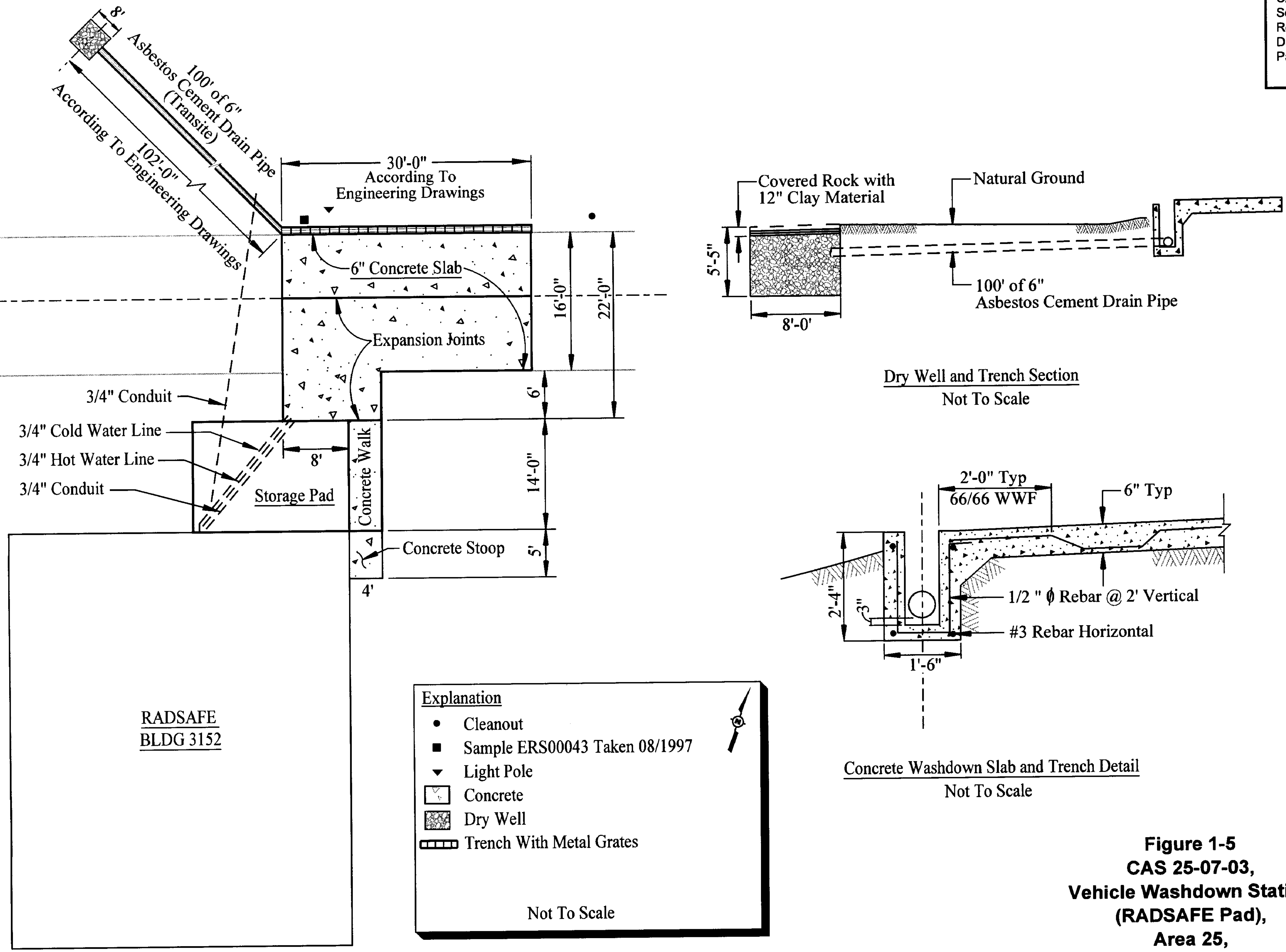


Figure 1-5
CAS 25-07-03,
Vehicle Washdown Station
(RADSAFE Pad),
Area 25,
Nevada Test Site

Source: U.S. Atomic Energy Commission, Drawing RE-3152-C2
Structure 3152-RADSAFE Bldg. Miscellaneous Layout and Details, 1961

h:\cau_240\caip\1201b03.dgn
07-JAN-1999

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified in the DQO process (see Appendix A) which states that radioactive and possibly hazardous wastes were released at the CAU and that existing data are insufficient to support selection of a preferred corrective action for the CAU. Therefore, the scope of the corrective action investigation includes the following tasks:

- Perform video camera surveys to evaluate condition of piping and to locate components of the CAU.
- Collect surface and near-surface samples using a direct-push method.
- Conduct field screening to direct sampling activities and provide a qualitative assessment of conditions (potential limitations in field screening capabilities [i.e., for SVOCs and PCBs] will be addressed through laboratory analysis).
- Sample step-out locations as required to define extent of COPCs.
- Conduct laboratory analysis of environmental samples for COPCs specific to individual CASs.
- Conduct trenching or drilling as required to locate site components or to investigate vertical extent of COPCs beyond the limits of the direct-push method.

1.3 CAIP Contents

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

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

The managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994) and the site-specific Field Management Plan that will be developed prior to field activities. A facility description is presented in Section 2.0. The technical aspects of this CAIP are contained in Section 3.0 and 4.0 of this document and in the DQO summary presented in Appendix A. Also discussed in Section 4.0 are the field sampling activities and general health and safety concerns. General field and laboratory quality assurance and quality control (QA/QC) issues, including collection of quality control (QC) samples, are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b); the methods for field QA/QC are discussed in approved procedures. The generic health and safety aspects of this project are discussed in the *Environmental Restoration Project Health and Safety Plan* (HASP) (DOE/NV, 1998a) and will also be supplemented with a site-specific HASP (SSHASP) written prior to the start of field work. No CAU-specific public involvement activities are planned at this time; however, an overview of public involvement is documented in the “Public Involvement Plan” in Appendix V of the FFACO (1996). Waste management issues are discussed in Section 5.0. The project schedule and records availability information for this CAIP are discussed in Section 6.0, while Section 7.0 provides a list of project references.

2.0 Facility Description

2.1 Physical Setting

The three CASs of CAU 240 are located within Area 25, Nuclear Rocket Development Station (NRDS), of the NTS. The Propellant Pad is located north of the CSA along 2nd Street North, east of Building 4839. The F and J Roads Pad is located at the southwest corner of the intersection of F and J Roads. The RADSAFE Pad is located on the north side of Cane Spring Road, north of the RADSAFE Building (Building 3152) (Figure 1-2).

Topographically, Area 25 (Jackass Flats) is an intermontane valley bordered by highlands on all sides except for a large drainage outlet to the southwest. Elevations range from 1,020 to 1,670 meters (m) (3,400 to 5,600 feet [ft]). The dominant plant community is *Larrea-Ambrosia* associated with a transition zone between the Mojave and Great Basin Deserts (DOE/NV, 1988).

Jackass Flats is a basin formed by structural deformation, mainly faulting of Paleozoic rocks, consisting of carbonate and clastic sediments, approximately 6,700 m (22,000 ft) thick. They are overlain by welded and semi-welded ash flow and ash fall tuffs of Tertiary age, approximately 1,500 m (5,000 ft) thick. Block faulting has displaced both the Paleozoic strata and the Tertiary pyroclastic rocks as much as 2,000 ft, creating trough-like depressions. Valley fill washed into these depressions is as much as 1,900 ft thick in south-central Yucca Flat (SNPO, 1970).

The Jackass Flats basin is filled by alluvial, colluvial, and volcanic rocks of Cenozoic age. The alluvium and colluvium are above the saturated zone throughout most of Jackass Flats. Paleozoic sedimentary rocks, limestone, and dolomite occur at greater depths. In western Jackass Flats, a highly fractured welded-tuff aquifer (Topopah Spring Member) is an important water-producing unit. Groundwater flow for the region is generally to the south and southwest (DOE/NV, 1988).

Three water supply wells, Wells J-11, J-12, and J-13, are within the NRDS. Yucca Flat, Frenchman Flat, and Jackass Flats are believed to be hydraulically connected, with groundwater moving along fracture zones in the carbonates. It is thought that the present groundwater is a result of rainfall in the past, and that no significant recharge of groundwater is occurring now (SNPO, 1970).

Surface water flow is ephemeral and is a function of variations in annual climate patterns. Climate in this area is affected by the rain shadow of the Sierra Nevada. The average annual rainfall for Jackass Flats is approximately 10 centimeters (cm) (4 inches [in.]). Most of the precipitation (approximately 65 percent) for the area occurs between October and April as a result of Pacific Coast storms. The remaining precipitation occurs in the summer months and is the result of convection of moist air brought on by southeasterly winds from the Gulf of Mexico, or cyclonic lows developed over the Great Basin. Summer showers are generally isolated and precipitation is variable. Occasionally, storms move directly from the Gulf of California, resulting in wide-spread heavy rain (DOE/NV, 1988).

2.2 Operational History

Although all three of the CASs are referred to as either a Vehicle Washdown Station or Vehicle Washdown Area, only two of the three CASs, the F and J Roads Pad and the RADSAFE Pad, are believed to have actually been used as washdown stations or areas. Each CAS consists of a concrete pad equipped with water and power and some form of drainage. Operational histories of the three CASs are described in Sections 2.2.1, 2.2.2, and 2.2.3.

2.2.1 Corrective Action Site 25-07-01 (Propellant Pad)

The 1969-1970 Master Plan for the NRDS indicates that the Propellant Pad is part of the Central Propellant Support Area (CPSA) (Figure 1-3) (SNPO, 1970). The CPSA was designed for the sampling of gases and liquid gases as the dewars arrived at the NRDS from the supplier. Sampling was performed prior to releasing the gases and liquid gases to the test cells in the NRDS. The CPSA consists of the dewars sampling area or the Propellant Pad, a "K" bottle storage area, and a propellant building (Building 4839) (SNPO, 1970). The nature, operational history, and process knowledge of the "K" bottle storage area is unknown; the dewars were containers used for compressed gas and liquid gas. Liquid gases and gases such as propane, helium, nitrogen, and oxygen, may also have been sampled at the CPSA (Garey, 1998). Prior to sampling, the gas and liquid gas dewars were vented. The use of the Propellant Pad for sampling gases and liquid gases probably continued through 1973, until the nuclear rocket tests were terminated. The process of sampling these gases may or may not have introduced hazardous materials.

Historical information indicates that construction of the Propellant Pad occurred between December 1965 and February 1967. The site consists of a concrete pad approximately 12 m wide by 21 m long by 15 cm thick (40 ft wide by 70 ft long by 6 in. thick). The pad is reinforced concrete. A safety shower is located at the southeast corner of the pad and a water hydrant and hose rack are located along the east edge of the pad. Water was present for cleanup in the event of spillage during sampling at the pad. The concrete pad slopes slightly to the east. There is a graded drainage ditch east of the pad (SNPO, 1970).

Building 4839 was constructed southwest of the Propellant Pad in 1968 to support activities at the CPSA (SNPO, 1970). In 1989, Reynolds Electrical and Engineering Company, Inc. (REECo) Power and Communications organization began using Building 4839 to support the power maintenance function in Area 25. The building was mainly used for material storage, repairs, and lunch breaks. Utilities (power and water) were disconnected from Building 4839 and a Facility Closure Inspection was performed by Bechtel Nevada in December 1996 (BN, 1996). Nonetheless, the faucet was observed to be leaking during an IT site visit performed on September 28, 1998.

2.2.2 Corrective Action Site 25-07-02 (F and J Roads Pad)

The F and J Roads Pad was originally designed as a radiation check point and decontamination site. The F and J Roads Pad site consists of a concrete washdown pad, a gravel sump along the west side of the pad, two concrete trailer pads located east of the washdown, and remaining piping system (Figure 1-4). The concrete washdown pad is approximately 5 m wide by 9 m long (15 ft wide by 30 ft long); the associated gravel sump is approximately 14 m by 13 m (46 ft by 43 ft) in size. The depth of the sump is estimated to be 1.5 m (5 ft) based on visual observation. The thickness of the gravel within the gravel sump is unknown. The two concrete trailer pads are approximately 16 m long by 1 m wide by 20 cm thick (53 ft long by 3.5 ft wide by 8 in. thick).

Historical information regarding the operation of the F and J Roads Pad site is limited. Interviews with former workers at the NRDS indicate that the site was operated by PanAmerican Corporation during the 1960s and early 1970s. Based on this information, the site is believed to have been used to decontaminate vehicles and possibly disassembled engine and reactor parts from Test Cell C. Interviews indicate that there was a trailer present during this time; however, the function of the trailer is unknown (Sorom, 1998). Site drawings show that the site, along with the trailer pad, was supplied with water from Test Cell A. REECo construction drawings with no date also indicate a drain connection and pipe leading from the trailer pad into the gravel sump located west of the washdown pad. The location of the pipe was verified through site visits (IT, 1998).

The concrete washdown pad slopes to the west towards the gravel sump. There are no visible drains leading from the pad to the gravel sump so it is believed that the liquid from decontamination activities flowed from the surface of the pad down into the gravel sump. It is unknown how often this site was used. The concrete washdown pad is currently roped off and labeled as a Soil Radiation Contamination Area.

2.2.3 Corrective Action Site 25-07-03 (RADSAFE Pad)

The RADSAFE Pad is located north of the Radiation Safety Building (Building 3152) in the Security Control Point and consists of a concrete washdown pad and associated dry well and clean-out pipe (Figure 1-5). There is a drain/trench covered by a metal grate located along the north edge of the concrete pad. There is an opening in the west end of the drain/trench. The west opening leads to the dry well and it is not known if there is an east opening or if that opening leads to the clean-out pipe. The concrete washdown pad is approximately 9 m long by 6 m wide (30 ft wide by 18 ft wide). The drain is approximately 0.6 m deep (2 ft deep). The dry well is located approximately 31 m (102 ft) northwest of the concrete pad, is approximately 2.4 m wide by 2.4 m long by 1.5 m deep (8 ft wide by 8 ft long by 5 ft deep), is filled with gravel, and is below grade (AEC, 1961). Located along the south edge of the RADSAFE Pad, is a concrete drum storage pad and associated ramp. The storage pad was reportedly used to store contaminated and radioactive materials (Sorom, 1998).

The RADSAFE Building and Pad were originally designed as a radiation checkpoint and decontamination area for the NRDS and are believed to have been in operation from 1958, when the NRDS began operation, until the 1973 termination of the NRDS program. Building 3152 was used for equipment pick up at the beginning of the day and for radiation-checking and decontaminating personnel at the end of the day (Hayes, 1998). The washdown pad was originally intended to be a radiation control area and occasional decontamination facility. Most vehicles were decontaminated at other facilities in the vicinity such as the Reactor Maintenance Assembly and Disassembly (R-MAD) and the Engine Maintenance Assembly and Disassembly (E-MAD) facilities. Vehicles reentering the test cell and reactor facilities were decontaminated at the RADSAFE Pad. Also, it is believed that parts associated with reactor runs were decontaminated at the RADSAFE Pad. These parts are not believed to have been the actual reactor parts. Actual reactor parts were reported as being possibly decontaminated at the F and J Roads Pad. In 1962, beagles associated with the Beagle Experiment were decontaminated at the RADSAFE Pad. These dogs are said to have been radioactively contaminated. The dogs were housed in kennels located east of the RADSAFE Building (Sorom, 1998).

2.3 Waste Inventory

The three CASs were constructed to support NRDS activities from the late 1950s to 1973, when the NRDS program was terminated. Operations at the sites varied from sampling gas and liquid gas trucks (Propellant Pad) to decontaminating reactor parts and vehicles associated with the rocket tests (F and J Roads Pad), to decontaminating animals associated with aboveground testing at the NTS (RADSAFE Pad). Each site was equipped with water and power. The exact volume of water, if any, used during decontamination activities is unknown; therefore, the amount of rinsate released to the decontamination pads and surrounding areas is unknown. These sites are not known to have received any type of waste nor does it appear that there is buried waste at the sites.

2.4 Release Information

The source of potential contamination at the CASs depends on the activities conducted at the individual CASs. At the Propellant Pad, the source of potential contamination would have been the release of the materials being sampled; however, given that this pad was used to sample gas and liquid gas, the result of contamination from a spill is unlikely. At the F and J Roads Pad and the RADSAFE Pad, the source of potential contamination are radionuclides from decontaminating the vehicles, reactor parts, and animals, as well as hydrocarbons from vehicle decontamination activities. Releases are believed to have occurred at two of the concrete pads (F and J Roads Pad and RADSAFE Pad), the surface and subsurface soil adjacent to the pads, the gravel sump, and dry well and associated piping.

2.5 Investigative Background

Past investigative activities at the sites include both surface soil sample collection and surface radiological surveys. The results of these activities are discussed in the following subsections.

2.5.1 Previous Sampling Effort

In 1997, IT Corporation (IT) sampled the surface soil at Propellant Pad and RADSAFE Pad. One surface soil sample was collected from each of the two CASs at locations identified as those most likely to be contaminated based on the site layout. Constituents detected above the contract required detection limits are listed in Table 2-1.

Table 2-1
Preliminary Sampling Results CAU 240

CAS No.	Sample Number	Parameter	Result	Units	PRG[a]
25-07-01	ERS00041	Methylene Chloride	26	µg/kg	20,000
		Arsenic	3.2	mg/kg	3.0
		Barium	86.0	mg/kg	100,000
		Chromium	5.7	mg/kg	450
		Lead	6.2	mg/kg	1,000
		Aroclor-1254	110	µg/kg	1,300[b]
25-07-03	ERS00043	Acetone	40	µg/kg	6,100,000
		Arsenic	4.3	mg/kg	3.0
		Barium	162	mg/kg	100,000
		Cadmium	4.0	mg/kg	930
		Chromium	16.7	mg/kg	450
		Lead	190	mg/kg	1,000
		Americium - 241	5.11	pCi/g	c
		Cesium-137	3.71	pCi/g	c
		bis(2-Ethylhexy)Phthlate	700	µg/kg	210,000
		ButylBenzylPhthalate	510	µg/kg	930,000
		Di-N-Butylphthalate	440	µg/kg	110,000,000
		Aroclor-1260	570	µg/kg	1,300[b]

[a]For chemical constituents, EPA Region IX Preliminary Remediation Goals for Industrial Soils were used for comparison (EPA, 1998)
[b]Cancer endpoint for polychlorinated biphenyls (EPA, 1998)
[c]Activities were greater than regional background activities from McArthur and Miller (1989)
mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram
µg/kg = Micrograms per kilogram

The chemical data were compared to the Region IX Preliminary Remediation Goals (PRGs) (EPA, 1998). The chemical concentrations from both the Propellant Pad and the RADSAFE Pad preliminary samples were below the corresponding PRGs, except for arsenic, which is within NTS arsenic background levels. Two radionuclides, cesium-137 and americium-241, were detected at the RADSAFE Pad at concentrations above regional background concentrations (McArthur and Miller, 1989). Arsenic was detected above the corresponding PRG but was detected within background. Samples were not collected at the F and J Roads Pad due to elevated surface radiological readings.

2.5.2 Previous Radiological Survey Efforts

As part of the sampling effort performed in 1997 by IT, surface radiological surveys were performed at each of the three CASs prior to sample collection. Sampling was not performed at the F and J Roads Pad due to elevated beta readings. As a result of this survey, the site was roped off and labeled as a "Soil Contamination Area" (IT, 1997).

A second surface radiological survey was performed at the three CASs in 1998 by IT to identify any locations of surface contamination and show radiological trending information. Appendix C presents the results of the 1998 survey. The results of the survey demonstrate the following:

- Slightly elevated measurements for the Propellant Pad indicate that there may be a few scattered spots of elevated alpha/beta contamination on the concrete pad. No radiological contamination was found on the soil or asphalt (Adams, 1998).

- The F and J Roads Pad has elevated beta and gamma measurements. These measurements were identified on the soil directly west of the concrete pad and down the slope into the gravel sump, on the north edge of the concrete pad, and on the soil between the end of the gravel road and the edge of the concrete pad (Adams, 1998).

- The radiological surveys at RADSAFE Pad are consistent with background locations taken on similar media in the near vicinity (Adams, 1998). However, laboratory results indicated elevated levels of cesium-137 and americium-241.

2.5.3 National Environmental Policy Act (NEPA) Requirements

In accordance with the DOE/NV NEPA compliance program, a NEPA checklist shall be completed prior to commencement of site investigation activities at CAU 240. This checklist requires DOE/NV projects to evaluate their proposed project against a list of several potential environmental impacts. These include, but are not limited to, air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the DOE/NV NEPA Compliance Officer.

3.0 Objectives

The DQOs are qualitative and quantitative statements that specify the quality of the data required to support potential courses of action for CAU 240. The DQOs were developed to clearly define the uses for the environmental data and to design a data collection program appropriate to these uses. A conceptual site model was formulated to facilitate the DQO process and to help with data quality decisions.

3.1 Conceptual Site Model

The conceptual site model defines the expected nature and extent of contamination within CAU 240. The conceptual site model for this CAU is based on assumptions formulated from information presented in Section 2.0 and discussed during the DQO process. The model is used to identify appropriate sampling strategy and data collection methods. The conceptual site model and assumptions developed in the DQO process are presented in Appendix A and are summarized as follows:

- Liquid waste associated with decontamination activities was released to the soils at two of the CASs (F and J Roads Pad and RADSAFE Pad).
- Gases and liquid gases associated with gas sampling activities may have been released to the soils at one of the Corrective Action Sites (Propellant Pad).
- Lateral extent of COPCs is limited to the proximity of the site components.
- Vertical extent of COPCs is unknown but is expected to be limited due to intermittent past use, and because there are no current driving forces and there are low precipitation rates (the sites are no longer active).
- Depth to groundwater is approximately 317 m (1,040 ft); groundwater impacts are not expected.
- Future use of the site is stated in the Environmental Impact Statement and is assumed to be light industrial and industrial.
- Potential exposure pathways are limited to ingestion, inhalation, and dermal contact.

3.2 Contaminants of Potential Concern

Based on a combination of process knowledge and preliminary sampling, COPCs were identified for each CAS during the DQO process. At the Propellant Pad, COPCs include VOCs, SVOCs, and PCBs. While not anticipated at this site, analysis for radionuclides will be done using gamma spectroscopy as a precautionary measure. The F and J Roads Pad and the RADSAFE Pad include these same COPCs in addition to *Resource Conservation and Recovery Act* (RCRA) metals and TPH. Radionuclides including strontium-90 (F and J Roads Pad), cesium-137, and isotopic uranium and plutonium may be present at these CASs. Tables A.3-1 through A.3-3 in Appendix A list the COPCs for each CAS and include field screening methods and levels, analytical methods, and preliminary action levels (PALs). Table A.3-4 in Appendix A specifies minimum reporting limits, precision, and accuracy for the analytes.

3.3 Preliminary Action Levels

The following subsections describe the field screening levels and PALs for the CAU. Field screening levels for on-site field screening methods will be used to determine the presence of contamination and guide the investigation.

3.3.1 Field Screening Levels

The following field screening levels will be used for on-site field screening methods (20 at each CAS):

- Volatile organic compound headspace screening levels using a photoionization detector and a water bath (at constant temperature) are established at 20 parts per million (ppm) or 2.5 times background, whichever is greater.

- Radiation (alpha and beta/gamma) screening is defined as the mean background activity level plus two times the standard deviation of the mean background activity level (to be determined prior to start of field activities) and monitored during sampling.

Concentrations exceeding field screening levels indicate potential contamination at that sample location. This information will be documented, and the investigation will be continued to delineate the extent of the contamination.

3.3.2 Chemical Preliminary Action Levels

Off-site laboratory analytical results will be compared to the following PALs to evaluate the need for possible corrective actions:

- Nevada Division of Environmental Protection Corrective Action Regulations (NAC, 1997b) (for purposes of this CAIP, Region IX PRGs for industrial soils are the PALs [EPA, 1998])

- Total petroleum hydrocarbons concentrations above the TPH limit of 100 ppm (100 mg/kg) per the *Nevada Administrative Code* (NAC) 445A.345 - NAC 445A.22755 (NAC, 1997b)

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

3.3.3 Radiological Preliminary Action Levels

The PAL is a calculated concentration of a radionuclide in a sample that is used to distinguish contaminated samples from background. The PALs for radioactive COPCs will be calculated in accordance with the guidance described in the Nuclear Regulatory Commission's *Multiagency Radiation Survey and Site Investigation Manual (MARSSIM)* (NRC, 1997). The MARSSIM provides detailed guidance for designing, conducting, and documenting radiological surveys. The MARSSIM provides guidance on evaluating survey results prior to making decisions concerning radionuclide concentrations relative to concentrations in a background area. The assumption will be made that any difference in the distribution of the radionuclide concentrations between the background area and the areas of concern within the CAU is due to the presence of residual radioactivity in addition to background. As stated in Section 8.4.1 of MARSSIM, radionuclide concentrations in some samples may be higher than some background area results, while the average concentration in the environment is still not significantly greater than background. The result of the hypothesis testing determines if the radionuclide concentrations in the areas of concern within the CAU are deemed to exceed background concentration.

The evaluation of potential corrective action and the justification for a preferred action will be included in the CADD based on the results of this field investigation.

3.4 DQO Process Discussion

Details of the DQO process are presented in Appendix A. The DQO results indicated the need for biased sampling at each of the CASs for both surface and near-surface locations. The COPCs, analytical methods, and reporting limits prescribed through the DQO process are provided in Appendix A. The precision and accuracy requirements are those stated in EPA *Contract Laboratory Program Statements of Work* (EPA, 1988, 1990; 1994a; 1994b).

4.0 Field Investigation

This section of the CAIP contains the sampling approach for investigating CAU 240, Area 25 Vehicle Washdown. All sampling activities will be conducted in compliance with the Industrial Sites QAPP (DOE/NV, 1996b) and other applicable/contractor, approved procedures. Quality assurance and quality control requirements for field and laboratory environmental sampling are also contained in the Industrial Sites QAPP (DOE/NV, 1996b). Data will be collected during field investigations to confirm or refute the conceptual model by assessing the migration of COPCs and determining if COPCs are present in concentrations exceeding the PALs established for the CAU.

The field investigation at CAU 240 will consist of video surveying, surface and near-surface field screening, and surface and near-surface sampling using direct-push methods. Contingent excavating and drilling will be conducted if necessary. These activities will define the extent of the contamination at the CASs. Field screening will be conducted for VOCs and radioactivity. Environmental samples will be collected at selected locations based on the surface radiological survey results, field screening results, and process knowledge (details provided in Sections 4.4 through 4.7).

Excavation to locate subsurface features (i.e., piping and disposal features) will be conducted if the video survey fails to adequately define them. Drilling will only be performed to determine the extent of contamination beyond the depth capabilities of the direct-push equipment. If the direct push equipment continues to show contamination at its greatest depth, then drilling will be conducted to determine the extent of the contamination.

Field activities will be performed according to the current version of the HASP and an approved SSHASP. As required by the U.S. Department of Energy (DOE) Integrated Safety Management System, these documents outline the requirements for protecting the health and safety of the workers and the public, and some procedures for protection of the environment. Site personnel will take every reasonable step to reduce or eliminate the possibility of injury, illness, or accidents, and to protect the environment during all project activities. The following will be taken into consideration when evaluating the hazards and associated control procedures for the field activities:

- Potential hazards to site personnel and the public including, but not limited to, radionuclides, chemicals (such as heavy metals, VOCs, SVOCs, and PCBs), adverse and rapidly changing weather, remote location, motor vehicle and heavy equipment operation, drilling and excavations

- Proper training of all site personnel to recognize and mitigate the anticipated hazards

- Work controls to reduce or eliminate the hazards including engineering controls, substitution of less hazardous materials, and personal protective equipment

- Occupational exposure monitoring to prevent overexposures to hazards such as radionuclides, chemicals, and physical agents (heat, cold, and high wind)

- Use of the “as low as reasonably achievable” (ALARA) principle when dealing with radiological hazards

- Emergency and contingency planning and communications to include medical care and evacuation, decontamination and spill control measures, and appropriate notification of project management

4.1 Technical Approach

The following activities will be conducted during the site investigation:

- Conduct video surveys to determine the extent, condition and/or location of the sewer line, the drain pipe, and the dry well.

- Excavate to locate piping if video survey fails to adequately define subsurface features.

- Excavate to remove gravel to sample soils in the center of gravel sump and dry well if required.

- Collect surface and near-surface environmental samples from biased locations at each CAS using direct-push methods.

- Collect two surface background samples and two near-surface background samples from two nearby undisturbed locations at each CAS (a total of four samples per CAS) using the direct-push method and submit them for laboratory analysis. Background data taken for other Area 25 CASs may be incorporated with background data taken at this CAU to use as background data for Area 25 soil in general.

- Determine radiological field-screening level by taking 20 background sample readings at each CAS and calculating the mean plus two standard deviations for each CAS.

- Field screen for VOCs using a headspace method (photoionization detector [PID] and waterbath) and for radioactivity using an Electra™ alpha/beta scintillator and a sodium iodide (NaI) detector or intrinsic germanium detector. Because field-screening techniques are not readily available for some of the COPCs (i.e., SVOCs and PCBs), they will be evaluated through laboratory analysis.

- Conduct laboratory analysis for CAS-specific COPCs.

- Analyze background samples for RCRA metals, strontium-90 (only at F and J Roads Pad), gamma spectroscopy, and isotopic uranium and plutonium.

- Collect additional environmental samples at step-out locations if field screening levels are exceeded in original sample locations.

- Drill borings to delineate vertical extent of COPCs only if contamination extends beyond the limits of the direct-push equipment.

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

4.2 Video Survey Activities

The first phase of the field investigation will consist of video surveying. Video surveys allow a visual assessment of the system's integrity and can be used to identify obvious breaches, unexpected branchings (i.e., tie-ins or off-shoots), and open joints. A radiolocator which emits a signal that can be tracked at the ground surface may be coupled with the video setup and introduced into the piping. The piping will be inspected and physically mapped by tracking the camera head inside the piping network. A radiation detector (gamma probe) may be attached to the camera to qualitatively measure radiation levels within the surveyed components. The video system will be decontaminated using standard techniques and equipment. Rinsate samples will also be collected from camera decontamination for waste management and QA/QC purposes.

A video camera survey will be attempted at the F and J Roads Pad. The video camera will be inserted into the sewer pipe located on the northeast side of the eastern-most trailer pad. The camera may carry a gamma detector and a locator. This survey will attempt to determine the condition and extent of this sewer pipe.

A video camera survey will also be attempted at the RADSAFE Pad. The video camera will be inserted at the beginning of the drain pipe located on the northwest corner of the concrete pad. The camera may carry a gamma detector and a locator. The survey will attempt to determine the location and condition of the pipe and dry well.

4.3 Excavation Activities

If necessary, excavation activities will consist of using a backhoe or shovel to obtain access to piping or sampling locations. Contingent excavation may be necessary at the F and J Roads Pad to obtain soil samples from near the center of the gravel sump. The depth of the gravel at the gravel sump is unknown. Excavation may be necessary to investigate piping visible at the gravel sump and believed to originate at the sewer connection on the northeast side of the trailer pads.

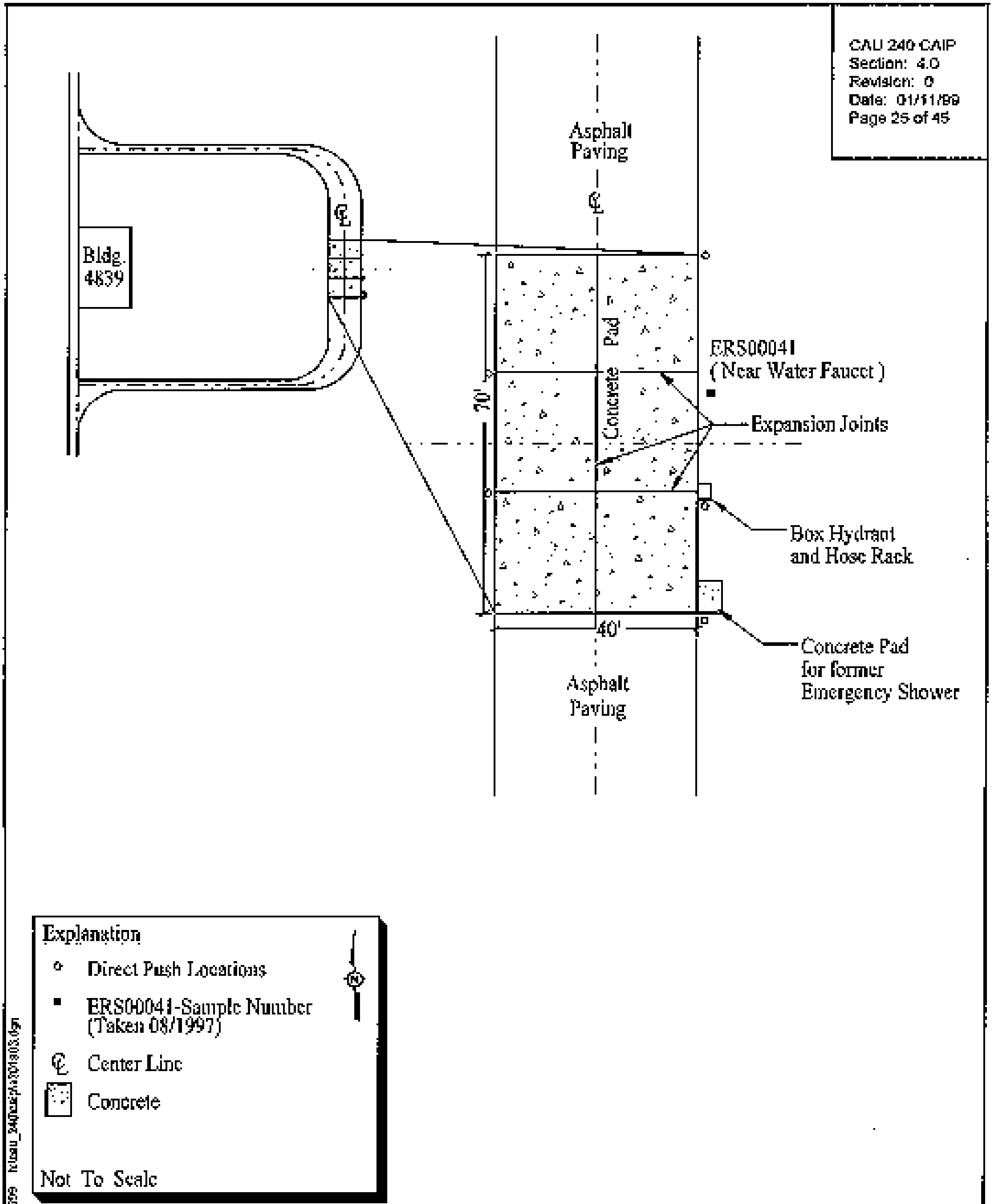
Contingent excavation may be necessary at the RADSAFE Pad to locate piping and the dry well and to obtain samples at the dry well. The dry well is believed to be a 2.4 m by 2.4 m by 1.7 m (8.0 ft by 8.0 ft by 5.5 ft) deep, gravel-filled excavation covered by 0.3 m (1 ft) of clay material. Based on engineering drawings, excavating to a depth of 1.5 m (5.5 ft) should be sufficient to identify the pipe leading to the dry well and to collect samples, if required.

If excavation is necessary, the excavated soil will be used as backfill. The soil will be returned to the excavation hole in the opposite order it was removed. This process will help control the potential spread of any COPCs.

4.4 Surface and Near-Surface Sampling

Surface and near-surface samples will be collected at each of the three sites at biased locations as shown on Figures 4-1, 4-2, and 4-3. A direct-push method will be used to collect samples from 0 to 0.3 m (0 to 1 ft) below ground surface (bgs) (surface samples) and from 0.9 to 1.5 m (3 to 5 ft) bgs (near-surface samples). Surface and near-surface samples will be field screened for VOCs and radioactivity. Section 4.6 provides additional details on field-screening methods. The number and placement of sampling locations are based on those areas most likely to have received COPCs. These locations were determined from historical and process knowledge. Samples will be collected from biased locations within each site as follows:

Propellant Pad - A total of five surface and near-surface locations will be sampled using the direct-push method at this CAS as follows (Figure 4-1):



Source: Space Nuclear Propulsion Office Drawing NRDS-SF-P18/C-2
LH, Sampling Facility Civil & Piping Details, 1965

Figure 4-1
Sample Locations CAS 25-07-01 Vehicle Washdown Area (Propellant Pad)
Area 25 Nevada Test Site

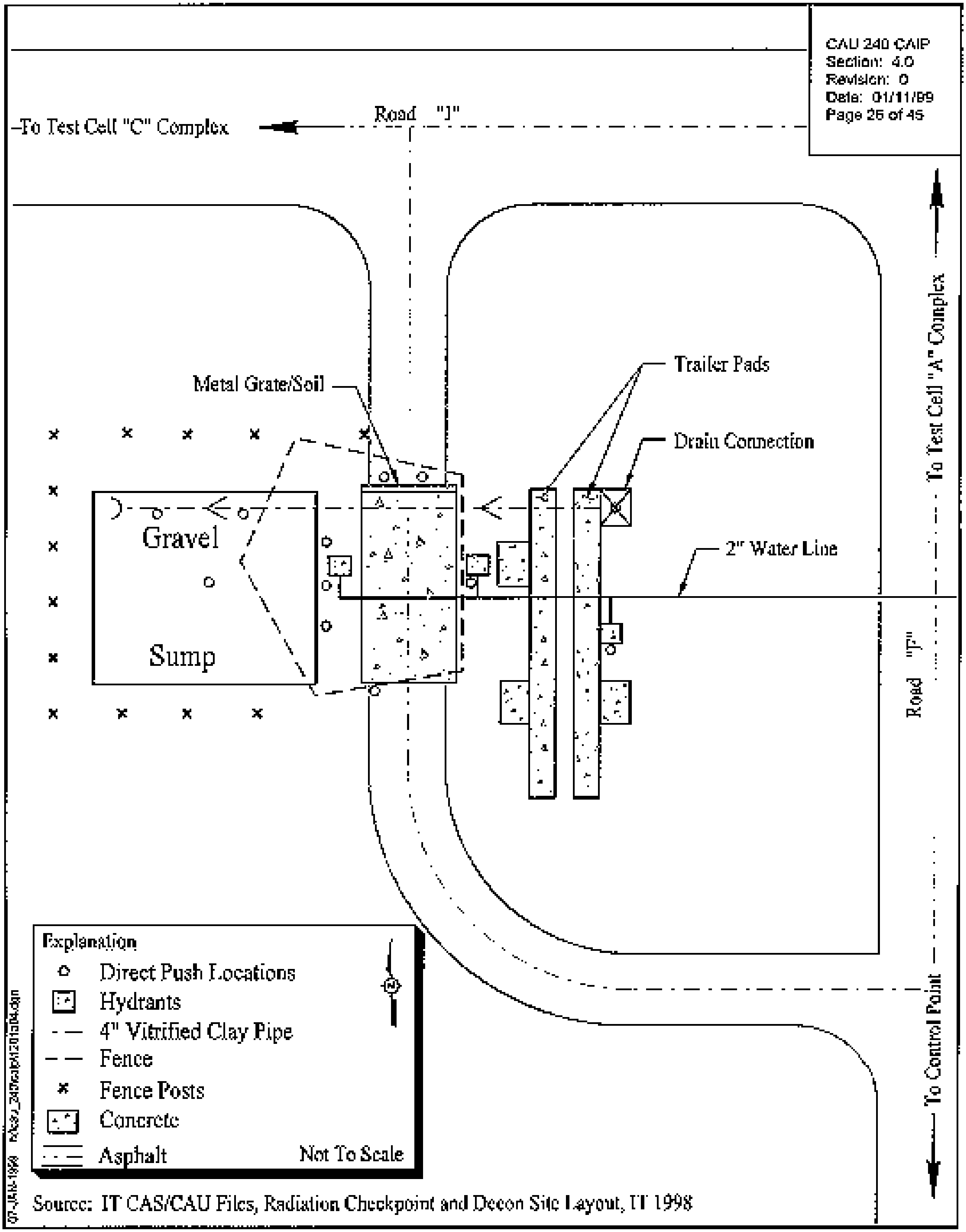
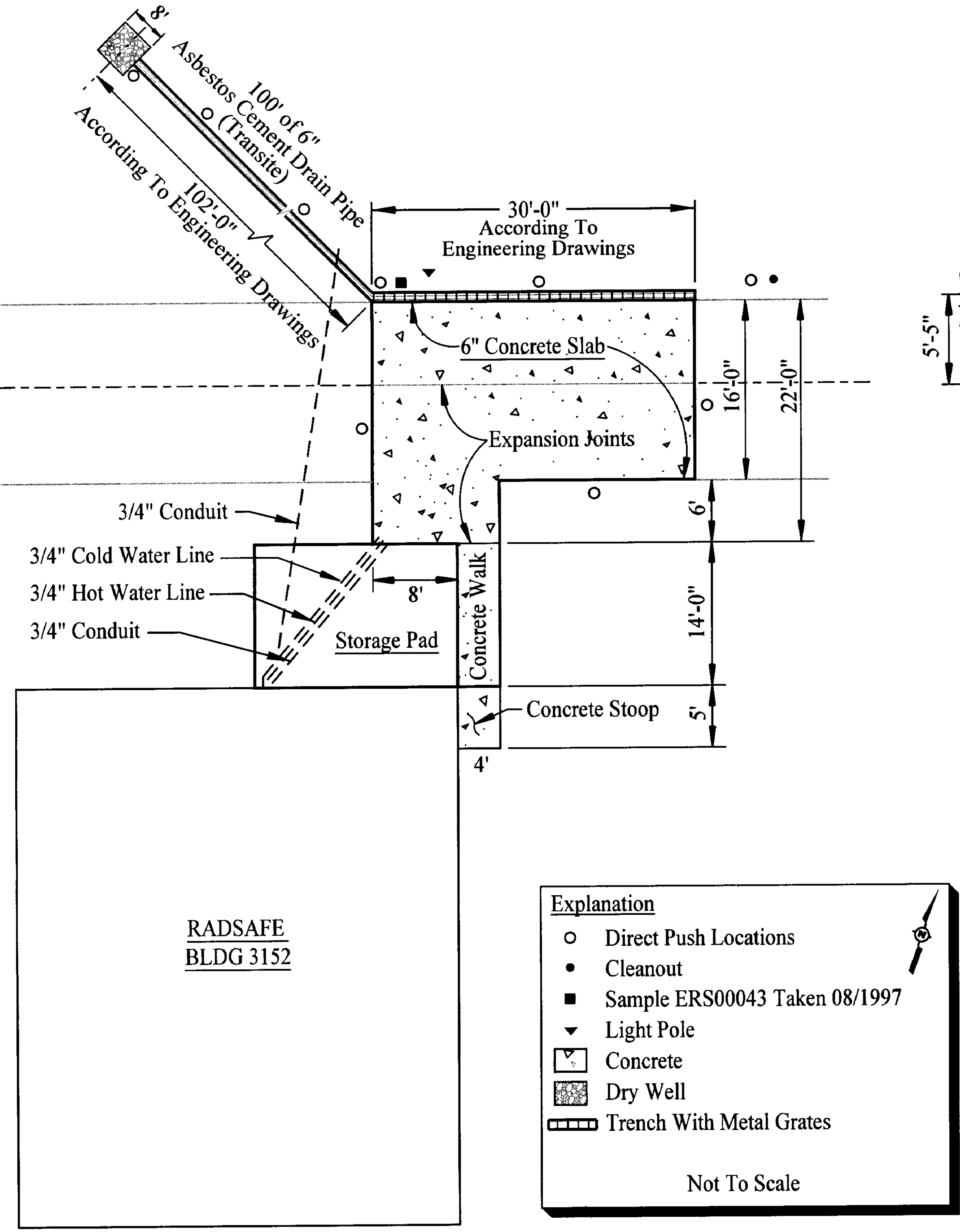
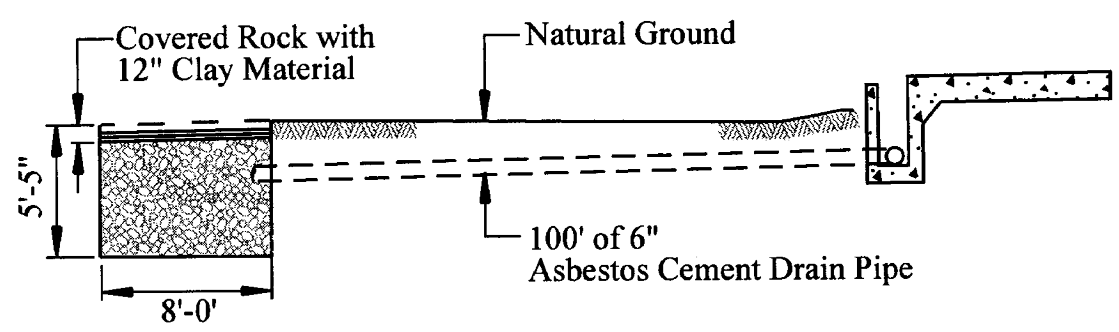
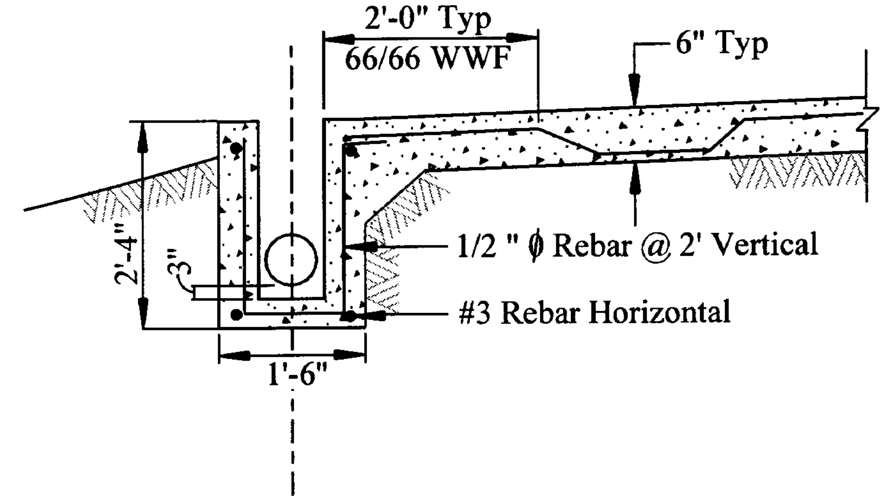


Figure 4-2
Sample Locations CAS 25-07-02 Vehicle Washdown Area (F and J Roads Pad)
Area 25 Nevada Test Site





Dry Well and Trench Section
Not To Scale



Concrete Washdown Slab and Trench Detail
Not To Scale

Source: U.S. Atomic Energy Commission, Drawing RE-3152-C2
Structure 3152-RADSAFE Bldg. Miscellaneous Layout and Details, 1961

Figure 4-3
Sample Locations CAS 25-07-03
Vehicle Washdown Station
(RADSAFE Pad)
Area 25
Nevada Test Site

07-JAN-1999 h:\cau_240\caip\1201b01.dgn

- Two sample locations at the west side of the pad
- One sample location at the northeast corner of the pad
- One sample location near the water hydrant/faucet location
- One sample location near the safety shower pad located on the southeast corner of the concrete pad.

F and J Roads Pad - A total of 12 surface and near-surface locations will be sampled using the direct-push method at this CAS as follows (Figure 4-2):

- Three sample locations on the west side of the concrete pad between the pad and the gravel sump, where elevated radiological survey readings were taken
- Two sample locations at the breaks in the discharge pipe in the gravel sump
- One sample location at the center of the gravel sump
- Two sample locations from the soil strip on the north edge of the concrete pad downgradient from the grate
- One sample location from the soil strip on the south edge of the concrete pad
- One sample location near each hydrant located east of the concrete pad
- One sample location on the outflow of the sewer drain connection located east of the trailer pads

RADSAFE Pad - A total of nine surface and near-surface locations will be sampled using the direct-push method at this CAS as follows (Figure 4-3):

- Four sample locations around the pad perimeter (one sample on each side of the concrete pad)
- One sample location close to the outlet drain located on the northwest corner of the concrete pad
- One sample location between the cleanout and the concrete pad

- Two sample locations along the piping to the dry well (one sample approximately one-third of the way and the other approximately two-thirds of the way to the dry well or at identified breaches)
- One sample location at the outflow of the pipe into the dry well

If field-screening levels are exceeded at the locations, step-out samples will be taken by the direct-push method to further delineate the lateral and vertical extent of COPCs as necessary. The location and depth of proposed step-out samples will be based on the results of field screening at the initial locations and at the discretion of the Site Supervisor. Step-out samples will be collected by the direct-push method in the same manner as the initial samples. Soil remaining after the direct-push activities will be placed back in the direct-push hole, and if contaminated, will be addressed during the corrective action.

4.5 Contingency Sampling

Potential soil borings may be drilled using a hollow-stem auger drill or another appropriate drilling method if contamination extends beyond the maximum investigation depth of the direct-push equipment. Borings will be advanced in 1.5-m (5-ft) intervals and will continue until two consecutive, 1.5-m (5-ft) intervals, nondetect field screening readings are obtained for VOCs and radionuclides. If COPCs are encountered at the maximum attainable depth of the drilling rig, NDEP will be notified and the investigation rescoped.

4.6 Field Screening

Field screening for VOCs and radioactivity will be conducted for all samples. The field-screening methods include screening for VOCs using a headspace method and screening for radioactivity using an Electra™ alpha/beta scintillator and NaI detector or intrinsic germanium detector.

Field screening results will provide information to establish the maximum depth of COPCs and the need for step-out samples. If field screening results exceed the field screening levels listed in Section 3.3, additional samples and step-outs will be taken by the direct-push method or drilling as necessary.

4.7 Sampling Criteria

Soil samples will be collected for laboratory analysis at all the initial biased sample locations. Samples submitted to the laboratory will be analyzed in accordance with Tables A.3-1 through A.3-4 in Appendix A. In step-out samples (if performed), samples will be collected for laboratory analysis from the highest field screening interval and the first of the two consecutive, nondetect intervals. If field screening does not detect any contamination in the step-out samples, the first of the two consecutive samples below field-screening levels will be submitted to the laboratory for confirmation of the nondetect field screening readings.

Proposed analytical parameters were selected based on process and historical knowledge, sampling data, and discussions during the DQO process. The parameters, methods, and associated QC ranges for precision and accuracy measurements are specified in Table A.3-4 in Appendix A. All laboratory samples from the proposed initial samples and step-outs, if required, will be analyzed for the following constituents according to each CAS as follows:

Propellant Pad - Vehicle Washdown Area:

- VOCs
- SVOCs
- Total PCBs
- Radionuclides through gamma spectroscopy
- Uranium and plutonium isotopic analysis only if gamma spectroscopy results exceed PALs (The gamma spectrometry is being used to detect fission and activation products. If fission and activation product concentrations exceed the PALs, then alpha spectrometry will be performed to detect uranium and plutonium).

F and J Roads Pad - Vehicle Washdown Area:

- VOCs
- SVOCs
- Total RCRA Metals
- TPH - Diesel/Waste Oil

- Total PCBs
- Radionuclides through gamma spectroscopy
- Strontium-90
- Uranium and plutonium isotopic analysis only if gamma spectroscopy results exceed PALs (The gamma spectrometry is being used to detect fission and activation products. If fission and activation product concentrations exceed the PALs, then alpha spectrometry will be performed to detect uranium and plutonium).

RADSAFE Pad - Vehicle Washdown Station:

- VOCs
- SVOCs
- Total RCRA Metals
- TPH - Diesel/Waste Oil
- Total PCBs
- Radionuclides through gamma spectroscopy
- Uranium and plutonium isotopic analysis only if gamma spectroscopy results exceed PALs (The gamma spectrometry is being used to detect fission and activation products. If fission and activation product concentrations exceed the PALs, then alpha spectrometry will be performed to detect uranium and plutonium).

Environmental samples collected for laboratory analysis will be samples of fresh (unused) media. Samples will be collected with highest priority given to those that will be analyzed for VOCs and SVOCs. When volatilization of COPCs is not a concern, the soil may be homogenized and the samples collected with priority given to those with the shortest hold times prior to analysis.

Analytical samples will be submitted to the laboratory in appropriate sample containers. Discretionary sampling points may also be selected for laboratory analysis based on visual examination by the Site Supervisor/Geologist. Selection criteria for discretionary samples could include:

- Moist or discolored zones

- Significant changes in soil grain size
- Odor

All sampling equipment which contacts soil will be decontaminated in accordance with written and approved procedures consistent with the Environmental Restoration Division Procedure ERD-05-701, "Sampling Equipment Decontamination," Rev. 1 (DOE/NV, 1998c), or as appropriate for special equipment being decontaminated (i.e., decontaminating core barrels). Core barrels (including direct-push barrels), if used, will be decontaminated prior to each sampling event and between boreholes to minimize the potential for cross-contamination of samples from different sample locations or depths.

Records will be maintained for a visual classification of the soil, field-screening measurements, and all other relevant data. Pertinent and required sampling information (e.g., date, time, sample interval) will be documented in accordance with the Industrial Sites QAPP (DOE/NV, 1996b). Approved chain of custody procedures will be followed to assure data defensibility (DOE/NV, 1998b).

4.8 Background Samples

Background surface and near-surface samples will be collected from two background locations at each CAS in an area assumed to not have been disturbed by vehicle washdown area operations. Background information will be used to evaluate analytical data to support the corrective action at this site. Background samples will be collected using the direct-push method from 0 to 0.3 m (0 to 1 ft) bgs and 0.9 to 1.5 m (3 to 5 ft) bgs depth. Samples will be analyzed for RCRA metals, gamma emitters using gamma spectroscopy, strontium-90, and isotopic uranium and plutonium according to Table A.3-4 in Appendix A. Background data taken for other Area 25 CASs may be incorporated with background data taken at this CAU to use as background data for Area 25 soil in general. The discrete background samples will be evaluated against the environmental sample data to evaluate the presence of metals and radionuclides above background levels.

4.9 Quality Control Samples

Quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 1996b). These samples will include trip blanks, equipment blanks, field blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples. Except for trip blanks, all QC samples will be analyzed for applicable parameters specified in Appendix A for each CAS. Trip blanks will only be analyzed for VOCs. The QC samples will be collected as specified in the QAPP and approved procedures. Additional QC samples may be submitted at the discretion of the Site Supervisor.

5.0 Waste Management

Management of investigation-derived waste (IDW) will be based on regulatory requirements, field observations, process knowledge, and the results of laboratory analysis of CAU 240 investigation samples. Decontamination activities will be performed according to approved contractor procedures specified in the contractor field sampling instructions and as appropriate for the COPCs likely to be identified at the CAU.

Waste other than soil is potentially contaminated waste only by virtue of contact with potentially contaminated media. Therefore, sampling and analysis of IDW, separate from analyses of site characterization samples, will generally not be required. Rinsate may be analyzed separately to determine final disposition if soil contamination is present above FSL. The data generated as a result of site characterization and process knowledge will be used to assign the appropriate waste type (i.e., sanitary, hazardous, low-level radioactive waste [LLW], or mixed) to the IDW with the exception noted in Section 5.3.

There is no process knowledge that indicates specific hazardous waste constituents were disposed of in these CASs. Therefore, if contaminants are identified, they will be considered characteristic rather than listed hazardous wastes. Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE Orders, U.S. Department of Transportation (DOT) regulations, RCRA regulations, *Nevada Revised Statutes* (NRS, 1998), and agreements and permits between the DOE and NDEP.

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

5.1 Waste Minimization

Corrective action investigation activities have been planned to minimize IDW generation. Decontamination activities are planned to minimize the use of rinsate; and will be conducted in accordance with approved contractor procedures. Waste, such as disposable sampling equipment, decontamination rinsate, and personal protective equipment (PPE) will be segregated to the greatest extent possible to minimize the generation of hazardous, radioactive, and/or mixed waste.

5.2 Potential Waste Streams

Process knowledge indicates that potentially hazardous materials were used at this CAU. Wastes generated during the investigation activities will include the following:

- Potentially contaminated disposable sampling equipment (such as plastic, paper, sample containers, aluminum foil, spoons, scoops, and bowls) and PPE
- Decontamination rinsate
- Potentially contaminated soil

The waste will be managed in three waste streams; additional segregation will occur within each waste stream based on sample location. Waste will be traceable to its source and to individual samples.

5.3 Investigation-Derived Waste Management

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

5.3.1 Sanitary Wastes

Sanitary waste generated outside the controlled area will be contained in plastic bags and will be transported to a solid waste management unit. Sanitary waste generated within the controlled area will be swiped to determine if the removable contamination is under the limits defined in Table 2-2 of the *NV/YMP Radiological Control Manual* (Gile, 1996).

5.3.2 Low-Level Waste

Low-level waste, if generated, will be managed in accordance with the contractor-specific waste certification program plan and the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (DOE/NV, 1997). Waste containers containing soil, PPE, and disposable sampling equipment shall be staged at a designated Radioactive Material Area pending certification and disposal under NTSWAC requirements (DOE/NV, 1997). Waste containers shall be labeled "Radioactive Material Pending Analysis." All containers shall be locked or fitted with tamper-indicating devices (TIDs). Traceability shall be maintained by assigning unique waste tracking numbers to each container and by maintaining records that trace the IDW back to the original sampling locations.

The PPE and disposable sampling equipment shall be placed in clear plastic bags marked with the date and an associated borehole number or sample location. The bags will be tagged with a contractor-specific waste tracking tag and logged in the contractor-specific waste management logbook.

Soil generated (cuttings) during borehole advancement using a drill rig shall be collected in containers that meet DOT specifications for packages (49 *Code of Federal Regulations* [CFR] 172) (CFR, 1998a), 6-millimeter liners will be placed in the containers. Cuttings shall be segregated by borehole. Containers used to contain soil shall be inspected prior to use. If a container is damaged, cannot be locked, or cannot accommodate a TID, it shall not be used. Absorbent Stergo™ pads shall be added to containers of radiologically contaminated soil or PPE. Contractor-specific waste tracking tags shall be used and may be attached to the inside liner, or marked with the container's unique identification number, and stored with the contractor-specific logbook. The borehole number must be placed on each tracking tag. Container inspection and absorbent addition shall be documented on the appropriate form.

Rinsate will be collected in containers that meet DOT specifications (49 CFR 172) (CFR, 1998a) for packages pending further treatment. Rinsate may be analyzed separately to determine final disposition. If rinsate is categorized as low-level waste on the basis of container-specific sampling or other methods, it will be solidified prior to NTSWAC certification activities.

5.3.3 Hazardous Waste

Suspected hazardous waste will be managed in accordance with RCRA and State of Nevada hazardous waste management regulations, interpreted as follows. Suspected hazardous waste will be placed in containers that meet DOT specifications (49 CFR 172) (CFR, 1998a) for packages which will be closed and secured when not in use. The IDW containers shall be compatible with the waste in accordance with the requirements of 40 CFR 265.172 (CFR, 1998d). No incompatible wastes are expected to be generated; however, if incompatible waste is encountered in the field, it will be managed in accordance with 40 CFR 265.177 (CFR, 1998d) (i.e., shall not be placed in the same set) and shall be separated so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another. Containers shall be handled and inspected in accordance with the requirements of 40 CFR 265.173 and 174, respectively (CFR, 1998d).

Hazardous waste shall be characterized in accordance with the requirements of 40 CFR 261 (CFR, 1998b). Characterization will be based on laboratory results and process knowledge. Containers of IDW pending characterization will be marked with the words "Hazardous Waste Pending Analysis" until its regulatory status can be determined through interpretation and evaluation of laboratory results. Traceability shall be maintained by assigning a unique waste tracking number to each set and by maintaining records that trace the IDW back to the samples. After receipt of analytical results, hazardous wastes, if identified will be labeled and marked in accordance with the requirements of 40 CFR 262.32 (CFR, 1998c).

Gamma spectroscopy is included in the required site characterization analyses. If radionuclide concentrations exceed preliminary action levels, plutonium and uranium alpha spectroscopy will be performed. These analysis are included to determine if the waste will meet the *Nevada Test Site Performance Objectives for Certification of Nonradioactive Hazardous Waste* (BN, 1995). These analysis are included in the event the waste generated during site characterization is determined to be a hazardous waste.

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

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

5.3.4 Mixed Wastes

Mixed waste, if generated, shall be managed in accordance with (40 CFR 262) (CFR, 1998c) and State of Nevada NAC 444 (NAC, 1997a). These regulations, as well as DOE requirements for radioactive waste, are interpreted as follows. Where there is a conflict in regulations or requirements, the most stringent shall apply. For example, the 90-day accumulation time limit and weekly inspections per RCRA regulations will be applied to mixed waste even though it is not required for radioactive waste. Conversely, while RCRA does not require documented traceability, the waste acceptance program for LLW does; therefore, traceability shall be documented as described in Section 5.3.2.

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

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

6.0 Duration and Records Availability

6.1 Duration

After the submittal of the CAIP to NDEP (FFACO milestone date of February 1, 1999), the following is a tentative schedule of activities (in calendar days):

- Day 0: Preparation for field work will begin.
- Day 60: The field work, including field screening and sampling, will begin. Samples will be shipped to meet laboratory holding times.
- Day 110: The field work will be completed.
- Day 185: The quality-assured laboratory analytical sample data will be available for review.
- The FFACO date for the CADD is August 18, 1999.

6.2 Records Availability

This document is available in the DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

7.0 References

AEC, see U.S. Atomic Energy Commission.

Adams, S.R. 1998. Memo to B. Bordelois, "Review of Radiological Survey Data for CAU 240," 3 November. Las Vegas, NV: IT Corporation.

APHA, see American Public Health Association.

American Public Health Association. 1992. *Standard Methods for the Examination of Water and Waste Water.*

Analytical Chemistry. 1979. *Determination of Strontium-89 and -90 in Soil with Total Sample Decomposition*, October.

BN, see Bechtel Nevada.

Bechtel Nevada. 1995. *Nevada Test Site Performance Objective for Certification of Nonradioactive Hazardous Waste*, G-E11/96.01, Rev. 0. Las Vegas, NV.

Bechtel Nevada. 1996. "ES&H Facility Closure Inspection" for Building Number 4839 in Area 25, 4 December. Las Vegas, NV.

CFR, see *Code of Federal Regulations*.

Code of Federal Regulations. 1998a. 49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998b. 40 CFR Part 261, "Identification and List of Hazardous Waste." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998c. 40 CFR Part 262, "Standards Applicable to Generators of Hazardous Waste." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 1998d. 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." Washington, DC: U.S. Government Printing Office.

Coleman, G.H. 1965. *The Radiochemistry of Plutonium*. National Academy of Sciences, September.

DOE, see U.S. Department of Energy.

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. Agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense.

Garey, K. 1998. Record of telecon with C. Speer (SAIC) to K. Garey (Peer Consultants) regarding Building 4839 and its washdown pad, and what was sampled on the pad, 8 August. Las Vegas, NV.

Gile, 1996. *NV/YMP Radiological Control Manual*, Rev. 2, DOE/NV/11718-079, UC-702. Las Vegas, NV: Bechtel Nevada.

Grindler, J.E. 1962. *The Radiochemistry of Uranium.* National Academy of Science.

Hayes, T. 1998. Record of telecon with B. Bordelois (SAIC) to T. Hayes (BN) regarding the historical activities at RADSAFE Pad, 10 June. Las Vegas, NV.

Horowitz. 1992. Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography. Analytica Chimica Acta.

Horowitz. 1993. Separation and Preconcentration of Activities from Acidic Media by Extraction Chromatography. Analytica Chimica Acta.

IT, see IT Corporation.

IT Corporation. 1997. Field Activity Daily Log for site spill sampling conducted by J. Quarles and R. Johnson, 15 August. Las Vegas, NV.

IT Corporation. 1998. Field Activity Daily Log for site visit by B. Bordelois and C. Rodriguez to CAU 240 including CASs 25-07-01, 25-07-02, and 25-07-03, 28 September. Las Vegas, NV.

McArthur, R.D., and F.L. Miller, Jr. 1989. *Off-Site Radiation Exposure Review Project (ORERP), Phase II Soil Program*, DOE/NV/10384-23. Las Vegas, NV: Desert Research Institute.

MOSA, see Soil Science Society of America.

NAC, see *Nevada Administrative Code*.

NDEP, see Nevada Division of Environmental Protection.

NRC, see U.S. Nuclear Regulatory Commission.

NRS, see *Nevada Revised Statutes*.

Nevada Administrative Code. 1997a. NAC444.940 - NAC444.9555, "Sanitation." Carson City, NV: Nevada Division of Environmental Protection.

Nevada Administrative Code. 1997b. NAC445A.2272, "Water Controls." Carson City, NV: Nevada Division of Environmental Protection.

Nevada Division of Environmental Protection. 1995. "Mutual Consent Agreement Between the State of Nevada and the Department of Energy for the Storage of Low-Level Land Disposal Restricted Mixed Waste." Transmittal from P. Liebendorfer (NDEP) to D. Elle (DOE/NV), 7 June. Carson City, NV.

Nevada Revised Statutes. 1998. 459.9973, 459.9975, and 459.9977, "Hazardous Materials." Carson City, NV: Nevada Division of Environmental Protection.

REECo, see Reynolds Electrical and Engineering Company, Inc.

Reynolds Electrical and Engineering Company, Inc. No date. *Radiation Check Point and Decon Site Layout*, construction drawings located in IT Project Files for CAU 240. Las Vegas, NV.

SNPO, see Space Nuclear Propulsion Office.

Sorom, E. 1998. Record of telecon with B. Bordelois (SAIC) to E. Sorom (retired from REECo) regarding F and J Roads Pad and RADSAFE Pad, the nature of their activities, and the trailer location, 28 April and 12 June. Las Vegas, NV.

Space Nuclear Propulsion Office. 1965. U.S. Atomic Energy Commission (AEC) - National Aeronautics Administration (NASA), Drawing NRDS-SF-P18/C-2, LH2 Sampling Facility Civil & Piping Details. Jackass Flats, Nevada.

Space Nuclear Propulsion Office. 1970. *NRDS Master Plan 1969-1970, Nuclear Rocket Development Station, Jackass Flats, Nevada*. Las Vegas, NV.

U.S. Atomic Energy Commission. 1961. *Structure 3152 Rad Safe Bldg. Miscellaneous Layout and Details*, Drawing RE-3152-C2. Las Vegas, NV.

U.S. Department of Energy. 1992. *Environmental Measurements Laboratory Procedures Manual*, HASL-300, 27th Edition, Vol. 1. New York, NY.

U.S. Department of Energy, Nevada Operations Office. 1987. Nevada Test Site - Environmental Compliance Atlas, 15 June. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1988. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office, Nuclear Weapons Testing Area*, Vol. I. 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. 1996a. *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. 1996b. *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. 1997. *Nevada Test Site Waste Acceptance Criteria*, NVO/NV--325, Rev. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998a. *Environmental Restoration Project Health and Safety Plan*, Rev. 3. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998b. ERD-05-201, "Chain of Custody," Rev. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998c. ERD-05-701, "Sampling Equipment Decontamination," Rev. 1. Las Vegas, NV.

U.S. Environmental Protection Agency. 1980. *Prescribed Procedures for Measurements of Radioactivity in Drinking Water.* Washington, DC.

U.S. Environmental Protection Agency. 1988a. *Contract Laboratory Program Statement of Works for Inorganic Analysis*, *ILMO 3.0*. Washington, DC.

U.S. Environmental Protection Agency. 1988b. *Contract Laboratory Program Statement of Work for Organic Analysis*, 2/88. Washington, DC.

U.S. Environmental Protection Agency. 1990. *Contract Laboratory Program Statement of Work for Organic Analysis*, 3/90. Washington, DC.

U.S. Environmental Protection Agency. 1991. *Contract Laboratory Program Statement of Work for Organic Analysis*, *OLMO 1.8*. Washington, DC.

U. S. Environmental Protection Agency. 1993. *Contract Laboratory Program Statement of Work for Inorganic Analysis, ILMO 3.0*. Washington, DC.

U.S. Environmental Protection Agency. 1994a. *Contract Laboratory Program Statement of Work for Inorganics Analysis, ILMO 4.0*. Washington, DC.

U.S. Environmental Protection Agency. 1994b. *Contract Laboratory Program Statement of Work for Organics Analysis*, *OLMO 3.1*. Washington, DC.

U.S. Environmental Protection Agency. 1994c. *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, 3rd Edition, CDROM includes 1986, 1992, and 1994 revisions. Washington, DC.

U.S. Environmental Protection Agency. 1998. Memo from S. J. Smucker regarding *Region 9 Preliminary Remediation Goals (PRGs)*, 1 August. San Francisco, CA.

U.S. Nuclear Regulatory Commission. 1997. *Multiagency Radiation Survey and Site Investigation Manual (MARSSIM)*, NUREG-1575/EPA 402-R-97-016. Washington, DC.

Appendix A

Data Quality Objectives Process

A.1.0 Introduction

A.1.1 Problem Statement

Potentially hazardous wastes were discharged to the Area 25 vehicle washdown stations that comprise CAU 240. The three CASs within CAU 240 are CAS 25-07-01, Vehicle Washdown Area; CAS 25-07-02, Vehicle Washdown Area; and CAS 25-07-03, Vehicle Washdown Station. These sites will be referred to in this appendix as the Propellant Pad to indicate CAS 25-07-01, F and J Roads Pad to denote CAS 25-07-02, and RADSAFE Pad to refer to CAS 25-07-03. Existing information about the nature and extent of contamination is insufficient to evaluate and select preferred corrective actions for these sites.

These CAUs will be investigated based on DQOs developed by representatives of the NDEP and DOE/NV. This investigation will determine if COPCs are present and if concentrations exceed preliminary action levels in soils surrounding the vehicle washdown stations. If COPCs are detected, the lateral and vertical extent of contamination will be delineated. Data adequate to close the site under NDEP, RCRA, and DOE requirements will be collected.

A.1.2 DQO Kickoff Meeting

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

Table A.1-1
DQO Kickoff Meeting Participants

Participant	Affiliation	Meeting Date **Kickoff Meeting** October 21, 1998
Steve Adams	IT	X
Betty Bordelois	SAIC	X
Sabine Curtis	DOE/NV	X
Mark DiStefano	IT	X
Cindy Dutro	IT	X
Thomas Fitzmaurice	BN	X
Syl Hersh	IT	X
Linda Linden	SAIC	X
Dave Madsen	BN	X
Mike McKinnon	NDEP	X
Cheryl Rodriguez	IT	X
Carl Speer	SAIC	X
Jeanne Wightman	Mactec	X
Dustin Wilson	SAIC	X

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

A.2.0 Conceptual Model

The following is a conceptual model of CAU 240:

- During the 1950s and 1960s, vehicle washdown stations were used to decontaminate vehicles, reactor parts, and animals related to the Beagle Experiment.
- Decontamination fluids were released to the ground from concrete decontamination pads through a variety of disposal options, including a dry well and runoff.
- The vehicles, reactor parts, and animals decontaminated on these pads may have contained radionuclides from nearby NRDS operations or hydrocarbons from vehicles.
- Section 2.0 of the CAIP describes the vehicle washdown stations, their operational histories, waste information, release information, and investigative backgrounds.

The conceptual model for the CAU 240 Area 25 Vehicle Washdown is provided in Table A.2-1.

Table A.2-1
Conceptual Model
(Page 1 of 4)

Conceptual Model Element	Description	Source
Vehicle Washdown Area (CAS 25-07-01) (Propellant Pad)	Located in Central Support Area (CSA) at the Central Propellant Storage Area behind Building 4839 in Area 25 of the Nevada Test Site.	IT, 1998
	Consists of a concrete pad and safety shower pad, neither expected to be contaminated. The concrete pad is actually made up of six smaller concrete pads placed side by side and connected by expansion joints.	Process Knowledge, IT, 1998; SNPO, 1965
	This concrete pad is not expected to be a washdown pad due to the nature of its design (no sump or dry well to receive runoff), and due to the known past use of the pad. Central Propellant Storage Area was designed for sampling liquid hydrogen from trucks upon arrival at the NRDS; the shipments were then released to the test cells in the NRDS; liquid hydrogen truck dewars were vented before sampling.	SNPO, 1970
	Propane, helium, oxygen, and liquid and gaseous nitrogen and other gasses could have been sampled at this site.	Garey, 1998
	The following constituents were detected above contract required detection limits: Methylene Chloride, Aroclor-1254, Arsenic, Barium, Chromium, and Lead. These constituents are below preliminary action levels or regional background concentrations (see Table 2-1 in the CAIP).	IT, 1997

Table A.2-1
Conceptual Model
(Page 2 of 4)

Conceptual Model Element	Description	Source
Vehicle Washdown Area (CAS 25-07-02) (F and J Roads Pad)	The Vehicle Washdown Area is located at the southwest corner of the intersections of F Road and J Road in Area 25.	IT, 1994
	The Vehicle Washdown Area was probably in operation from 1958, when the NRDS began operations, to 1973, when the program was terminated.	Sorom, 1998
	Vehicles and disassembled engine and reactor parts coming from the nearby NRDS facilities, including Test Cell A and Test Cell C, were screened for radioactive contamination, and then decontaminated on the vehicle washdown pad. The types and amounts of decontamination fluids used are unknown.	Sorom, 1998
	Concrete strips believed to have been used for a trailer pad are located east of the vehicle washdown concrete pad. A pipe from the sewer connection drains into the gravel sump. Effluent from the concrete washdown pad drained to the gravel sump.	Sorom, 1998; IT, 1998; REECo, date unknown
	Preliminary sampling efforts had to be cancelled due to elevated beta readings on the Electra™ field screening instrument. The high beta background reading was 6,963 disintegrations per minute (dpm) with a background of 1,692 dpm. The concrete pad was fenced and a radiological sign reading: "Caution - Soil Contamination Area" was posted. The radiological survey indicated elevated gamma survey results of 5 times background.	IT, 1997
	Transuranic elements and daughter products may be present as a result of reactor operations, but have not been verified.	Sorom, 1998; Duce, 1998
	There is an asphalt road which leads to and from the concrete pad. There is a strip of soil on the north and south sides of the pad between the asphalt road. A metal grate was observed in the northern portion of the soil. Gravel layer is evaporation barrier for water to percolate down.	IT, 1998

Table A.2-1
Conceptual Model
(Page 3 of 4)

Conceptual Model Element	Description	Source
Vehicle Washdown Station (CAS 25-07-03) (RADSAFE Pad)	Vehicle Washdown Station is located behind Building 3152 (RADSAFE).	IT, 1994
	Drain/trench sump with multiple metal grates are on north side of the concrete pad. This pad consists of two concrete slabs joined together by an expansion joint. A concrete storage pad is located south of the concrete vehicle washdown pad.	IT, 1998; REECo, 1961
	Four-inch pipe labeled c.o. encased in metal vault is located northeast of the concrete pad.	IT, 1998; REECo, 1961
	Berm/sump area is located northwest of the vehicle washdown pad.	IT, 1998; REECo, 1961
	The dry well is shown in the engineering drawings to be located northwest of the vehicle washdown station, at the end of a pipe measuring 102 ft from the pad.	IT, 1998; REECo, 1961
	Vehicles, parts associated with the Area 25 reactors, and dogs from the Beagle experiment were decontaminated at this vehicle washdown station.	Sorom, 1998
	Radioactively contaminated materials were stored in uncovered drums on the storage pad. Drums were removed in early 1990s.	Sorom, 1998
	Surface analytical results from a soil sample collected north of the sump outlet on August 15, 1997, indicated the following constituents above contract required detection limits: Acetone, Bis(2-Ethylhexyl)Phthalate, ButylBenzylPhthalate, Di-N-Butylphthalate, Aroclor-1260, Arsenic, Barium, Cadmium, Chromium, Lead, Americium-241, Cesium-137. These constituents, except Americium-241 and Cesium-137, are below preliminary action levels or regional background concentrations (see Table 2-1 in CAIP).	IT, 1997

Table A.2-1
Conceptual Model
(Page 4 of 4)

Conceptual Model Element	Description	Source
Lateral extent of potential contaminants	Hydrogen sampling pad (propellant pad) is not expected to be contaminated.	IT, 1998
	RADSAFE site may include concrete pad, surrounding soils, cleanout, and possibly dry well area, piping leading to dry well and soil adjacent to and in area of expansion joint.	
	Contamination at the site located at the intersection of Roads F and J with the gravel sump may include the concrete pad, gravel sump, soils adjacent to concrete pad and trailer pads where runoff might have occurred, and area beyond gravel sump within fence posts.	
	In general, lateral extent should be limited to the proximity of the site elements.	
Vertical extent of potential contaminants	Vertical extent is unknown. There is no remaining driving force other than precipitation.	Not Applicable
Depth to Groundwater	Groundwater impacts are not anticipated. The F and J Roads Pad and the RADSAFE Pad both have nearest well (Well J-11) located at approximately 5,286 m (18,000 ft) south of the Test Cell A facility. The depth to groundwater at this well is 317 m (1,040 ft) bgs. Wells J-12 and J-13 derive their water from an aquifer approximately 180 m (591 ft) bgs.	DOE/NV, 1988a USGS, 1993
System dynamics	Annual precipitation is approximately 6 in.	BN, 1996
	The concrete pads are no longer in service and the sites are abandoned.	IT, 1998
Physical and practical constraints	F and J Roads site is fenced and posted as soil contamination area. Nearby utilities and buildings are found at the RADSAFE and Propellant site and adverse weather conditions may affect all sites.	IT, 1998
Future Use	Future use for the sites will include light industrial, industrial, educational tours, research, and support sites.	DOE, 1996a
Potential exposures	Potential for exposure is mainly to field personnel and workers performing investigations at these sites. Exposure pathways include ingestion, inhalation, and dermal contact. Groundwater pathways are not considered at this CAU.	DOE/NV, 1988b

A.3.0 Potential Contaminants

Section 3.0 of the CAIP provides additional information on the COPCs for the Vehicle Washdown Station CASs, including PALs and QA/QC requirements.

The COPCs for the Vehicle Washdown Station CAU vary from CAS to CAS as follows:

- Table A.3-1 identifies the COPCs for CAS 25-07-01.
- Table A.3-2 identifies the COPCs for CAS 25-07-02.
- Table A.3-3 identifies the COPCs for CAS 25-07-03.
- Table A.3-4 shows the precision, accuracy, and practical quantitation limits.

A.3.1 Decisions

Decisions to be resolved by the investigation include:

- Determine if COPCs are present at the site.
- Determine if COPC concentrations exceed field screening levels.
- Determine if COPC concentrations exceed PALs.
- Determine the nature and extent of contamination with enough certainty to develop and evaluate a range of potential corrective actions, including closure in place and clean closure.

A.3.2 Inputs and Strategy

Inputs to the decisions include those elements of information used to support the decisions in addressing the identified problem. A list of information inputs, existing data, identified data gaps, and brief strategies are discussed in Table A.3-5. A more detailed discussion of investigation strategies is found in Section A.5.0.

Table A.3-1
CAU 240 Contaminants of Potential Concern
(Vehicle Washdown Area, CAS 25-07-01)

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Analytical Method	Preliminary Action Level
Volatile Organic Compounds	Not expected; however, low levels of 2-Butanone, Methyl Ethyl Ketone, and Methylene Chloride were detected in preliminary samples	Headspace	20 ppm or 2.5X background (use greater value)	Yes	8260B[c]	PRGs[a] NAC 445[b]
Semivolatile Organic Compounds	Unknown	NA	NA	Yes	8270C[c]	PRGs[a] NAC 445A[b]
Total RCRA Metals	Arsenic, Barium, Lead, Chromium, and Mercury were detected at background levels in preliminary samples	NA	NA	No	6010B/7470A[c] 6010B/7471A[c]	PRGs[a] NAC 445A[b]
Total Petroleum Hydrocarbons	Not expected, minor discharges from vehicle leaks only	NA	NA	No	8015B modified[c]	100 ppm |NAC 445A[b]
Total PCBs	Aroclor-1254 was detected	NA	NA	Yes	8082[c]	PRGs[a] NAC 445A[b]
Radionuclides	No radionuclides were detected above background concentrations in preliminary sample	Electra™ Alpha/ Beta scintillator and NaI detector or intrinsic germanium detector	Mean background activity plus 2 times standard deviations of 20 background sample readings[d]	Yes	L-E10.602.PC (Gamma-ray Spectroscopy)[e] If gamma > PALs, then add Uranium and Plutonium Isotopic Analysis	PAL determined by applying nonparametric test to background concentration NUREG-1575[f] (MARSSIM)

[a]EPA *Region IX Preliminary Remediation Goals* (PRGs) (EPA, 1998)
[b]NDEP Corrective Action Regulations (NAC, 1998)
[c]EPA *Test Methods for Evaluating Solid Waste*, 3rd edition, Parts 1-4, SW-846 (EPA, 1996)
[d]Adams, S.R. 1998. Memo to B. McCall regarding "Methodology for Determining Preliminary Action Levels for CAU 407, the Roller Coaster RADSAFE Area," 16 June. Las Vegas, NV: IT Corporation.
[e]*Bechtel Nevada Local Implementing Directive* (BN, 1996)
[f]NUREG Nuclear Regulatory Commission *Multiagency Radiation Survey and Site Investigation Manual* (MARSSIM) (NRC, 1997)

NA = Not Applicable

Table A.3-2
CAU 240 Contaminants of Potential Concern
(Vehicle Washdown Area, CAS 25-07-02)

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Analytical Method	Preliminary Action Level
Volatile Organic Compounds	Unlikely	Headspace	20 ppm or 2.5X background (use greater value)	Yes	8260B[c]	PRGs[a] NAC 445A[b]
Semivolatile Organic Compounds	Unlikely	NA	NA	Yes	8270C[c]	PRGs[a] NAC 445A[b]
Total RCRA Metals	Unlikely	NA	NA	Yes	6010B/7470A[c] 6010B/7471A[c]	PRGs[a] NAC 445A[b]
Total Petroleum Hydrocarbons	Not expected, minor discharges from vehicle leaks only	NA	NA	Yes	8015B modified[c]	100 ppm NAC 445A[b]
Total PCBs	Unlikely	NA	NA	Yes	8082[c]	PRGs[a] NAC 445A[b]
Radionuclides	Elevated beta readings encountered by field equipment	Electra™ Alpha/ Beta scintillator and NaI detector or intrinsic germanium detector	Mean background activity plus 2 times standard deviations of 20 background sample readings[d]	Yes	L-E10.602.PC (Gamma-ray Spectroscopy)[e] Strontium-90 Analysis (L-E10.610.PL)[e] If gamma > PALs, then add Uranium and Plutonium Isotopic Analysis	PAL determined by applying nonparametric test to background concentration NUREG-1575[f] (MARSSIM)

[a]EPA *Region IX Preliminary Remediation Goals* (PRGs) (EPA, 1998)
[b]NDEP Corrective Action Regulations (NAC, 1998)
[c]EPA *Test Methods for Evaluating Solid Waste*, 3rd edition, Parts 1-4, SW-846 (EPA, 1996)
[d]Adams, S.R. 1998. Memo to B. McCall regarding “Methodology for Determining Preliminary Action Levels for CAU 407, the Roller Coaster RADSAFE Area,” 16 June. Las Vegas, NV: IT Corporation.
[e]*Bechtel Nevada Local Implementing Directive* (BN, 1996)
[f]NUREG Nuclear Regulatory Commission *Multiagency Radiation Survey and Site Investigation Manual (MARSSIM)* (NRC, 1997)

NA = Not Applicable

Table A.3-3
CAU 240 Contaminants of Potential Concern
(Vehicle Washdown Station, CAS 25-07-03)

Potential Contaminants	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Analytical Method	Preliminary Action Level
Volatile Organic Compounds	Not expected, however, low levels of 2-Butanone, Methyl Ethyl Ketone, and Acetone were detected in preliminary samples	Headspace	20 ppm or 2.5X background (use greater value)	Yes	8260B[c]	PRGs[a] NAC 445A[b]
Semivolatile Organic Compounds	bis(2-Ethyhexyl)Phthalate, ButylBenzylPhthalate and Di-N-Butylphthalate were detected	NA	NA	Yes	8270C[c]	PRGs[a] NAC 445A[b]
Total RCRA Metals	Arsenic, Barium, Cadmium, Chromium, and Lead were detected	NA	NA	Yes	6010B/7470A[c] 6010B/7471A[c]	PRGs[a] NAC 445A[b]
Total Petroleum Hydrocarbons	Not expected	NA	NA	Yes	8015B modified[c]	100 ppm (EPA, 1998)
Total PCBs	Aroclor-1260 was detected	NA	NA	Yes	8082[c]	PRGs[a] NAC 445A[b]
Radionuclides	Americium-241 and Cesium-137 were detected	Electra™ Alpha/ Beta scintillator and NaI detector or intrinsic germanium detector	Mean background activity plus 2 times standard deviations of 20 background sample readings[d]	Yes	L-E10.602.PC (Gamma-ray Spectroscopy)[e] If gamma > PALs, then add Uranium and Plutonium Isotopic Analysis	PAL determined by applying nonparametric test to background concentration NUREG-1575[f] (MARSSIM)

[a]EPA *Region IX Preliminary Remediation Goals* (PRGs) (EPA, 1998)
[b]NDEP Corrective Action Regulations (NAC, 1998)
[c]EPA *Test Methods for Evaluating Solid Waste*, 3rd edition, Parts 1-4, SW-846 (EPA, 1996)
[d]Adams, S.R. 1998. Memo to B. McCall regarding "Methodology for Determining Preliminary Action Levels for CAU 407, the Roller Coaster RADSAFE Area," 16 June. Las Vegas, NV: IT Corporation
[e]*Bechtel Nevada Local Implementing Directive* (BN, 1996)
[f]NUREG Nuclear Regulatory Commission *Multiagency Radiation Survey and Site Investigation Manual (MARSSIM)* (NRC, 1997)

NA = Not Applicable

Table A.3-4
Laboratory Analytical Requirements
(Page 1 of 2)

Analyte	Medium	Analytical Method	Minimum Reporting Limit	Precision (RPD)[a]	Accuracy (%R)[b]
Total VOCs	Water	8260B[c]	Analyte-Specific Estimating Quantitation Limits[d]	14[e]	61-145[e]
	Soil			24[e]	59-172[e]
Total SVOCs	Water	8270C[c]	Analyte-Specific Estimated Quantitation Limits[d]	50[e]	9-127[e]
	Soil			50[e]	11-142[e]
Total RCRA Metals	Water	6010B/7470A[c]		20[g]	75-125[g]
Arsenic			10 µg/L[f,g]		
Barium			200 µg/L[f,g]		
Cadmium			5 µg/L[f,g]		
Chromium			10 µg/L[f,g]		
Lead			3 µg/L[f,g]		
Mercury			0.2 µg/L[f,g]		
Selenium			5 µg/L[f,g]		
Silver			10 µg/L[f,g]		
Total RCRA Metals	Soil	6010B/7471A[c]		20[g]	75-125[g]
Arsenic			1 mg/kg[f,g]		
Barium			20 mg/kg[f,g]		
Cadmium			0.5 mg/kg[f,g]		
Chromium			1 mg/kg[f,g]		
Lead			0.3 mg/kg[f,g]		
Mercury			0.1 mg/kg[f,g]		
Selenium			0.5 mg/kg[f,g]		
Silver			1 mg/kg[f,g]		
TPH	Water (diesel)	8015B modified[c]	0.5 mg/L[f]	Lab-specific RPD[h]	Lab-specific %R[h]
	Soil (diesel)		25 mg/kg[f]		
PCBs	Water	8082[c]	Analyte-Specific Contract Required Quantitation Limits (CRQL)[e]		
	Soil				

Table A.3-4
Laboratory Analytical Requirements
(Page 2 of 2)

Analyte	Medium	Analytical Method	Minimum Reporting Limit	Precision (RPD)[a]	Accuracy (%R)[b]
Gamma-Emitting Radionuclides	Water	EPA 901.1[i]	Isotope Specific[j]	20	Tracer Yield 30-105 Laboratory Control Sample Yield 80-120
	Soil	HASL 300[k]	Isotope Specific[j]	35	
Isotopic Plutonium	Water	NAS-NS-3058[l,m]	2 pCi/L	20	
	Soil		0.5 pCi/g	35	
Isotopic Uranium	Water	NAS-NS-3050[n,o]	2 pCi/L	20	
	Soil		1 pCi/g	35	
Strontium-90	Water	SM 7500-Sr[p]	8 pCi/L	20	
	Soil	Martin 79[q]	2 pCi/g	35	

[a] RPD is Used to Calculate Precision:
Precision is estimated from the relative percent difference (RPD) of the concentrations measured for MS/MSD pairs, for laboratory duplicate analyses of unspiked field samples, or for field duplicates of unspiked samples. It is calculated by: $RPD=100x\{(|C_1-C_2|)/[(C_1+C_2)/2]\}$, where C_1=Concentration of the analyte in the first sample aliquot and C_2=Concentration of the analyte in the second sample aliquot

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

[c] EPA *Test Methods for Evaluating Solid Waste*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)
[d] Estimated Quantitation Limit (EQL) as given in SW-846, U.S. EPA (EPA, 1996)
[e] EPA Contract Laboratory Program Statement of Work for Organic Analyses (EPA, 1988b, 1990, 1991, and 1994b)
[f] *Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996b)
[g] EPA Contract Laboratory Program Statement of Work for Inorganic Analysis (EPA, 1988a, 1993, and 1994a)

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

[i] Prescribed Procedures for Measurements of Radioactivity in Drinking Water (EPA, 1980) or equivalent method
[j] Isotope specific Minimum Reporting Limit to be specified in CAIP
[k] *Environmental Measurements Laboratory Procedures Manual* (DOE, 1992) or equivalent method
[l] The *Radiochemistry of Plutonium* (Coleman, 1965) or equivalent method
[m] *Separation and Preconcentration of Actinides from Acidic Me*dia by E*xtraction Chromatography* (Horwitz, 1993) or equivalent method
[n] The *Radiochemistry of Uranium* (Grindler, 1962) or equivalent method
[o] *Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography* (Horwitz, 1992) or equivalent method
[p] *Standard Methods for the Examination of Water and Waste Water* (APHA, 1992) or equivalent method
[q] *Determination of Strontium-89 and -90 in Soil With Total Sample Decomposition* (Analytical Chemistry, 1979) or equivalent method

mg/kg = Milligram(s) per kilogram
pCi/L = Picocurie(s) per liter
mg/L = Milligram(s) per liter
pCi/g = Picocurie(s) per gram
µg/L = Microgram(s) per liter
RCRA = *Resource Conservation and Recovery Act*

Table A.3-5
Decisions, Inputs, and General Strategies
(Page 1 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are COPCs present above PALs at site?	Potential contaminant identification	Process knowledge of potential discharges	Exact COPCs	Collect laboratory samples; analyze for COPCs.
	Potential contaminant concentration	Preliminary sampling data available	COPC concentrations; do concentrations exceed PALs?	Collect field screening and laboratory samples at biased locations that represent worst case for contamination; compare results to field screening levels or to PALs.
	Potential contaminant distribution	COPCs may have extended in a vertical and lateral manner beyond vehicle washdown stations, gravel sump, and dry well and into surrounding soils.	Exact vertical and lateral extent	Sample using direct-push technique or hollow stem auger to define extent of contamination; if contamination extends beyond direct-push limit, drill at the gravel sump, washdown stations, and around dry well to establish worst case depth of COPCs; drill step-out borings to determine lateral extent if COPCs are detected; collect laboratory samples to confirm extent.

Table A.3-5
Decisions, Inputs, and General Strategies
(Page 2 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are potential contaminants migrating?	Relative mobility of potential contaminant	Heavy metals and radionuclides relatively low mobility	As discussed above	As discussed above.
	Potential contaminant distribution	Contaminant-specific, limited by geological, operational, and meteorological characteristics	As discussed above	As discussed above.
	Meteorologic data	Sufficient information is available	None	No site-specific meteorological data will be collected; general weather conditions and wind speed and direction are noted on daily field notes.
	Geologic/hydrologic data	General geologic/hydrologic characteristics of site; specific geologic conditions of nearby sites	No specific geologic or hydrologic sample data will be collected for this site. Assume mainly near-surface investigation	General soil characteristics will be noted on sample collection log.
	Radioactive decay	Radionuclides expected in CASs 25-07-02 and 25-07-03	Presence, types, and extent of radionuclides at CAS 25-07-02 and 25-07-03	Establish background; field screen for gamma-ray and alpha/beta radiation; collect samples for laboratory analysis.

Table A.3-5
Decisions, Inputs, and General Strategies
(Page 3 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	Historical evidence that COPCs released to the environment at site; no further action may apply at propellant pad	Presence, concentration, and extent of COPCs	Insufficient evidence to proceed without investigation. Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report.
	Closure in place	Potential for PCBs, VOCs, SVOCs, TPH, RCRA metals, and radionuclides	Presence of regulated COPCs; concentrations above PALs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD.
	Clean closure by contaminant removal	Potential for PCBs, VOCs, SVOCs, TPH, RCRA metals, and radionuclides	Presence, concentration, and extent of COPCs; volume of contaminated material above PALs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/Closure Report; otherwise prepare CADD.

A.4.0 Investigation Strategy

Samples collected from all three CASs will be analyzed according to the appropriate COPC table as provided in Section A.3.0.

A.4.1 CAS 25-07-01 Vehicle Washdown Area (Propellant Pad)

Investigate the vehicle washdown area using the following approach:

- Conduct radiological survey of concrete pad and soils surrounding concrete pad using Electra™ for alpha/beta and Ebertine™ ESP-2 ratemeter with 3 in. by 3 in. NaI detector for gamma or using an intrinsic germanium detector.
- Collect surface samples (0 to 1 ft) and near-surface samples (3 to 5 ft) bgs using direct push:
  - Soil from the east and west sides of concrete pad
  - Step-out from sampling location as necessary to determine extent of contamination
- Field screen direct-push samples for VOCs (using headspace method) and for radioactivity (using Electra™ alpha/beta scintillator and NaI detector or intrinsic germanium detector).
- Submit samples for laboratory analysis for PCBs, VOCs, SVOCs, and radionuclides (gamma spectroscopy). Isotopic uranium and plutonium will be analyzed for if gamma spectroscopy results exceed PALs.
- Collect and submit QA/QC samples as prescribed in the QAPP (no trip blanks unless VOC samples collected).

A.4.2 CAS 25-07-02 Vehicle Washdown Area (F and J Roads Pad)

Investigate the vehicle washdown area using the following approach:

- Conduct radiological survey of concrete pad and soils surrounding concrete pad using Electra for alpha/beta and Eberline™ ESP-2 ratemeter with 3 in. by 3 in. NaI detector for gamma or using intrinsic germanium detector.
- Conduct survey with video camera, locator, and radiation detector system to determine extent and condition of sewer line.

- Remove gravel to expose soils (by shovel or backhoe depending on thickness of gravel) if necessary.

- Sample soil beneath gravel, if soil found to be contaminated, the gravel will be sampled at a later time.

- Collect surface soil samples (0 to 1 ft) and near-surface samples (3 to 5 ft) bgs using direct push:

  - From sewer discharge adjacent to trailer pads

  - Soil near water hydrants

  - Soil near center of gravel sump

  - Soil between washdown pad and gravel sump

  - Soil between the asphalt and the grate on north side of concrete pad

  - Soil between the asphalt and the concrete on the southwest side of the concrete pad

  - Soil along sewer pipe within gravel sump where the pipe is disconnected

  - Step-outs from sampling locations as necessary to determine extent of contamination

- Field screen direct-push samples for VOCs (using headspace method) and for radioactivity (using Electra™ alpha/beta scintillator and NaI detector or intrinsic germanium detector).

- If contamination extends deeper than the 4 to 5 ft level, attempt deeper investigation with direct push.

- If contamination does not extend deeper than 4 to 5 ft level, continue to direct push step-outs at a 5 ft distance as required until contamination is no longer detected.

- Submit samples for laboratory analysis for PCBs, RCRA metals, VOCs, SVOCs, TPH, and radionuclides (strontium-90 [F and J Roads Pad] and gamma spectroscopy). Isotopic uranium and plutonium will be analyzed for if gamma spectroscopy results exceed PALs.

- The following contingency plan will be implemented if contamination is found to extend beyond the limits of the direct-push method (approximately 5 to 10 ft).

- Drill boreholes to investigate depths:

  - At locations where contamination is above field screening levels at bottom of the direct-push holes

  - 5 ft field screening and sampling interval or at discretion of site supervisor

  - Additional step-out borings may be drilled as required

A.4.3 CAS 25-07-03 Vehicle Washdown Station (RADSAFE pad)

This site will be investigated in the following approach:

- Conduct radiological survey of concrete pad and soils surrounding concrete pad using Electra™ for alpha/beta and Ebertine™ ESP-2 ratemeter with 3 in. by 3 in. NaI detector for gamma or intrinsic germanium detector.

- Conduct survey with video camera, locator, and rad detector system to determine extent and condition of the dry well and piping from drain trench to dry well and the cleanout northeast of the concrete pad.

- A backhoe will be used to locate the drain pipe if the video camera cannot get through.

- Collect surface samples (0 to 1 ft) and near-surface samples (3 to 5 ft) bgs using direct push:

  - Soil from four sides of concrete pad

  - Soil from influent end of piping to dry well

  - Soil along pipe leading to dry well

  - Soil surrounding dry well

  - Soil between cleanout and concrete pad

- Conduct field screening for VOCs (using headspace method) and for radioactivity (using Electra alpha/beta scintillator and NaI detector or intrinsic germanium detector).

- If contamination does not extend deeper than 4 to 5 ft level, continue to direct push with step-outs at a 5 ft distance as required until contamination is no longer detected.

- If contamination extends deeper than the 4 to 5 ft level, attempt deeper investigation with direct push.

- Conduct laboratory analysis for VOCs, SVOCs, RCRA metals, TPH, PCBs, and radionuclides (gamma spectroscopy). Isotopic uranium and plutonium will be analyzed for if gamma spectroscopy results exceed PALs.

- Direct-push/drill through dry well in order to sample at its soil/gravel interface and below the interface.

The following contingency plan will be implemented if contamination is found to extend beyond the limits of the direct-push method (approximately 5 to 10 ft):

- Drill boreholes to investigate depths

  - At locations where contamination is above field screening levels at bottom of the direct-push holes

  - Five-ft field screening and sampling interval or at discretion of Site Supervisor

  - Additional step-out borings may be drilled as required

A.5.0 Decision Rules

The following decision rules are applicable to all three Vehicle Washdown Station CASs and will be used to guide the investigation and subsequent data evaluation.

- If, in the course of the investigation, either of the following occur, then the investigation will be halted and rescoped as necessary:
  - The conceptual model fails to such a degree that rescoping is required
  - Sufficient data are collected to support evaluation of corrective actions
- For the subsurface investigation, if field screening indicates no COPCs above field-screening action levels, then a sample at the next prescribed subsurface location will be field-screened. If no COPCs are indicated, a confirmatory laboratory sample will be collected, and the subsurface investigation will be halted for that boring.
- For the subsurface investigation, if field screening indicates the presence of COPCs above field-screening levels, then the investigation will continue to determine extent of COPCs until two, consecutive samples with field screening results below field screening levels are obtained. Samples will be collected for laboratory analysis at the subsurface interval that represents the worst-case field-screening result and as stated in the previous bulleted item.
- If laboratory results indicate the presence of COPCs above PALs, then a CADD will be prepared.
- If no COPCs are identified above PALs, then a CADD/Closure Report will be prepared according to the outline agreed upon by NDEP and DOE/NV. This type of CADD incorporates the elements of the regular CADD and the corrective action plan and serves as the closure report for the site.

Table A.5-1 provides additional decision points and rules specific to each CAS.

Table A.5-1
CAS-Specific Decision Points and Rules

Investigation Activity	Decision Point	Decision Result	Decision Rule
Vehicle Washdown Area (CAS 25-07-01) Propellant Pad.			
Surface and Near-Surface Investigation.	Do field data from the concrete pad, and surrounding soils indicate contamination above field screening levels?	No.	Submit laboratory samples for confirmation.
		Yes .	Continue to perform direct-push sampling at 0 to 1 ft and 3 to 5 ft as planned.
Vehicle Washdown Area (CAS 25-07-02) F and J Roads Pad.			
Surface and Near-Surface Investigation.	Do field data from the gravel sump, concrete pad, and surrounding soils indicate contamination above field screening levels?	No.	Submit laboratory samples for confirmation.
		Yes for surface samples.	Continue to perform direct-push sampling at 0 to 1 ft and 3 to 5 ft.
		Yes for surface and near-surface samples.	Go to contingency drilling plan of deeper direct-push or drilling.
Vehicle Washdown Station (CAS 25-07-03) RADSAFE Pad.			
Pipeline Camera Survey.	Can dry well and/or drainage piping location be identified?	Yes.	Proceed with surface investigation (and subsurface as required).
		Yes, but in different location.	Adjust investigation location.
		No.	Pipe may have been removed, trench to gain access to pipe and well and proceed with survey.
Surface and Near-Surface Investigation.	Do field data from the concrete pad, storage pad, cleanout, expansion joint, dry well area and soils surrounding dry well area indicate contamination above field screening levels?	No.	Submit laboratory samples for confirmation.
		Yes for surface samples.	Continue to perform direct-push sampling at 0 to 1 ft and 3 to 5 ft.
		Yes for surface and near-surface samples.	Go to contingency plan of deeper direct-push or drilling.

A.6.0 Decision Error

Biased sampling will be conducted on surface and near-surface samples at CASs 25-07-01, 25-07-02, add 25-07-03 as identified in Sections A.4.0, A.5.0, and A.6.0. Biased sampling is appropriate because the locations are known or can be reasonably assumed. For CAS 25-07-03 Vehicle Washdown Station, the assumed location of the dry well will be verified prior to the investigation. Table A.5-1 describes actions if the location cannot be identified.

Biased sampling is to be performed. The sampling strategy targets the worst-case contamination by sampling the individual vehicle washdown areas, especially at points with highest potential for contamination. This will ensure that the extent of the contamination has been adequately located and identified. Two consecutive samples below field screening levels will be obtained from the soil borings to define the lower limit of the affected soils, and these field screening results will be confirmed through off-site laboratory analysis.

A.7.0 References

AEC, see U.S. Atomic Energy.

Adams, S.R. 1998. Memo to B. McCall regarding "Methodology for Determining Preliminary Action Levels for CAU 407, the Roller Coaster RADSAFE Area," 16 June. Las Vegas, NV: IT Corporation.

Bechtel Nevada. 1996. *Annual Site Environmental Report for Calendar Year 1996*. Las Vegas, NV.

Bechtel Nevada. 1998. *Bechtel Nevada Analytical Services Laboratory Procedures Manual I.* Las Vegas, NV.

Desert Research Institute. 1988. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office Nuclear Weapons Testing Areas*, Vol. 1, April. Prepared for U.S. Department of Energy, Nevada Operations Office. Las Vegas, NV.

DOE, see U.S. Department of Energy.

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

DRI, see Desert Research Institute.

Duce, S. 1998. Record of telecon with B. Bordelois (SAIC) to S. Duce (IT) regarding transuranic elements at CAS 25-07-02 and 25-07-03, 18 June. Las Vegas, NV.

EPA, see U.S. Environmental Protection Agency.

Garey, K. 1998. Record of telecon with C. Speer (SAIC) to K. Garey (Peer Consultants) regarding Building 4839 and its washdown pad, and what was sampled on the pad, 08 August. Las Vegas, NV.

Horwitz, E.P., M.L. Dietz, R. Chiarizia, and H. Diamond. 1992. "Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography." In *Analytica Chimica Acta*, 266: 25-37. Amsterdam, The Netherlands: Elsevier Publishing, B.V.

Horwitz, E.P., M.L. Dietz, R. Chiarizia, and H. Diamond. 1993. "Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography." In *Analytica Chimica Acta*, 281: 261-372. Amsterdam, The Netherlands: Elsevier Publishing, B.V.

IT Corporation. 1994. Field Activity Daily Log for the IT field crew visit to CAU 240, CAS 25-07-02 (F and J Roads Pad), 12 April. Las Vegas, NV.

IT Corporation. 1997. Field Activity Daily Log for the IT field crew visit to CAU 240, CAS 25-07-01 (Propellant Pad), CAS 25-07-02 (F and J Roads Pad), and CAS 25-07-03 (RADSAFE Pad), 15 August. Las Vegas, NV.

IT Corporation. 1998. Field Activity Daily Log for site visit B. Bordelois and C. Rodriguez to CAU 240, CAS 25-07-01, CAS 25-07-02, and CAS 25-07-03, 28 September. Las Vegas, NV.

NAC, see *Nevada Administrative Code.*

NRC, see U.S. Nuclear Regulatory Commission.

Nevada Administrative Code. 1998. NAC445A.345 - 445A.22755, "Corrective Action Regulations." Carson City, NV: Nevada Division of Environmental Protection.

REECo, see Reynolds Electrical & Engineering Company, Inc.

Reynolds Electrical & Engineering Company, Inc. Date unknown. *Radiation Checkpoint and Decon Site Layout*, construction drawing located in IT Project Files for CAU 240. Las Vegas, NV.

Reynolds Electrical and Engineering Company, Inc. 1961. Structure 3152-RADSAFE and Structure 3153-Fire Station Sanitary Sewer System, RE-3152-M7. Las Vegas, NV.

Reynolds Electrical and Engineering Company, Inc. 1983. Existing Water and Sewer Layout Well J-11, Gate 500 & Adjoining Area Plan, 25-WJ11-C1. Las Vegas, NV.

SNPO, see Space Nuclear Propulsion Office.

Sorom, E. 1998. Record of telecon with B. Bordelois (SAIC) to E. Sorom (retired from REECo) regarding CAS 25-07-02 and CAS 25-07-03. 28 April and June 12. Las Vegas, NV.

Space Nuclear Propulsion Office. 1965. Atomic Energy Commission (AEC) - National Aeronautics Administration (NASA). Drawings NRDS-SF-P18/C-1 and NRDS-SF-P18/C-2. LH2 Sampling Facility Civil & Piping Details. Jackass Flats, NV.

Space Nuclear Propulsion Office. 1970. NRDS Master Plan 1969-1970, Nuclear Rocket Development Station, Jackass Flats, Nevada. Las Vegas, NV.

U.S. Atomic Energy Commission. 1961. *Structure 3152 Rad Safe Bldg. Miscellaneous Layout and Details*, Drawing RE-3152-C2. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1988a. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office, Nuclear Weapons Testing Area*, Vol. 1. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1988b. *Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada*, DOE/RW-0199, Vols. I-IX. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1992. *Environmental Measurements Laboratory Procedures Manual*, HASL-300, 27th edition, vol. 1. New York, NY.

U.S. Department of Energy, Nevada Operations Office. 1996a. *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. 1996b. *Industrial Sites Quality Assurance Project Plan*, DOE/NV--372. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996c. *Nevada Test Site Environmental Report for Calendar Year 1996*. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1997. *Nevada Test Site Annual Site Environmental Report for Calendar Year 1996*. Las Vegas, NV: Bechtel Nevada.

U.S. Environmental Protection Agency. 1986, 1992, 1994, and 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd Edition, CDROM, PB89-148076. Washington, DC.

U.S. Environmental Protection Agency. 1988. *Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis.* Washington, DC.

U.S. Environmental Protection Agency. 1988. *Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis*. Washington, DC.

U.S. Environmental Protection Agency. 1990. *Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis*. Washington, DC.

U.S. Environmental Protection Agency. 1994a. *Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis*. Washington, DC.

U.S. Environmental Protection Agency. 1994b. *Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis.* Washington, DC.

U.S. Environmental Protection Agency. 1994c. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4. Washington, DC.

U.S. Environmental Protection Agency. 1998. Memo from S.J. Smucker regarding *Region 9 Preliminary Remediation Goals (PRGs)*, 01 August. San Francisco, CA.

USGS, see U.S. Geological Survey.

U.S. Geological Survey. 1993. *Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, Calendar Year 1993*. Open-File Report 95-158.

U.S. Nuclear Regulatory Commission. 1997. *Multiagency Radiation Survey and Site Investigation Manual (MARSSIM)*, NUREG-1575/EPA 402-R-97-016. Washington, DC.

Appendix B

Project Organization

B.1.0 Project Organization

The DOE/NV Project Manager is Janet Appenzeller-Wing and she can be reached at (702) 295-0461.

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

Appendix C

Radiological Survey Results

INTERNATIONAL TECHNOLOGY CORPORATION

Memorandum

To: Steven Adams

Date: November 2, 1998

From: Carl Speer

Project No. 776712.01020100

Subject: **TRANSMITTAL OF A RADIOLOGICAL SURVEY OF CAU 240, CAS 25-07-01, VEHICLE WASHDOWN AREA**

Enclosed please find one copy of the report entitled: "Radiological Survey of CAU 240, CAS 25-07-01, Vehicle Washdown Area." This report outlines the survey objectives, instruments used, data acquisition and data processing methods, quality control procedures, and a brief review of the data. Also included is the processed radiological survey results, background survey results and data plots.

If you have any questions, please give me a call at (702) 295-2366.

Attachments

LV/11-2-98/G:\RADSUR\CAU240\MEMO240.WPD

RADIOLOGICAL SURVEY OF CAU 240, CAS 25-07-01,

VEHICLE WASHDOWN AREA

1.0 Objective

The objective of this radiological survey was to provide locations of surface contamination and show radiological trends to focus characterization and clean up efforts. Radiological instrumentation was used to define the nature and extent of potential radiological contaminants.

2.0 Instruments

- Eberline model ESP-2 Ratemeter (SN. 1729) with 3- by 3-inch NaI scintillation gamma detector (SN. 062293A)
- NE Technology model Electra (SN. 1531) with model DP6BD alpha/beta probe (SN. 1381)
- Trimble model Pro XRS Global Positioning System (GPS) Receiver with model TSC1 datalogger (SN. 220134393)

3.0 Data Acquisition

Radiological background locations were selected based on concrete and soil characteristics similar to the survey area. A concrete storage pad built from the same aggregate approximately at the same time as the vehicle washdown pad was selected for background concrete measurements. A total of 30 background concrete measurements were collected. The background concrete measurement results are shown in Table 1. Soil areas were selected approximately 50 meters up-gradient from the washdown pad with similar gravel/sand ratios for the soil background measurements. A total of 15 background soil measurements were collected. Background soil measurement results are shown in Table 2. Radiological and GPS measurements of the background locations were performed in the same manner as the site survey described below.

A radiological survey was performed October 6 and 7, 1998 at Corrective Action Site 25-07-01, Vehicle Washdown Area. An investigation grid of 18 by 27 meters was established around the washdown pad with 2- by 2-meter internal grid spacing. Random soil locations around the concrete pad were chosen where the alpha/beta probe could be placed directly on the soil. The grid was marked on the concrete pad with permanent markers to provide uniform measurement spacing. Each measurement location was surveyed by a Trimble Pro XRS GPS. Alpha, beta, and gamma measurements were collected by placing the detectors directly on the surface of the concrete pad and surrounding soils. Each radiological measurement was integrated for 30 seconds and recorded on the datalogger and stored with its related GPS measurement in a combined GPS/RAD file. A total of 142 alpha, 144 beta, and 111 gamma measurements were recorded. The radiological measurements and Universal Transverse Mercator coordinates for each measured point are shown in Table 3.

4.0 Data Processing

The GPS/RAD data from the datalogger was downloaded to a laptop computer and the GPS measurements were post-processed using Trimble's "Pathfinder" software. Each GPS measurement was positional corrected using collected real-time satellite differential signals or the USDA Forest Service Cedar City, UT base station differential files located at http://www.fs.fed.us/database/gps/cedarcty.htm. After post-processing, the GPS/RAD data was exported as an ASCII file and converted to an Excel spreadsheet file. The GPS/RAD data was processed using the commercial software package SURFER for graphical presentation. A separate post map was generated for alpha, beta, and gamma measurements. Figure 1, 2, and 3 show graphical representation of the alpha, beta, and gamma measurements, respectively, as they compare to established backgrounds for concrete and soil. Figures 4, 5, and 6 show the location and readings of the alpha, beta, and gamma measurements respectively.

5.0 Quality Control

Radiological detection equipment used in this survey was checked daily as described in SQP-ITLV-460. To ensure positional accuracy, the GPS system was programmed according to the operational manual to achieve submeter accuracy. In addition, each positional measurement recorded was an average of at least 30 readings, which increased the positional accuracy to less than 50 cm. A sampling of the data was checked against source information.

6.0 Data Review

Radiological measurements of the concrete pad and surrounding soils at CAU 240, CAS 25-07-01, Vehicle Washdown Area appear to be consistent with background measurements taken on similar media in the surrounding area. Factors affecting these radiological measurements included gamma and beta shine from surrounding soil, changing ambient radon levels, and instrument variations. No radiological measurements above 2.5 times mean background were identified at this Corrective Action Site.

TABLE 1

Background Concrete Pad Radiological Measurements for CAU 240

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
563367	4071505	56.8	915	29800
563367	4071505	125	932	28600
563367	4071505	125	1147	29300
563367	4071505	68.2	969	29800
563367	4071505	114	1077	29600
563367	4071505	102	981	29500
563367	4071505	102	1106	29900
563367	4071505	45.5	1085	30000
563367	4071505	136	1044	29800
563367	4071505	79.5	1048	28800
563367	4071505	125	1077	28500
563367	4071505	114	1010	29500
563367	4071505	90.9	1006	29200
563367	4071505	114	1106	29000
563367	4071505	136	990	29000
563367	4071505	159	1238	29500
563367	4071505	159	1023	29100
563367	4071505	170	1077	29200
563367	4071505	90.9	928	30100
563367	4071505	90.9	1039	29000
563367	4071505	90.9	977	29100
563367	4071505	114	1085	30000
563367	4071505	136	990	29400
563367	4071505	90.9	870	27400
563367	4071505	102	1081	29200
563367	4071505	79.5	1044	28700
563367	4071505	114	1023	29100
563367	4071505	148	957	28900
563367	4071505	136	1035	29300
563367	4071505	79.5	1039	29600

mean	109.82	1030	29263
mean + 2σ	170.67	1182	30373
mean + 3σ	201.10	1258	30928

TABLE 2

Background Soil Radiological Measurements in the Vicinity of 25-07-01

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
563431.454	4071519.104	56.8	1938	50300
563431.369	4071519.413	90.9	1938	50300
563430.832	4071519.180	125	1747	50600
563430.571	4071519.293	56.8	2079	50600
563432.205	4071518.751	56.8	1876	50500
563432.147	4071517.761	79.5	1826	50500
563431.577	4071517.106	45.5	2062	50400
563430.909	4071516.246	45.5	1996	52300
563431.716	4071516.361	0	1752	51400
563434.223	4071516.464	34.1	1897	51400
563434.495	4071516.312	68.2	1971	51100
563435.419	4071517.460	22.7	1834	50100
563430.547	4071513.546	68.2	2050	52300
563428.892	4071514.228	56.8	1926	50800
563427.137	4071514.157	45.5	2149	51300

mean	57	1938	50600
mean + 2σ	115	2175	51987
mean + 3σ	144	2294	52680

TABLE 3

Radiological Measurements of CAS 25-07-01 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)	Media
563438.994	4071538.341	114	No Result	No Result	Concrete
563438.049	4071539.473	90.9	No Result	No Result	Concrete
563436.457	4071540.686	148	No Result	No Result	Concrete
563435.507	4071542.331	216	No Result	No Result	Concrete
563434.307	4071544.087	136	No Result	No Result	Concrete
563433.133	4071545.477	114	No Result	No Result	Concrete
563432.015	4071546.908	90.9	No Result	No Result	Concrete
563430.728	4071547.989	159	No Result	No Result	Concrete
563429.628	4071549.305	227	No Result	No Result	Concrete
563428.566	4071550.756	56.8	No Result	No Result	Concrete
563427.171	4071552.469	34.1	No Result	No Result	Concrete
563426.479	4071553.412	125	No Result	No Result	Concrete
563425.805	4071554.716	45.5	No Result	No Result	Concrete
563426.812	4071556.013	45.5	No Result	No Result	Concrete
563428.279	4071554.247	79.5	No Result	No Result	Concrete
563428.811	4071553.425	56.8	No Result	No Result	Concrete
563429.972	4071552.045	148	No Result	No Result	Concrete
563431.241	4071550.466	79.5	No Result	No Result	Concrete
563432.253	4071549.136	90.9	No Result	No Result	Concrete
563434.376	4071546.399	102	No Result	No Result	Concrete
563435.467	4071544.932	159	No Result	No Result	Concrete
563437.228	4071543.735	114	No Result	No Result	Concrete
563438.424	4071541.957	125	No Result	No Result	Concrete
563439.772	4071541.502	136	No Result	No Result	Concrete
563440.778	4071538.891	90.9	No Result	No Result	Concrete
563442.027	4071538.645	90.9	No Result	No Result	Concrete
563442.991	4071535.461	22.7	No Result	No Result	Concrete
563444.772	4071536.047	22.7	No Result	No Result	Concrete
563443.409	4071539.652	56.8	No Result	No Result	Concrete
563442.100	4071540.995	170	No Result	No Result	Concrete
563440.665	4071541.120	79.5	No Result	No Result	Concrete
563439.500	4071536.535	No Result	1118	No Result	Concrete
563438.993	4071538.325	No Result	1064	No Result	Concrete
563438.078	4071539.726	No Result	1106	No Result	Concrete
563436.417	4071540.744	No Result	1118	No Result	Concrete
563435.614	4071542.384	No Result	1027	No Result	Concrete
563434.379	4071544.026	No Result	1031	No Result	Concrete
563433.052	4071545.296	No Result	1027	No Result	Concrete
563432.054	4071546.835	No Result	1101	No Result	Concrete
563430.695	4071547.908	No Result	1031	No Result	Concrete
563429.629	4071549.370	No Result	1031	No Result	Concrete
563428.589	4071550.784	No Result	990	No Result	Concrete
563427.125	4071552.493	No Result	1114	No Result	Concrete
563426.553	4071553.330	No Result	1018	No Result	Concrete
563425.897	4071554.846	No Result	923	No Result	Concrete
563426.734	4071556.130	No Result	965	No Result	Concrete

TABLE 3

Radiological Measurements of CAS 25-07-01 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)	Media
563428.208	4071554.178	No Result	948	No Result	Concrete
563428.809	4071553.379	No Result	1002	No Result	Concrete
563429.889	4071551.987	No Result	1060	No Result	Concrete
563431.265	4071550.604	No Result	1056	No Result	Concrete
563432.230	4071549.194	No Result	1056	No Result	Concrete
563433.356	4071547.989	No Result	998	No Result	Concrete
563434.485	4071546.723	No Result	1085	No Result	Concrete
563435.437	4071544.829	No Result	1110	No Result	Concrete
563437.397	4071544.270	No Result	1060	No Result	Concrete
563438.368	4071541.590	No Result	1230	No Result	Concrete
563439.782	4071541.593	No Result	1006	No Result	Concrete
563440.858	4071538.893	No Result	1015	No Result	Concrete
563442.021	4071538.515	No Result	1006	No Result	Concrete
563442.927	4071535.478	No Result	919	No Result	Concrete
563444.817	4071536.996	No Result	952	No Result	Concrete
563443.364	4071539.648	No Result	882	No Result	Concrete
563441.955	4071540.766	No Result	1155	No Result	Concrete
563440.537	4071540.986	No Result	903	No Result	Concrete
563439.647	4071541.998	125	1077	27600	Concrete
563438.604	4071543.371	125	1122	27300	Concrete
563437.491	4071544.624	125	1064	28300	Concrete
563436.324	4071546.136	136	1019	28000	Concrete
563435.583	4071547.469	182	1135	27600	Concrete
563434.380	4071548.877	148	1126	27900	Concrete
563433.073	4071550.375	205	1093	28800	Concrete
563431.800	4071552.033	125	1039	28700	Concrete
563430.856	4071553.268	227	1068	29300	Concrete
563429.792	4071554.775	56.8	1222	29600	Concrete
563428.970	4071555.755	34.1	923	29300	Concrete
563428.582	4071556.197	22.7	923	29600	Concrete
563427.863	4071557.093	68.2	952	31700	Concrete
563429.441	4071558.430	79.5	928	32400	Concrete
563430.408	4071556.958	56.8	865	30800	Concrete
563430.882	4071556.354	56.8	1006	29400	Concrete
563431.493	4071555.551	56.8	1188	30000	Concrete
563432.533	4071554.309	56.8	1060	30500	Concrete
563433.744	4071552.471	90.9	1280	28100	Concrete
563435.011	4071550.949	159	1060	29100	Concrete
563436.067	4071549.593	205	1201	28800	Concrete
563437.177	4071548.120	45.5	1015	28800	Concrete
563438.269	4071546.581	170	1035	28500	Concrete
563439.320	4071545.064	148	1039	28600	Concrete
563440.447	4071543.602	159	1015	27800	Concrete
563441.695	4071541.989	148	1019	28500	Concrete
563442.756	4071540.350	136	1044	29800	Concrete
563443.915	4071538.702	79.5	1035	28500	Concrete

TABLE 3

Radiological Measurements of CAS 25-07-01 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)	Media
563444.592	4071538.259	22.7	973	32000	Concrete
563444.900	4071537.719	45.5	968	32500	Concrete
563446.643	4071538.841	79.5	944	32300	Concrete
563445.750	4071540.233	68.2	857	31800	Concrete
563445.299	4071540.877	56.8	957	28200	Concrete
563444.172	4071542.360	159	1072	29300	Concrete
563443.031	4071543.884	205	1147	28000	Concrete
563441.948	4071545.414	136	981	28500	Concrete
563440.765	4071547.266	216	903	28100	Concrete
563439.761	4071547.939	170	1122	28500	Concrete
563438.576	4071549.369	125	969	29600	Concrete
563437.561	4071550.734	102	1188	29000	Concrete
563436.301	4071552.187	90.9	1044	29000	Concrete
563435.180	4071553.589	79.5	1035	29700	Concrete
563434.056	4071555.093	90.9	1077	31500	Concrete
563432.728	4071556.553	114	1060	29500	Concrete
563432.170	4071557.618	45.5	948	28600	Concrete
563431.238	4071558.822	68.2	977	30800	Concrete
563430.629	4071559.971	68.2	932	32600	Concrete
563432.509	4071561.073	90.9	973	33600	Concrete
563433.542	4071559.992	68.2	1015	32100	Concrete
563434.246	4071558.846	90.9	952	29100	Concrete
563435.681	4071556.995	148	1288	32200	Concrete
563436.643	4071555.455	90.9	1072	32200	Concrete
563437.640	4071553.766	114	1072	29800	Concrete
563438.954	4071552.477	79.5	1143	28900	Concrete
563439.930	4071550.731	125	1031	29000	Concrete
563440.796	4071549.891	114	1126	29800	Concrete
563441.970	4071548.331	170	1097	28700	Concrete
563443.051	4071546.866	90.9	1039	28600	Concrete
563444.148	4071545.454	90.9	1118	29200	Concrete
563444.891	4071544.506	114	1056	28900	Concrete
563446.176	4071543.222	182	990	29100	Concrete
563447.297	4071541.871	125	1135	27900	Concrete
563448.412	4071540.404	0	969	33200	Concrete
563449.119	4071543.226	125	1019	28600	Concrete
563448.020	4071544.811	125	1246	28600	Concrete
563447.000	4071546.067	114	1081	28700	Concrete
563445.557	4071547.410	136	1044	27600	Concrete
563444.486	4071548.852	148	1168	28000	Concrete
563443.336	4071550.200	239	1139	28100	Concrete
563442.273	4071551.474	125	940	28000	Concrete
563441.246	4071552.997	193	1180	28800	Concrete
563440.044	4071554.363	170	1072	29200	Concrete
563439.057	4071555.805	159	977	29200	Concrete
563437.942	4071557.320	159	986	30400	Concrete

TABLE 3

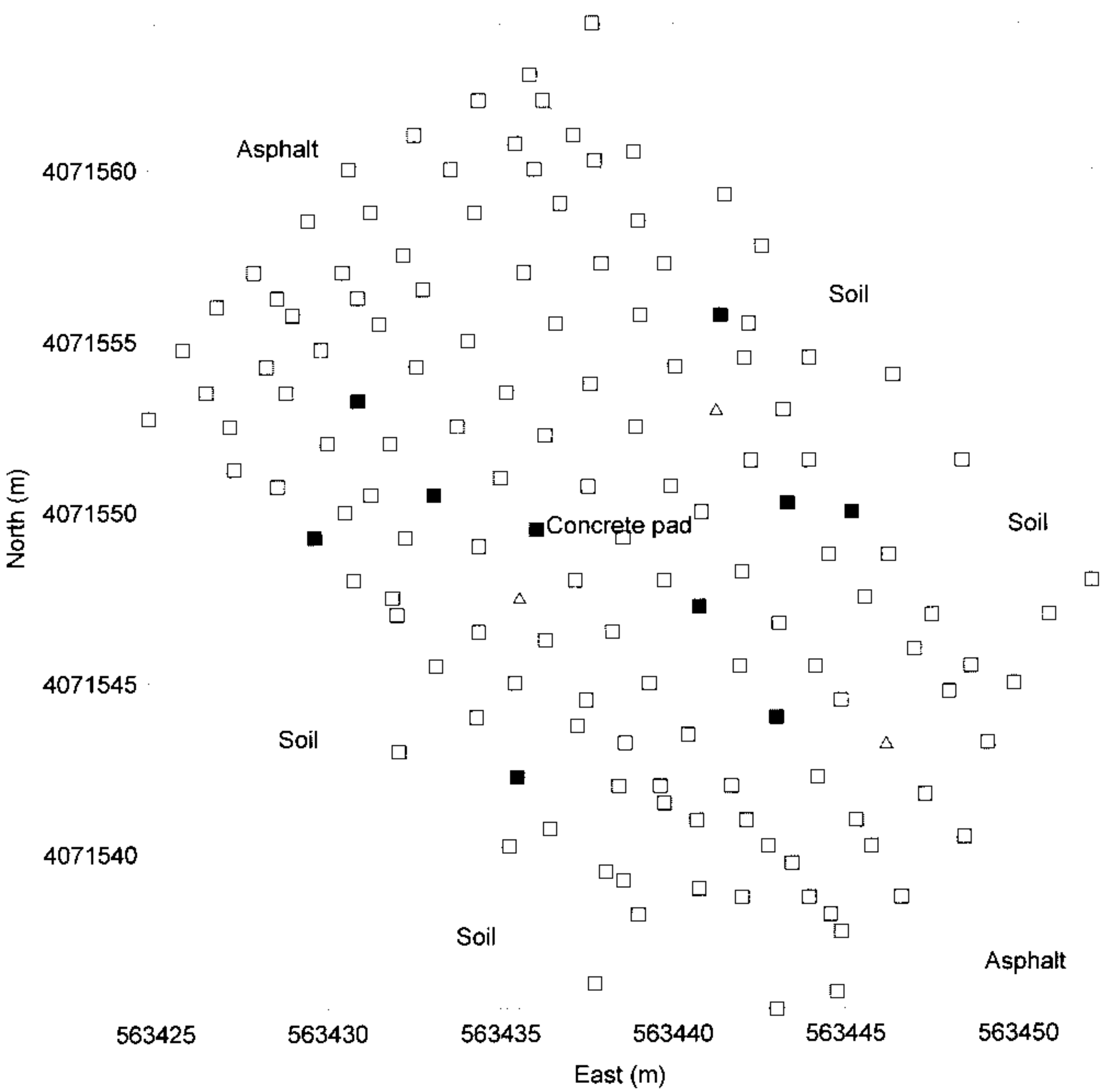
Radiological Measurements of CAS 25-07-01 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)	Media
563436.766	4071558.907	68	1110	28300	Concrete
563436.011	4071559.915	90.9	1077	29400	Concrete
563435.431	4071560.829	22.7	899	30600	Concrete
563434.369	4071562.045	56.8	886	32200	Concrete
563435.868	4071562.638	34.1	1731	53500	Concrete
563436.243	4071561.999	22.7	1441	47700	Concrete
563437.135	4071561.019	56.8	1081	33400	Concrete
563437.756	4071560.270	45.5	1031	35100	Concrete
563438.994	4071558.410	68.2	965	30100	Concrete
563439.722	4071557.286	125	1089	28300	Concrete
563441.355	4071555.696	239	1126	32800	Concrete
563442.087	4071554.474	136	1300	30800	Concrete
563443.196	4071553.069	56	1068	29300	Concrete
563443.923	4071551.387	56.8	1052	29600	Concrete
563445.185	4071550.062	216	1064	32400	Concrete
563446.276	4071548.778	114	1068	33700	Concrete
563447.497	4071547.005	114	1006	28300	Concrete
563448.611	4071545.588	148	1072	33100	Concrete
563449.861	4071545.062	68.2	1101	30600	Concrete
563450.867	4071547.002	34.1	1764	50700	Soil
563452.135	4071547.973	56.8	1942	49500	Soil
563448.385	4071551.491	22.7	1739	51400	Soil
563446.368	4071553.913	11.4	1793	51900	Soil
563443.954	4071554.459	11.4	1892	50500	Soil
563442.201	4071555.480	22.7	1781	50300	Soil
563442.536	4071557.764	56.8	1805	50900	Soil
563441.523	4071559.244	45.5	1930	51900	Soil
563438.897	4071560.501	22.7	1743	51600	Soil
563437.691	4071564.247	11.4	1834	51300	Soil
563424.800	4071552.805	68.2	1735	50100	Soil
563427.288	4071551.259	22.7	1859	51800	Soil
563430.476	4071549.988	56.8	1863	51600	Soil
563431.859	4071547.427	22.7	1789	50400	Soil
563432.032	4071542.905	45.5	1764	50000	Soil
563435.224	4071540.347	22.7	1797	50900	Soil
563438.565	4071539.294	79.5	1739	49100	Soil
563437.740	4071536.283	22.7	1694	50000	Soil

Figure 1

Vehicle Washdown Area
CAU 240, CAS 25-07-01

Alpha Measurements
dpm/100 square centimeters

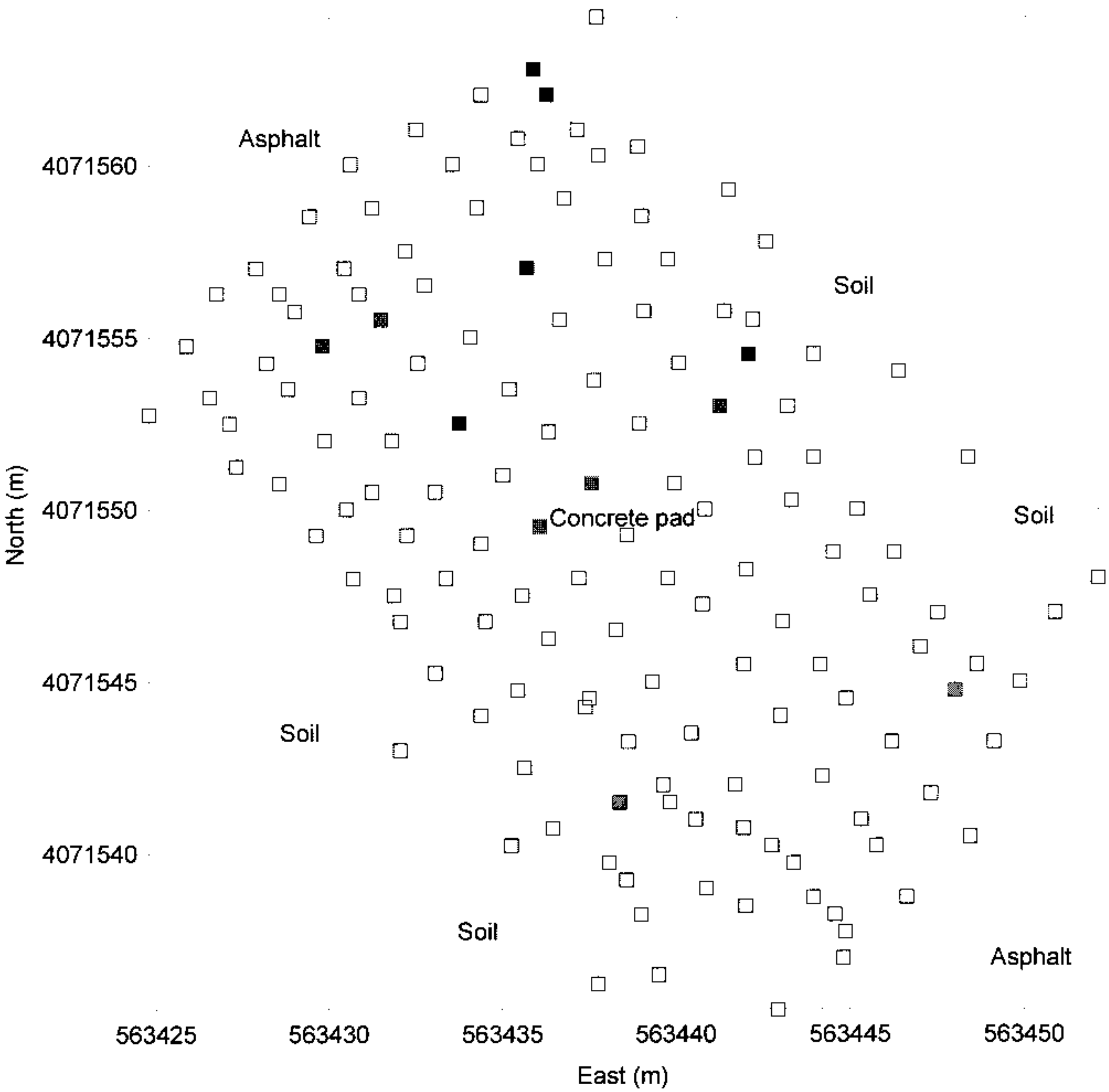


Concrete 110	Soil 57	Background Type Mean
0 to 171	11 to 115	Background Mean + 2 SD
171 to 201		Background Mean + 3 SD
201 to 239		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 2
Vehicle Washdown Area
CAU 240, CAS 25-07-01

Beta Measurements
dpm/100 square centimeter



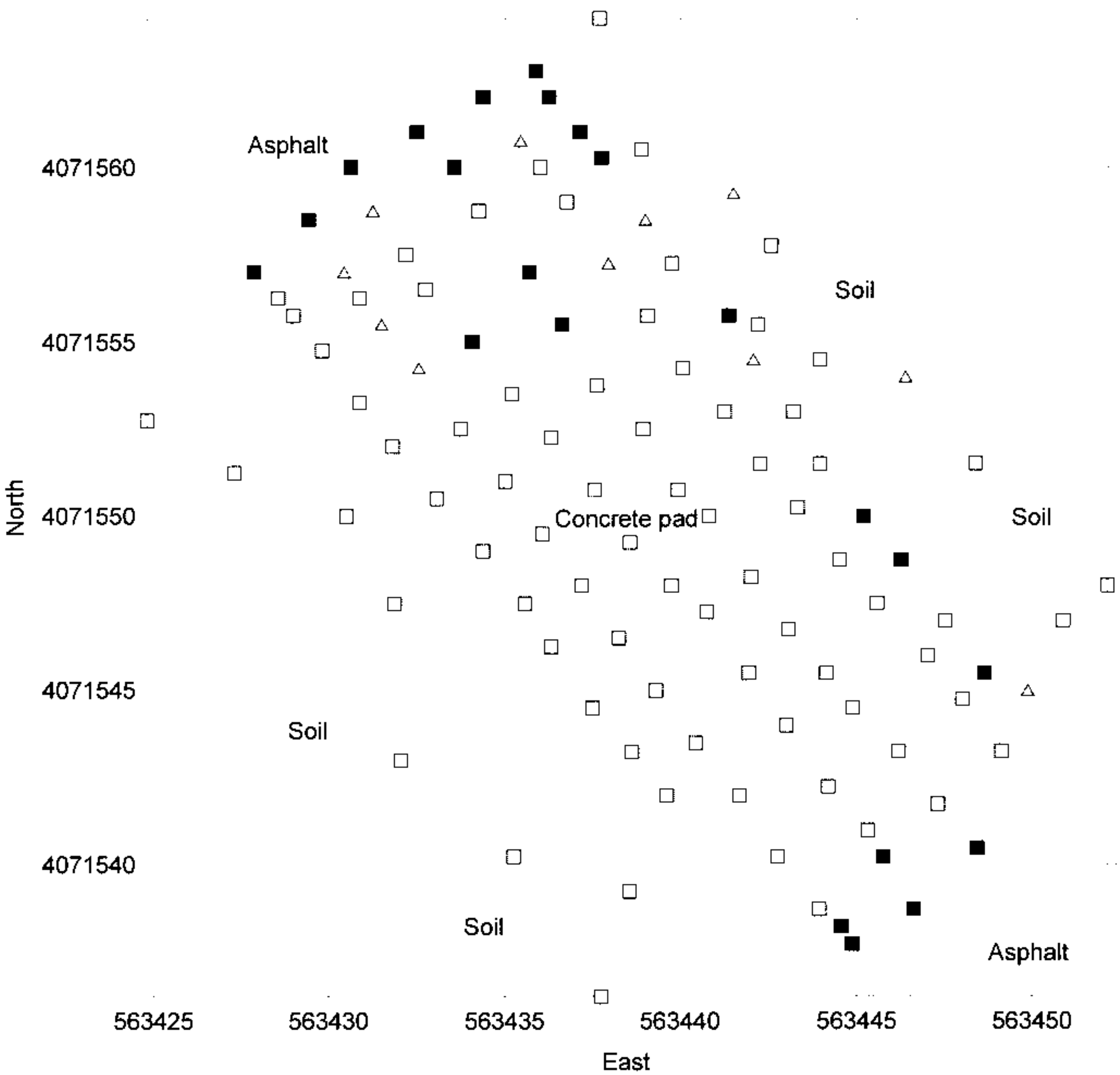
Concrete 1030	Soil 1938	Background Type Mean
857 to 1179	1694 to 2175	Background Mean + 2 SD
1179 to 1254		Background Mean + 3 SD
1254 to 1732		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 3

Vehicle Washdown Area
CAU 240, CAS 25-07-01

Gamma Count Rate Measurements
Kcpm



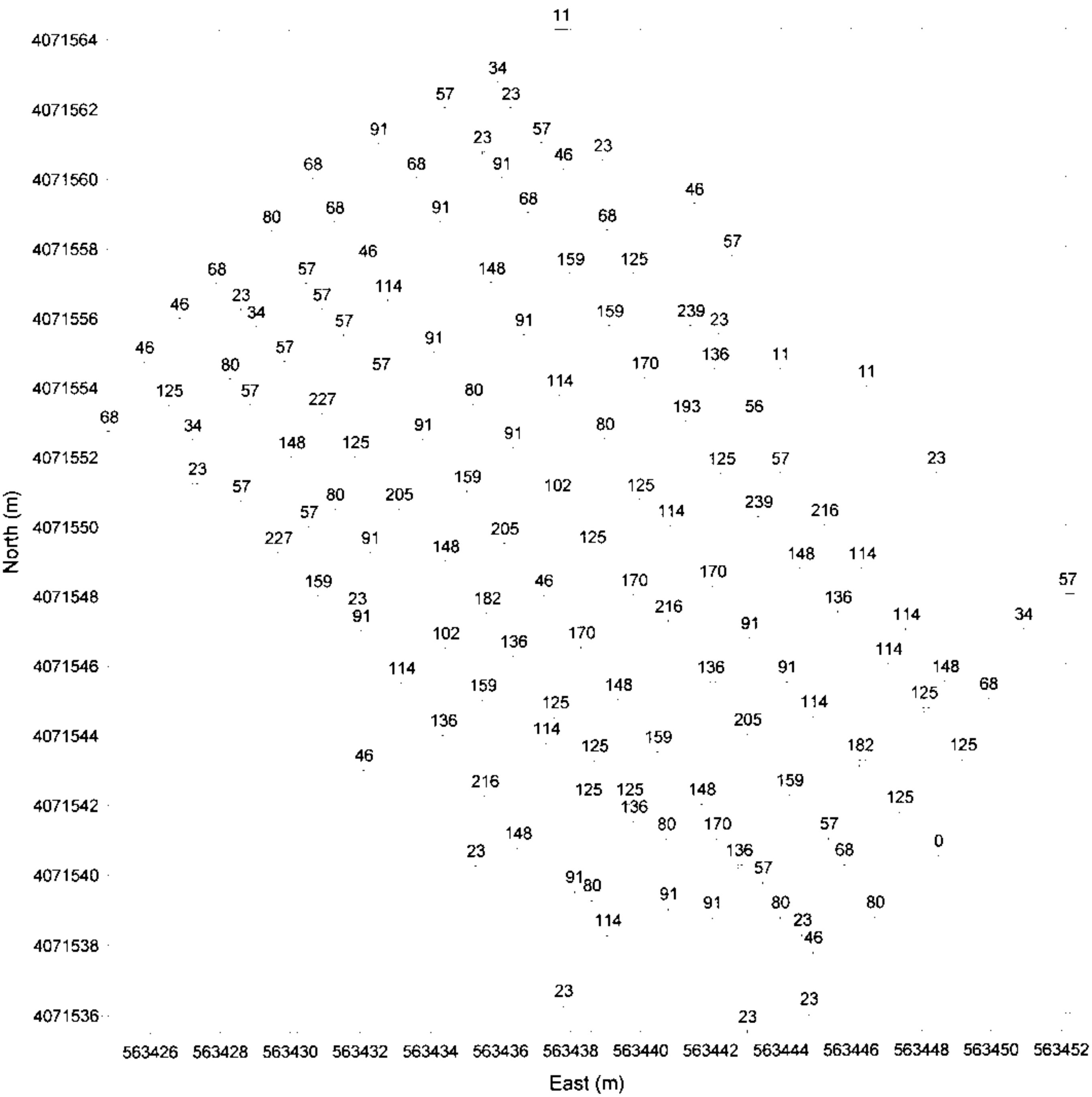
Concrete 29.2	Soil 50.6	Background Type Mean
□ 27.3 to 30.0	□ 49.1 to 51.9	Background Mean + 2 SD
△ 30.0 to 31.0	△ 51.9 to 52.6	Background Mean + 3 SD
■ 31.0 to 54.0		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 4

Vehicle Washdown Area
CAU 240, CAS 25-07-01

Alpha Measurements
dpm/100 square centimeter

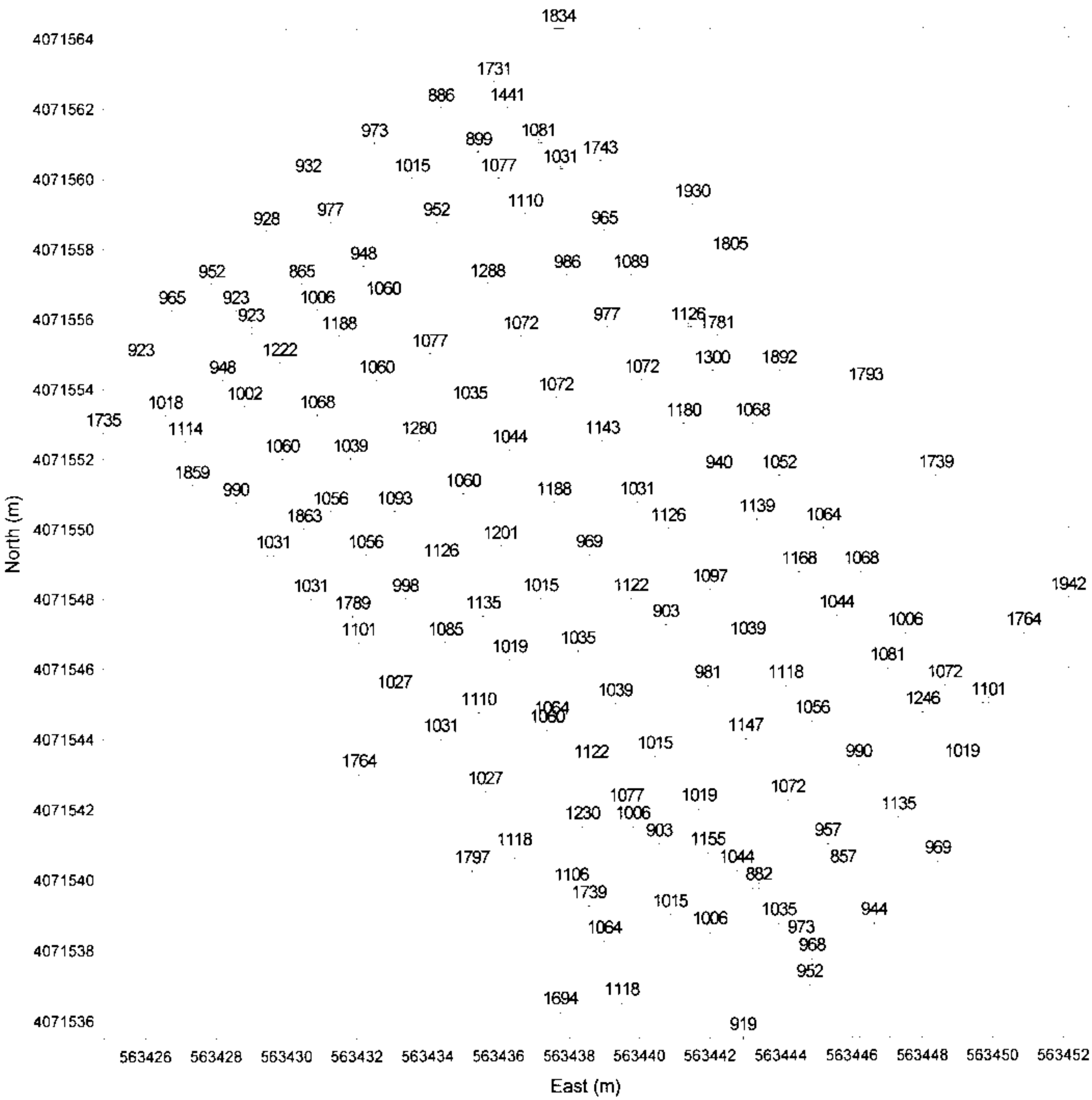


All positions are in Universal Transverse Mercator North American Datum of 1927.

Figure 5

Vehicle Washdown Area
CAU 240, CAS 25-07-01

Beta Measurements
dpm/100 square centimeter

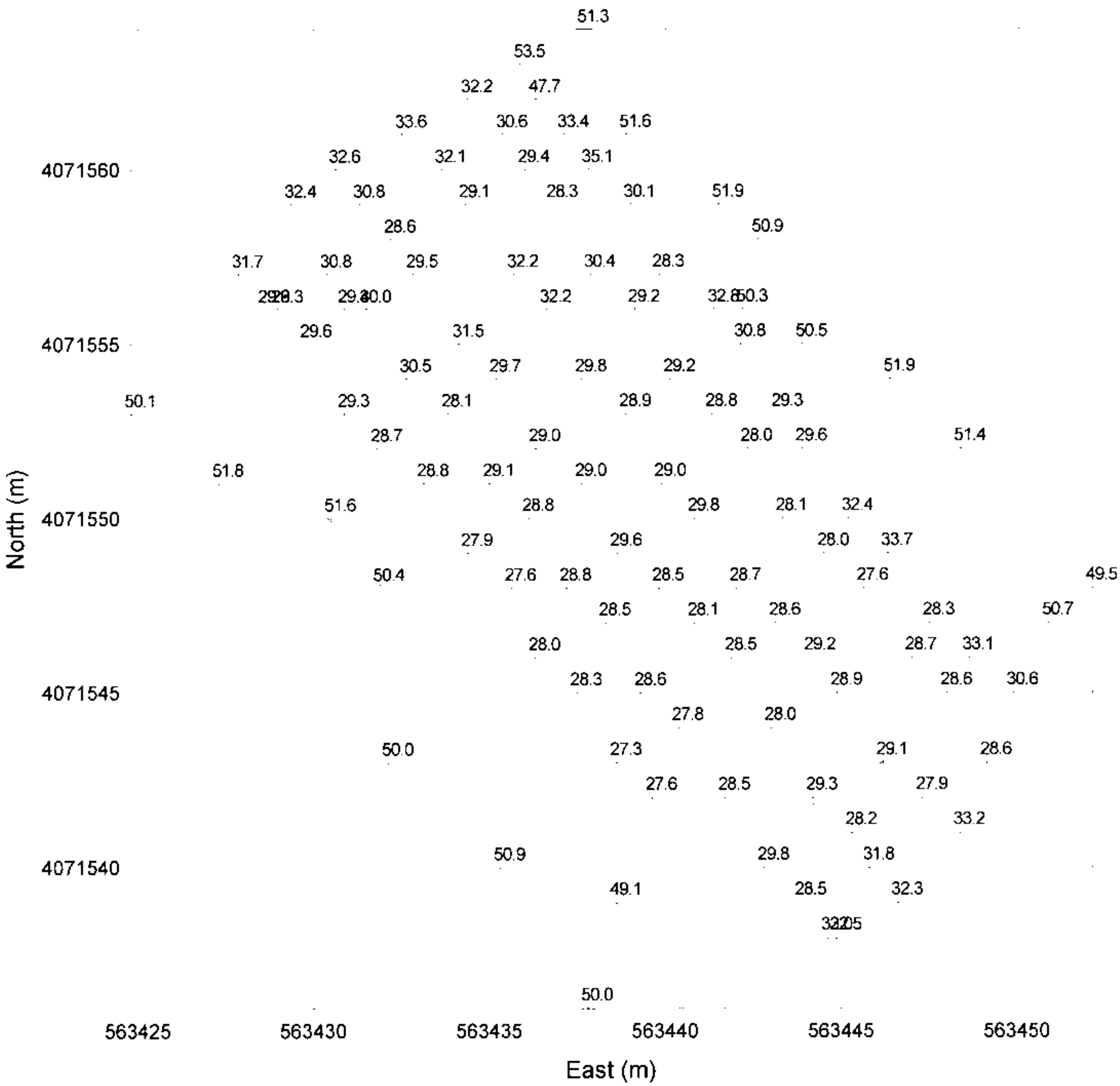


All positions are in Universal Transverse Mercator North American Datum of 1927.

Figure 6

Vehicle Washdown Area
CAU 240, CAS 25-07-01

Gamma Count Rate Measurements
Kcpm



All positions are in Universal Transverse Mercator North American Datum of 1927.

INTERNATIONAL TECHNOLOGY CORPORATION

Memorandum

To: Steven Adams

Date: November 2, 1998

From: Carl Speer

Project No. 776712.01020100

Subject: **TRANSMITTAL OF A RADIOLOGICAL SURVEY OF CAU 240, CAS 25-07-02, VEHICLE WASHDOWN AREA**

Enclosed please find one copy of the report entitled: "Radiological Survey of CAU 240, CAS 25-07-02, Vehicle Washdown Area." This report outlines the survey objectives, instruments used, data acquisition and data processing methods, quality control procedures, and a brief review of the data. Also included is the processed radiological survey results, background survey results and data plots.

If you have any questions, please give me a call at (702) 295-2366.

Attachments

LV/11-2-98/G:\RADSUR\CAU240\MEMO240.WPD

Radiological Survey of CAU 240, CAS 25-07-02,

Vehicle Washdown Area

1.0 Objective

The objective of this radiological survey was to provide locations of surface contamination and show radiological trends to focus characterization and clean up efforts. Radiological instrumentation was used to define the nature and extent of any radiological contaminants.

2.0 Instruments

- Eberline model ESP-2 Ratemeter (SN. 1729) with 3- by 3-inch NaI scintillation gamma detector (SN. 2293A)
- NE Technology model Electra (SN. 1531) with model DP6BD alpha/beta probe (SN. 1381)
- Trimble model Pro XRS Global Positioning System (GPS) Receiver with model TSC1 datalogger (SN. 220134393)

3.0 Data Acquisition

Radiological background locations were selected based on concrete and soil characteristics similar to the survey area. A concrete storage pad built approximately at the same time as the washdown pad was selected for background measurements. The background concrete measurement results are shown in Table 1. A total of 30 background concrete measurements were collected. Soil areas located in Area 25 with similar gravel/sand ratios were selected for the soil background measurements. A total of 17 background soil and 16 background gravel measurements were collected. Background soil measurement results are shown in Table 2 and background gravel measurements are shown in Table 3. Radiological and GPS measurements of the background locations were performed in the same manner as the site survey described below.

The radiological survey was performed October 8, 1998 at Corrective Action Site 25-07-02, Vehicle Washdown Area. An investigation grid of 26 by 16 meters was established around the washdown pad and gravel sump with 1 by 1-meter spacing on the concrete pad and 4 by 4-meter spacing on the gravel sump. Random soil locations around the concrete pad were chosen where the alpha/beta probe could be placed directly on the soil. The grid was marked on the concrete pad with permanent markers and in the gravel sump with wooden stakes to provide uniform measurement spacing. Each measurement location was surveyed by a Trimble Pro XRS GPS. Alpha, beta, and gamma measurements were collected by placing the detectors directly on the surface of the concrete pad, surrounding gravel and soils and integrating the count-rate for 30 seconds. Each radiological measurement was recorded on the TSC1 datalogger and stored with its related GPS measurement in a combined GPS/RAD file. A total of 137 alpha, 139 beta, and 140 gamma measurements were recorded. The radiological measurements and Universal Transverse Mercator coordinates for each measured point are shown in Table 4.

4.0 Data Processing

The GPS/RAD data from the datalogger was downloaded to a laptop computer and the GPS measurements were post-processed using Trimble's "Pathfinder" software. Each GPS measurement was positional corrected using collected real-time satellite differential signals or the USDA Forest Service Cedar City, UT base station differential files located at http://www.fs.fed.us/database/gps/cedarcty.htm. After post-processing, the GPS/RAD data was exported as an ASCII file and converted to an Excel spreadsheet file. The GPS/RAD data was processed using the commercial software package SURFER for graphical presentation. A separate post map was generated for alpha, beta, and gamma measurements. Figure 1, 2, and 3 show graphical representation of the alpha, beta, and gamma measurements, respectively, as they compare to established backgrounds for different measurement conditions.

5.0 Quality Control

Radiological detection equipment used in this survey was checked daily as described in SQP-ITLV-460. To ensure positional accuracy, the GPS system was programmed according to the operational manual to achieve submeter accuracy. In addition, each positional measurement recorded was an average of at least 30 readings, which increased the positional accuracy to less than 50 cm. A sampling of the data was checked against source information.

6.0 Data Review

Radiological measurements of the concrete pad and surrounding soils at CAU 240, CAS 25-07-02, Vehicle Washdown Area appear to be contaminated above background measurements taken on similar media in the surrounding area. The elevated beta and gamma measurements were located in the soil directly west of the concrete pad and down a slope into the gravel sump. Elevated beta and gamma measurements were also identified on the north edge of the concrete pad on the soil between the end of the gravel road and the edge of the concrete pad. Factors affecting these radiological measurements included gamma and beta shine from surrounding soil, changing ambient radon levels, and instrument variations. Radiological measurements above 5 times mean background were identified at this Corrective Action Site.

TABLE 1

Background Concrete Pad Radiological Measurements for CAU 240

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
563367	4071505	56.8	915	29800
563367	4071505	125	932	28600
563367	4071505	125	1147	29300
563367	4071505	68.2	969	29800
563367	4071505	114	1077	29600
563367	4071505	102	981	29500
563367	4071505	102	1106	29900
563367	4071505	45.5	1085	30000
563367	4071505	136	1044	29800
563367	4071505	79.5	1048	28800
563367	4071505	125	1077	28500
563367	4071505	114	1010	29500
563367	4071505	90.9	1006	29200
563367	4071505	114	1106	29000
563367	4071505	136	990	29000
563367	4071505	159	1238	29500
563367	4071505	159	1023	29100
563367	4071505	170	1077	29200
563367	4071505	90.9	928	30100
563367	4071505	90.9	1039	29000
563367	4071505	90.9	977	29100
563367	4071505	114	1085	30000
563367	4071505	136	990	29400
563367	4071505	90.9	870	27400
563367	4071505	102	1081	29200
563367	4071505	79.5	1044	28700
563367	4071505	114	1023	29100
563367	4071505	148	957	28900
563367	4071505	136	1035	29300
563367	4071505	79.5	1039	29600

mean	109.82	1030	29263
mean + 2σ	170.67	1182	30373
mean + 3σ	201.10	1258	30928

TABLE 2

Background Soil Radiological Measurements in the Vicinity of 25-07-01

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
563431.454	4071519.104	56.8	1938	50300
563431.369	4071519.413	90.9	1938	50300
563430.832	4071519.180	125	1747	50600
563430.571	4071519.293	56.8	2079	50600
563432.205	4071518.751	56.8	1876	50500
563432.147	4071517.761	79.5	1826	50500
563431.577	4071517.106	45.5	2062	50400
563430.909	4071516.246	45.5	1996	52300
563431.716	4071516.361	0	1752	51400
563434.223	4071516.464	34.1	1897	51400
563434.495	4071516.312	68.2	1971	51100
563435.419	4071517.460	22.7	1834	50100
563430.547	4071513.546	68.2	2050	52300
563428.892	4071514.228	56.8	1926	50800
563427.137	4071514.157	45.5	2149	51300

mean	57	1938	50600
mean + 2σ	115	2175	51987
mean + 3σ	144	2294	52680

TABLE 3

Background Gravel Radiological Measurements in the Vicinity of CAS 25-07-02.

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
565097.910	4075367.216	56.8	1015	35000
565097.333	4075367.754	56.8	1176	34400
565097.239	4075367.365	34.1	944	34500
565096.339	4075366.816	0	1166	36200
565098.688	4075366.486	90.9	957	35000
565099.490	4075365.921	34.1	1031	35900
565099.500	4075365.818	79.5	990	35300
565099.151	4075366.018	34.1	1015	36300
565099.011	4075365.683	45.5	1048	36500
565099.112	4075365.871	56.8	948	35700
565099.202	4075365.690	34.1	1044	36200
565111.875	4075372.297	56.8	919	28300
565112.422	4075372.652	56.8	874	28800
565109.786	4075372.677	22.7	836	32100
565109.928	4075372.308	11.4	1052	30700
565108.324	4075372.535	22.7	940	28900

mean		43	997	33738
mean + 2σ		91	1182	39642
mean + 3σ		115	1274	42595

TABLE 4

Radiological Measurements of CAS 25-07-02 Washdown Pad and surrounding soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (kcpm)	Media
565140.717	4075363.126	90.9	1114	32	Concrete
565140.578	4075364.456	79.5	1048	31.2	Concrete
565140.430	4075365.537	79.5	1077	31	Concrete
565140.680	4075366.154	102	1118	32	Concrete
565140.724	4075367.253	90.9	1089	31.8	Concrete
565140.801	4075368.287	79.5	1031	30.8	Concrete
565140.728	4075369.330	114	1159	31.6	Concrete
565140.872	4075370.158	90.9	1006	32.1	Concrete
565140.803	4075371.062	125	1122	33.3	Concrete
565140.828	4075371.666	79.5	1085	32.9	Concrete
565141.411	4075372.782	No Result	1333	48.1	Soil
565140.106	4075372.720	68.2	1064	41.8	Soil/asphalt
565140.086	4075371.481	34.1	1126	33.1	Concrete
565140.536	4075370.768	68.2	1052	32.3	Concrete
565140.226	4075370.138	56.8	1048	33.2	Concrete
565140.155	4075368.836	125	1110	32.2	Concrete
565139.998	4075368.393	102	1106	31.7	Concrete
565140.036	4075367.565	102	1089	31.8	Concrete
565139.786	4075366.632	114	1089	32.2	Concrete
565139.890	4075365.730	102	1023	32	Concrete
565139.743	4075364.992	102	1068	32.1	Concrete
565139.748	4075364.234	102	1023	30.6	Concrete
565139.634	4075363.731	125	1242	37.1	Concrete
565138.406	4075363.372	56.8	1441	42.5	Soil/asphalt
565138.569	4075364.147	68.2	1027	30.5	Concrete
565138.632	4075365.252	114	1068	32.5	Concrete
565138.743	4075366.011	102	1077	31.7	Concrete
565138.880	4075366.903	90.9	1044	32.3	Concrete
565138.826	4075367.522	90.9	1044	31.4	Concrete
565138.840	4075368.632	79.5	1081	31.7	Concrete
565138.838	4075369.691	136	1035	32.2	Concrete
565138.625	4075370.252	159	1155	32.9	Concrete
565138.813	4075371.085	114	1201	33.6	Concrete
565138.960	4075372.110	136	1205	34.5	Concrete
565138.987	4075372.965	114	1097	70.5	Concrete
565138.286	4075372.724	79.5	1251	89.7	Concrete
565137.995	4075372.234	34.1	1188	33.5	Concrete
565138.139	4075371.275	56.8	1052	34	Concrete
565138.220	4075370.310	148	1064	33.6	Concrete
565138.072	4075369.181	148	1147	32.8	Concrete
565138.449	4075368.417	102	1060	33.2	Concrete
565138.170	4075367.836	56.8	994	32.9	Concrete
565138.311	4075365.887	45.5	1052	32.4	Concrete
565138.118	4075365.909	68.2	1077	32.4	Concrete
565138.101	4075364.989	79.5	1068	32.9	Concrete
565138.072	4075363.918	68.2	977	31.8	Concrete
565137.962	4075363.642	114	1147	43.4	Concrete

TABLE 4

Radiological Measurements of CAS 25-07-02 Washdown Pad and surrounding soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (kcpm)	Media
565137.110	4075363.083	45.5	1159	42.4	Concrete
565137.068	4075363.745	170	1027	32.2	Concrete
565137.236	4075364.124	79.5	1081	33.3	Concrete
565137.169	4075365.071	68.2	1155	32.3	Concrete
565137.206	4075366.611	56.8	1155	32.8	Concrete
565138.253	4075366.100	125	998	31.4	Concrete
565138.071	4075367.000	79.5	1147	31.6	Concrete
565137.057	4075368.370	125	1097	32	Concrete
565137.220	4075369.348	159	1010	32.7	Concrete
565137.318	4075370.080	79.5	1126	33	Concrete
565137.249	4075371.144	102	1114	32.9	Concrete
565137.600	4075372.312	68.2	1106	60.1	Concrete
565137.122	4075371.862	68.2	1114	45.2	Concrete
565136.467	4075371.881	11.4	1251	34.7	Concrete
565136.626	4075370.727	205	1110	37.1	Concrete
565136.810	4075370.119	148	1197	59.6	Concrete
565136.642	4075369.383	170	1222	69.9	Concrete
565136.597	4075368.505	79.5	1226	34.9	Concrete
565136.508	4075367.571	56.8	1255	45.5	Concrete
565135.890	4075366.361	4.5	1139	65.7	Concrete
565136.458	4075365.691	56.8	936	34.7	Concrete
565136.356	4075364.740	159	1443	34.7	Concrete
565136.196	4075363.742	114	1317	44.5	Soil
565136.125	4075363.236	90.9	1180	48.9	Soil
565146.939	4075356.925	102	1044	35.4	Concrete
565146.771	4075357.682	68.2	1114	32.7	Concrete
565146.791	4075360.401	125	1106	33.4	Concrete
565146.903	4075362.779	102	1126	32.4	Concrete
565147.172	4075368.004	No Result	1048	34.8	Concrete
565147.390	4075369.751	68.2	1184	33.2	Concrete
565147.565	4075372.182	56.8	1044	35	Concrete
565145.146	4075372.492	79.5	1048	35.2	Concrete
565145.218	4075369.276	68.2	1118	33	Concrete
565144.946	4075366.050	125	1193	34.6	Concrete
565144.955	4075362.535	34.1	1309	33.5	Concrete
565144.933	4075357.638	79.5	1064	33	Concrete
565141.296	4075372.313	45.5	2319	51.9	Soil
565139.997	4075372.532	45.5	1797	47.7	Soil
565139.149	4075372.213	56.8	2013	75.5	Soil
565138.071	4075371.837	11.4	5213	203	Soil
565136.218	4075372.380	No Result	No Result	72.2	Soil
565135.433	4075372.797	22.7	1776	No Result	Soil
565135.914	4075371.946	No Result	No Result	83.7	Soil
565135.337	4075370.786	56.8	1930	60.3	Soil
565135.529	4075369.089	56.8	4680	32.6	Soil
565134.346	4075368.564	22.7	3773	132	Soil
565133.328	4075369.204	11.4	2431	84.7	Soil

TABLE 4

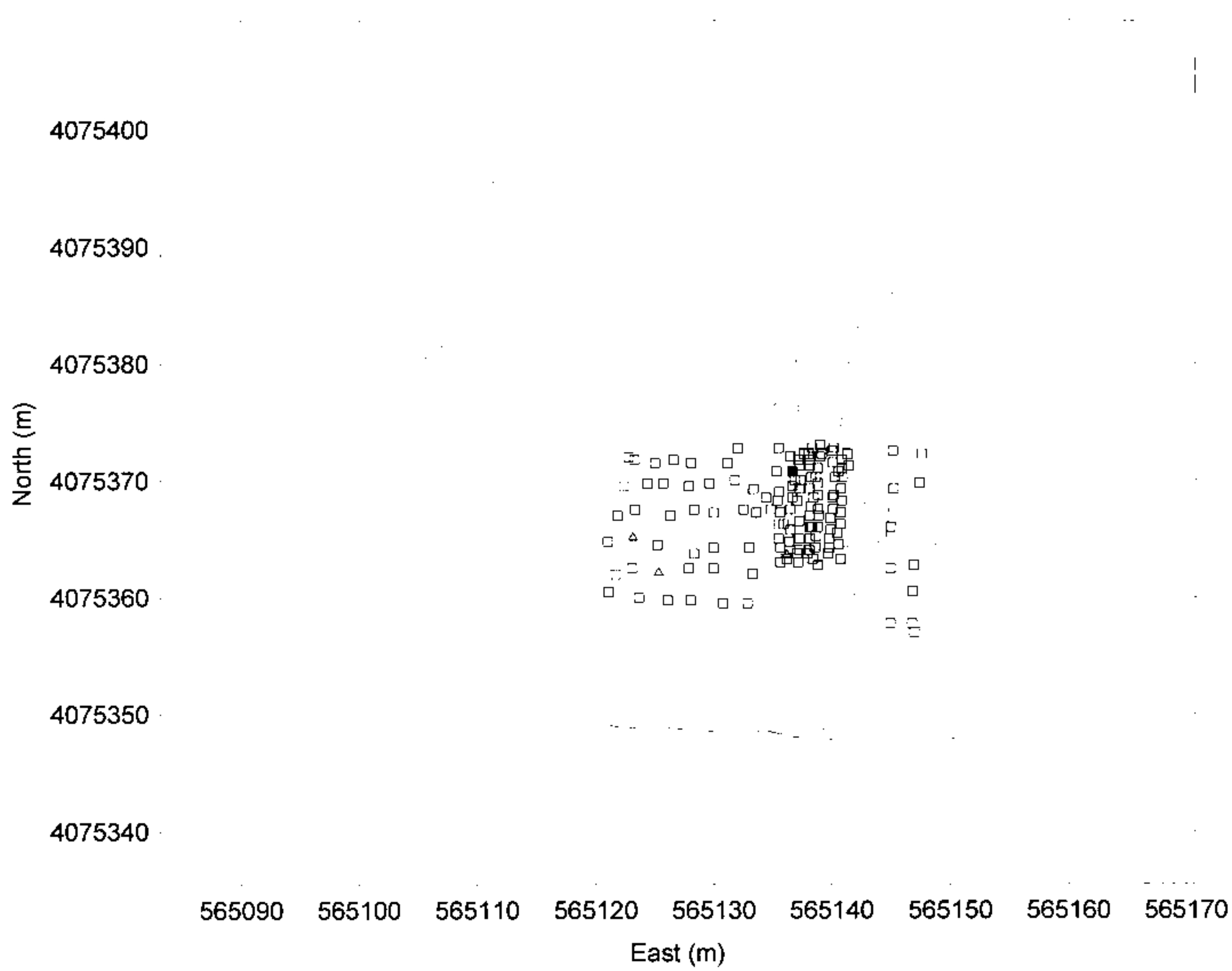
Radiological Measurements of CAS 25-07-02 Washdown Pad and surrounding soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha (dpm)	Beta (dpm)	Gamma (kcpm)	Media
565133.545	4075367.242	22.7	2766	138	Soil
565134.830	4075367.404	45.5	2911	125	Soil
565135.379	4075368.227	79.5	1180	34	Concrete
565135.617	4075367.332	11.4	5334	145	Soil
565135.452	4075366.171	22.7	4990	203	Soil
565135.440	4075365.005	11.4	7525	130	Soil
565135.611	4075364.224	34.1	1855	62	Soil
565135.636	4075363.034	68.2	3292	110	Soil
565138.787	4075362.826	45.5	3408	132	Soil
565141.420	4075371.253	45.5	1959	55.9	Soil
565131.997	4075372.846	79.5	1072	30.1	Gravel
565131.751	4075370.025	22.7	990	33	Gravel
565132.470	4075367.481	11.4	1524	39.2	Gravel/soil
565133.010	4075364.218	45.5	940	28.6	Gravel
565133.224	4075361.955	34	1669	40.6	Soil
565132.828	4075359.548	34.1	1540	48.7	Soil
565130.735	4075359.604	22.7	1594	52.7	Soil
565128.012	4075359.809	34.1	1718	51.2	Soil
565126.062	4075359.736	34.1	1710	52.7	Soil
565123.613	4075359.965	45.5	1706	50	Soil
565121.046	4075360.512	11.4	1665	52.2	Soil
565121.657	4075362.032	68.2	1731	50.9	Soil
565120.984	4075364.639	22.7	1805	49	Soil
565121.795	4075366.936	22.7	1772	48.2	Soil
565122.369	4075369.546	22.7	1565	43.6	Soil
565122.730	4075371.902	34.7	1511	48.1	Soil
565124.992	4075371.566	45.5	849	26.7	Gravel
565126.561	4075371.789	11.4	915	29.2	Gravel
565123.270	4075371.664	11.4	721	25.7	Gravel
565128.070	4075371.487	11.4	791	26.6	Gravel
565131.156	4075371.424	68.2	832	29.1	Gravel
565129.627	4075369.833	56.8	824	25.9	Gravel
565127.877	4075369.539	68.2	770	24.5	Gravel
565125.676	4075369.645	34.1	778	26.7	Gravel
565124.377	4075369.756	34.1	948	29.8	Gravel
565123.328	4075367.623	34.1	923	30.8	Gravel
565123.102	4075365.289	102	791	27	Gravel
565125.210	4075364.449	90.9	770	25.8	Gravel
565128.311	4075363.801	11.4	776	25.8	Gravel
565129.907	4075364.370	34.1	828	26.5	Gravel
565129.932	4075367.229	22.7	783	26.5	Gravel
565128.308	4075367.562	56.8	828	25.8	Gravel
565126.233	4075367.052	45.5	671	25.9	Gravel
565123.062	4075362.558	11.4	981	35.8	Gravel
565125.343	4075362.236	102	1081	28.9	Gravel
565127.874	4075362.419	34.1	1424	36.3	Gravel
565129.911	4075362.502	45.5	1126	28	Gravel

Figure 1

Vehicle Washdown Area
CAU 240, CAS 25-07-02

Alpha Measurements
dpm/100 square centimeter



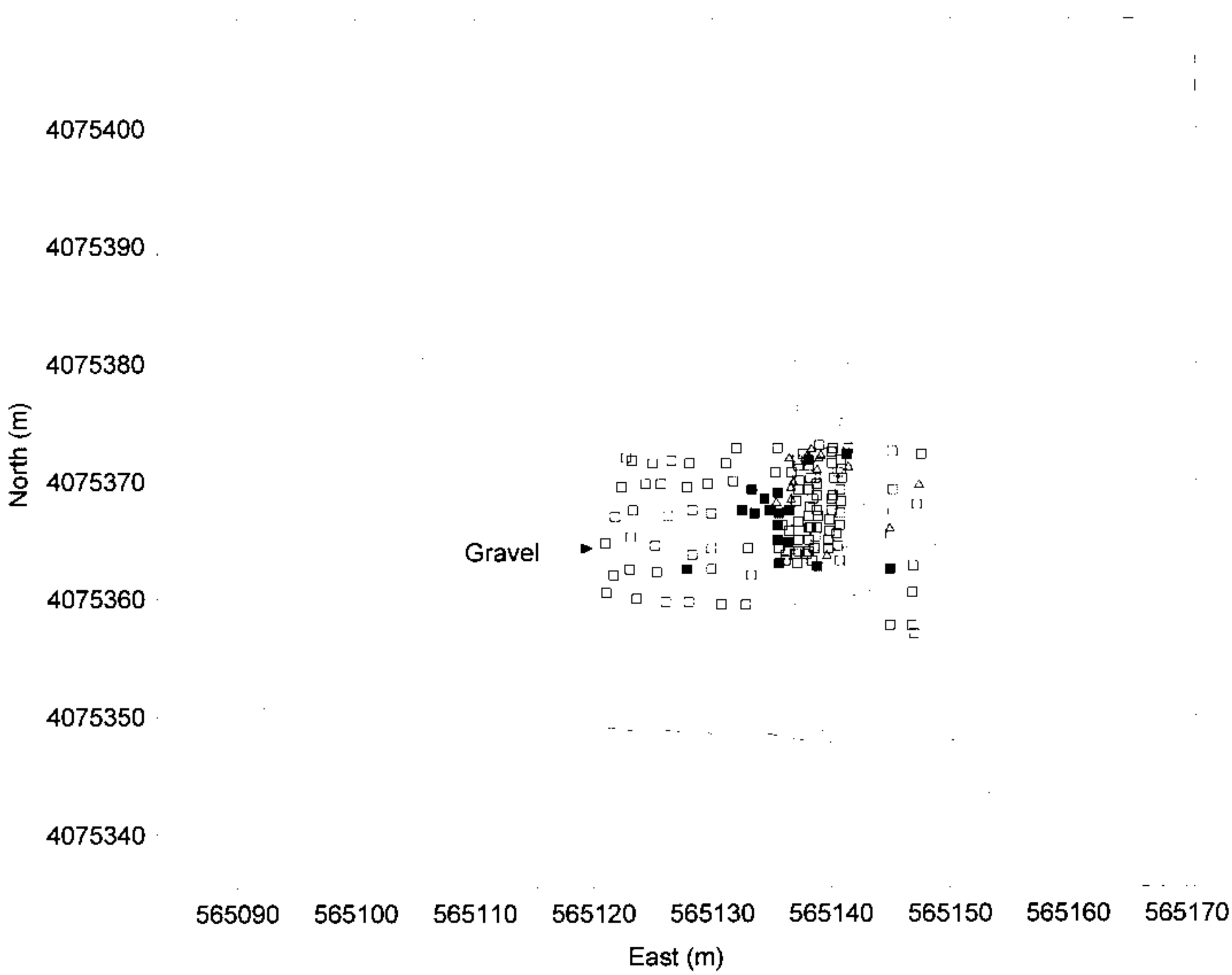
Gravel 43	Concrete 110	Soil 57	Background Type Mean
□ 11 to 91	□ 5 to 171	□ 11 to 99	Background Mean + 2 SD
△ 91 to 115	△ 171 to 201	△ 99 to 127	Background Mean + 3 SD
	■ 201 to 205		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 2

Vehicle Washdown Area
CAU 240, CAS 25-07-02

Beta Measurements
dpm/100 square centimeter



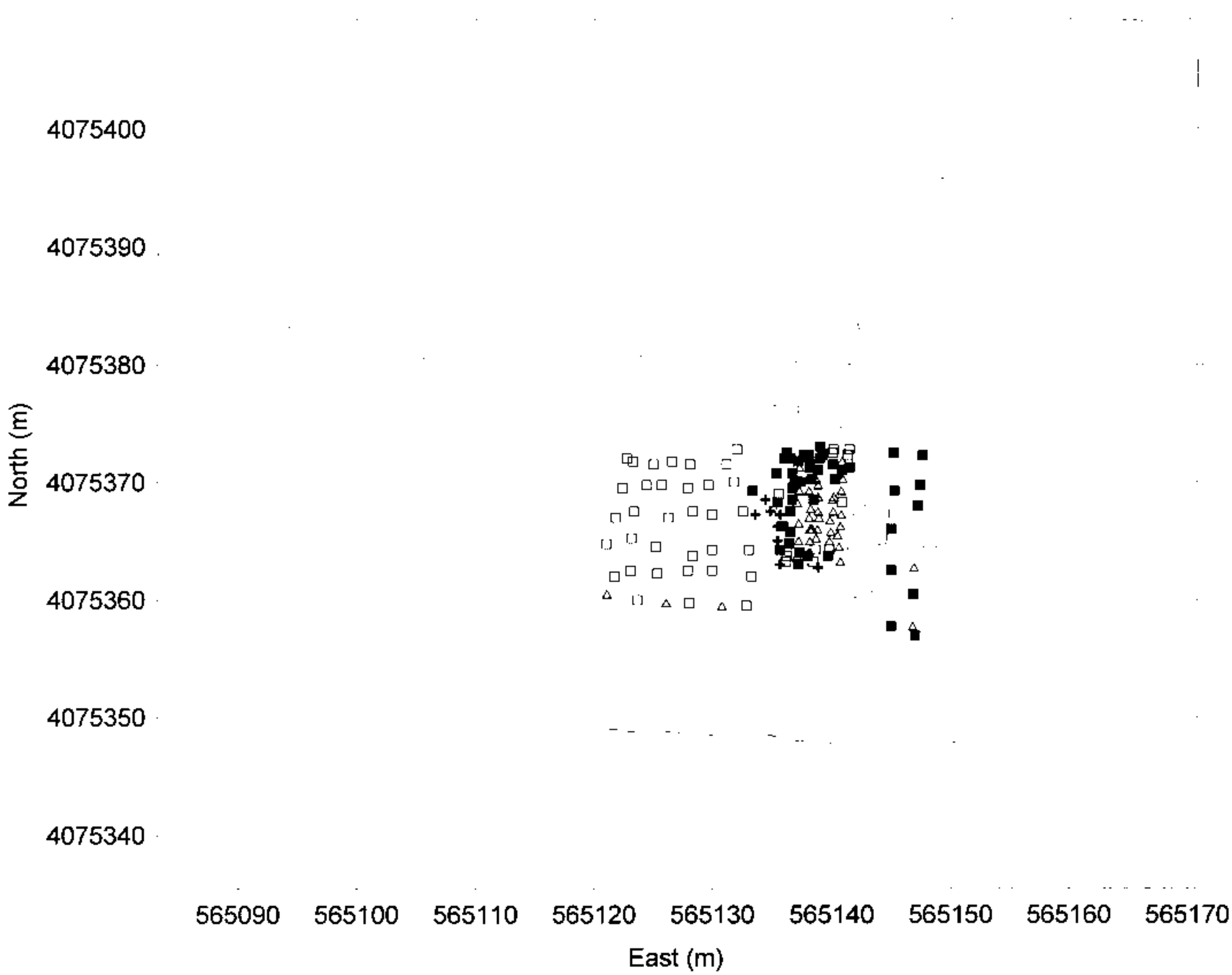
Gravel 997	Concrete 1030	Soil 1938	Background Type Mean
□ 671 to 1182	□ 936 to 1179	□ 1064 to 1941	Background Mean + 2 SD
△ 1182 to 1273	△ 1179 to 1254	△ 1941 to 2030	Background Mean + 3 SD
■ 1273 to 1525	■ 1254 to 1444	■ 2030 to 7526	Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 3

Vehicle Washdown Area
CAU 240, CAS 25-07-02

Gamma Measurements
Kcpm



Gravel 33.7	Concrete 29.3	Soil 50.6	Background Type Mean
□ 25 to 40	□ 30 to 31	□ 33 to 52	Background Mean + 2 SD
	△ 31 to 33	△ 52 to 53	Background Mean + 3 SD
	■ 33 to 90	■ 53 to 85	Background Mean + 50 SD
		✚ 85 to 205	Over Background Mean + 50 SD

kcpm - kilocounts per minute
SD- Standard Deviation
All positions are in Universal Transverse Mercator North American Datum of 1927.

INTERNATIONAL TECHNOLOGY CORPORATION

Memorandum

To: Steven Adams

Date: November 2, 1998

From: Carl Speer

Project No. 776712.01020100

Subject: **TRANSMITTAL OF A RADIOLOGICAL SURVEY OF CAU 240, CAS 25-07-03, VEHICLE WASHDOWN STATION**

Enclosed please find one copy of the report entitled: "Radiological Survey of CAU 240, CAS 25-07-02, Vehicle Washdown Station." This report outlines the survey objectives, instruments used, data acquisition and data processing methods, quality control procedures, and a brief review of the data. Also included is the processed radiological survey results, background survey results and data plots.

If you have any questions, please give me a call at (702) 295-2366.

Attachments

LV/11-2-98/G:\RADSUR\CAU240\MEMO240.WPD

RADIOLOGICAL SURVEY OF CAU 240, CAS 25-07-03,

VEHICLE WASHDOWN STATION

1.0 Objective

The objective of this radiological survey was to provide locations of surface contamination and show radiological trends to focus characterization and clean up efforts. Radiological instrumentation was used to define the nature and extent of radiological contaminants.

2.0 Instruments

- Eberline model ESP-2 Ratemeter (SN. 1729) with 3- by 3-inch NaI scintillation gamma detector (SN. 062293A)
- NE Technology model Electra (SN. 1531) with model DP6BD alpha/beta probe (SN. 1381)
- Trimble model Pro XRS Global Positioning System (GPS) Receiver with model TSC1 datalogger (SN. 220134393)

3.0 Data Acquisition

Radiological background locations were selected based on concrete and soil characteristics similar to the survey area. A concrete storage pad, built at approximately the same time as the vehicle washdown pad, was selected for background measurements. A total of 30 background concrete measurements were collected. The background concrete measurement results are shown in Table 1. Soil areas located approximately 50 meters north of the vehicle washdown pad with similar gravel/sand ratios were selected for the soil background measurements. Background soil measurement results are shown in Table 2. A total of 17 background soil measurements were collected. Radiological and GPS measurements of the background locations were performed in the same manner as the site survey described below.

The radiological survey was performed October 7 and 8, 1998 at Corrective Action Site 25-07-03, Vehicle Washdown Station. An investigation grid of 20 by 13 meters was established around the washdown pad with 1 by 1-meter spacing. Random soil locations around the concrete pad were chosen where the alpha/beta probe could be placed directly on the soil. The grid was marked on the concrete pad with permanent markers to provide uniform measurement spacing. Each measurement location was surveyed by a Trimble Pro GPS system. Alpha, beta, and gamma measurements were collected by placing the detectors directly on the surface of the concrete pad and surrounding soils and integrating the count-rate for 30 seconds. Each radiological measurement was recorded on a datalogger and stored with its related GPS measurement in a combined GPS/RAD file. A total of 110 alpha, beta, and gamma measurements were recorded. The radiological measurements and Universal Transverse Mercator coordinates for each measured point are shown in Table 3.

4.0 Data Processing

The GPS/RAD data from the datalogger was downloaded to a laptop computer and the GPS measurements were post-processed using Trimble's "Pathfinder" software. Each GPS measurement was positional corrected using collected real-time satellite differential signals or the USDA Forest Service Cedar City, UT base station differential files at http://www.fs.fed.us/database/gps/cedarcty.htm. After post-processing, the GPS/RAD data was exported as an ASCII file and converted to an Excel spreadsheet file. The GPS/RAD data was processed using the commercial software package SURFER for graphical presentation. A separate post map was generated for alpha, beta, and gamma measurements. Figure 1, 2, and 3 show graphical representation of the alpha, beta, and gamma measurements, respectively, as they compare to established backgrounds for concrete and soil. Figures 4, 5, and 6 show the location and readings of the alpha, beta, and gamma measurements respectively.

5.0 Quality Control

Radiological detection equipment used in this survey was checked daily as described in SQP-ITLV-460. To ensure positional accuracy, the GPS system was programmed according to the operational manual to achieve submeter accuracy. In addition, each positional measurement recorded was an average of at least 30 readings, which increased the positional accuracy to less than 50 cm. A sampling of the data was checked against source information.

6.0 Data Review

Radiological measurements of the concrete pad and surrounding soils at CAU 240, CAS 25-07-03, Vehicle Washdown Station appear to be consistent with background measurements taken on similar media in the surrounding area. Factors affecting these radiological measurements included gamma and beta shine from surrounding soil, changing ambient radon levels, and instrument variations. No radiological measurements above 2.5 times mean background were identified at this Corrective Action Site.

TABLE 1

Background Concrete Pad Radiological Measurements for CAU 240

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
563367	4071505	56.8	915	29800
563367	4071505	125	932	28600
563367	4071505	125	1147	29300
563367	4071505	68.2	969	29800
563367	4071505	114	1077	29600
563367	4071505	102	981	29500
563367	4071505	102	1106	29900
563367	4071505	45.5	1085	30000
563367	4071505	136	1044	29800
563367	4071505	79.5	1048	28800
563367	4071505	125	1077	28500
563367	4071505	114	1010	29500
563367	4071505	90.9	1006	29200
563367	4071505	114	1106	29000
563367	4071505	136	990	29000
563367	4071505	159	1238	29500
563367	4071505	159	1023	29100
563367	4071505	170	1077	29200
563367	4071505	90.9	928	30100
563367	4071505	90.9	1039	29000
563367	4071505	90.9	977	29100
563367	4071505	114	1085	30000
563367	4071505	136	990	29400
563367	4071505	90.9	870	27400
563367	4071505	102	1081	29200
563367	4071505	79.5	1044	28700
563367	4071505	114	1023	29100
563367	4071505	148	957	28900
563367	4071505	136	1035	29300
563367	4071505	79.5	1039	29600

mean		109.82	1030	29263
mean + 2σ		170.67	1182	30373
mean + 3σ		201.10	1258	30928

TABLE 2

Background Soil Radiological Measurements in the vicinity of CAS 25-07-03.

UTM Coordinates		Gross Radiological Measurements		
East	North	Alpha (dpm)	Beta (dpm)	Gamma (cpm)
565826.486	4071701.932	90.9	1714	45800
565826.123	4071701.884	34.1	1690	47100
565825.530	4071702.481	22.7	1706	46600
565825.926	4071703.786	22.7	1750	46300
565825.484	4071705.660	11.4	1834	46400
565828.934	4071704.383	22.7	1934	46200
565829.398	4071702.296	68.2	1888	47500
565829.711	4071700.849	22.7	1677	46400
565830.556	4071704.000	68.2	1768	45400
565830.329	4071705.008	11.4	1830	45500
565829.449	4071701.271	45.5	1673	46800
565822.716	4071715.054	68.2	1880	46500
565823.404	4071716.062	45.5	1706	45900
565820.188	4071713.024	102	1743	46000
565821.697	4071717.255	22.7	1814	47200
565820.093	4071717.055	56.8	1603	47300
565816.219	4071716.406	45.5	1756	47100

mean	45	1763	46471
mean + 2σ	99	1941	47735
mean + 3σ	127	2030	48367

TABLE 3

Radiological Measurements of CAS 25-07-03 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha dpm	Beta dpm	Gamma kcpm	Media
565846.875	4071674.507	102	948	28.9	Concrete
565847.003	4071672.537	227	1093	26.7	Concrete
565848.099	4071675.181	79.5	973	26.5	Concrete
565848.374	4071671.950	45.5	1072	26.8	Concrete
565849.229	4071672.285	79.5	1068	27.8	Concrete
565849.954	4071672.626	114	994	27.5	Concrete
565850.768	4071672.986	79.5	998	27.5	Concrete
565851.786	4071673.586	90.9	1010	27.7	Concrete
565852.717	4071673.680	79.5	932	27.4	Concrete
565853.446	4071673.836	102	1055	27.9	Concrete
565854.206	4071673.301	79.5	1143	34.2	Concrete
565853.554	4071674.853	45.5	1979	47.3	Soil
565854.468	4071675.095	11.4	1793	47.7	Soil
565855.595	4071675.341	56.8	1917	47.7	Soil
565856.820	4071675.508	22.7	1669	46.7	Soil
565856.832	4071676.253	45.5	1822	46.1	Soil
565856.002	4071676.254	56.8	1723	47	Soil
565855.374	4071676.219	11.4	1752	47.1	Soil
565854.235	4071675.889	45.5	1735	46.1	Soil
565853.173	4071675.199	136	1077	33.4	Concrete
565852.244	4071674.884	68.2	969	28.2	Concrete
565851.462	4071674.786	56.8	1085	27	Concrete
565850.459	4071674.406	170	1126	27.3	Concrete
565849.435	4071674.113	148	1052	27.5	Concrete
565848.205	4071673.691	148	1110	27.1	Concrete
565849.064	4071674.069	79.5	1110	27.4	Concrete
565848.337	4071673.963	102	1089	27.7	Concrete
565847.221	4071673.750	114	1164	38	Concrete
565845.008	4071673.020	79.5	952	27.1	Concrete
565844.346	4071672.857	170	957	27.1	Concrete
565844.554	4071673.319	56.8	1607	45.7	Soil
565843.903	4071673.237	45.5	1747	46.7	Soil
565843.014	4071672.915	22.7	1474	44.8	Soil
565842.248	4071672.669	68.2	1520	45.4	Soil
565841.579	4071672.502	45.5	1441	44.6	Soil
565840.812	4071672.467	22.7	1582	45	Soil
565840.758	4071672.983	11.4	1619	46.7	Soil
565841.642	4071673.032	11.4	1507	45.3	Soil
565842.505	4071673.156	56.8	1569	45.2	Soil
565843.604	4071673.641	45.5	1532	45.1	Soil
565844.497	4071674.099	34.1	1470	45.7	Soil
565845.342	4071674.152	34.1	1611	45.4	Soil
565846.186	4071674.340	79.5	1213	29	Concrete
565846.104	4071674.118	79.5	1139	27.9	Concrete
565847.583	4071675.142	22.7	1188	27.5	Concrete
565848.501	4071675.373	90.9	1130	28.1	Concrete

TABLE 3

Radiological Measurements of CAS 25-07-03 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha dpm	Beta dpm	Gamma kcpm	Media
565849.314	4071675.460	34.1	1064	27.4	Concrete
565851.010	4071675.792	148	1284	27.8	Concrete
565849.824	4071676.164	79.5	1168	26.9	Concrete
565850.689	4071676.312	102	1143	26.1	Concrete
565851.656	4071676.972	79.5	1168	27	Concrete
565852.673	4071677.115	125	1184	27	Concrete
565853.555	4071676.984	45.5	1180	32.2	Concrete
565854.668	4071677.231	90.9	1735	45	Soil
565856.149	4071678.160	68.2	1735	46.8	Soil
565856.851	4071678.166	79.5	1810	46.6	Soil
565858.080	4071678.238	45.5	1710	46.2	Soil
565856.968	4071678.554	68.2	1702	45.1	Soil
565856.351	4071678.606	68.2	1880	44.1	Soil
565855.753	4071678.621	34.1	1723	45.2	Soil
565855.445	4071677.877	79.5	1863	44.3	Soil
565854.235	4071677.954	68.2	1147	30.1	Concrete
565852.897	4071678.336	90.9	1072	27.5	Concrete
565852.531	4071677.468	56.8	1002	28.3	Concrete
565851.487	4071677.601	125	977	27.4	Concrete
565850.809	4071677.396	68.2	907	26.8	Concrete
565849.933	4071676.758	125	1060	27.3	Concrete
565849.180	4071676.260	250	1064	27	Concrete
565848.346	4071676.073	136	1064	26.9	Concrete
565847.340	4071676.017	114	1168	26.5	Concrete
565846.215	4071675.859	90.9	994	26.2	Concrete
565845.595	4071675.850	90.9	1025	29.9	Concrete
565845.322	4071676.680	90.9	1383	27.2	Concrete
565846.114	4071676.678	159	1027	27.3	Concrete
565846.949	4071676.672	148	1056	26.4	Concrete
565848.177	4071676.752	227	1234	28	Concrete
565848.698	4071677.261	125	954	27.8	Concrete
565848.313	4071676.974	182	965	28.1	Concrete
565849.917	4071677.705	170	948	27.2	Concrete
565850.911	4071678.022	148	1122	28	Concrete
565851.642	4071678.349	45.5	994	27.8	Concrete
565852.798	4071678.517	114	944	28.4	Concrete
565854.152	4071678.650	45.5	1205	40.7	Concrete
565852.779	4071679.535	11.4	886	35.2	Concrete
565851.815	4071679.241	90.9	1089	34.7	Concrete
565851.126	4071679.265	79.5	1015	36.7	Concrete
565851.134	4071678.979	45.5	1288	35.4	Concrete
565849.811	4071678.434	56.8	1077	36.8	Concrete
565849.447	4071678.287	193	1015	39.2	Concrete
565848.519	4071678.159	79.5	1097	37.1	Concrete
565848.031	4071678.031	68.2	1060	36.1	Concrete
565845.582	4071676.477	56.8	1172	37.9	Concrete

TABLE 3

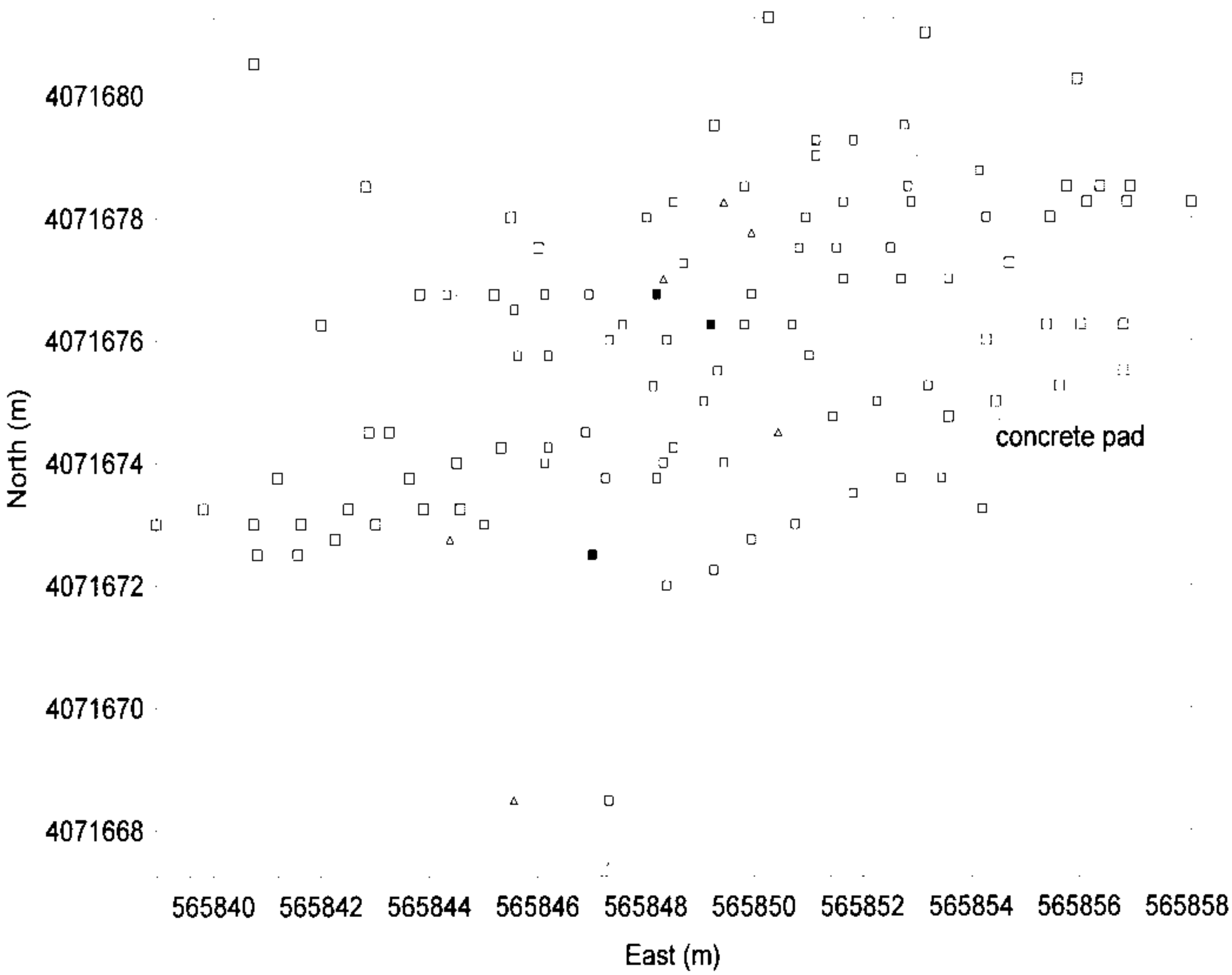
Radiological Measurements of CAS 25-07-03 Washdown Pad and Surrounding Soils

UTM Coordinates		Gross Radiological Measurements			
East	North	Alpha dpm	Beta dpm	Gamma kcpm	Media
565845.972	4071677.602	68.2	1582	39.7	Soil
565845.184	4071676.847	22.7	1284	32.6	Soil
565843.791	4071676.643	22.7	1284	30.7	Soil
565843.269	4071674.483	22.7	1532	44.8	Soil
565842.854	4071674.431	45.5	1491	44.8	Soil
565841.172	4071673.853	22.7	1511	46	Soil
565839.824	4071673.283	22.7	1441	45.8	Soil
565838.961	4071673.047	22.7	1222	45.6	Soil
565842.007	4071676.192	11.4	1234	41.8	Soil
565840.774	4071680.446	22.7	1735	46.1	Soil
565842.817	4071678.481	34.1	1880	47.5	Soil
565845.503	4071677.998	34.1	1611	46.9	Soil
565849.248	4071679.407	22.7	1822	47.1	Soil
565850.225	4071681.346	25.5	1603	47.1	Soil
565853.097	4071680.916	45.5	1685	46.9	Soil
565855.961	4071680.175	45.5	1652	45.9	Soil
565847.294	4071668.460	90.9	1159	26.7	Concrete
565845.581	4071668.405	193	1135	26.6	Concrete

Figure 1

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Alpha Measurements
dpm/100 square centimeters



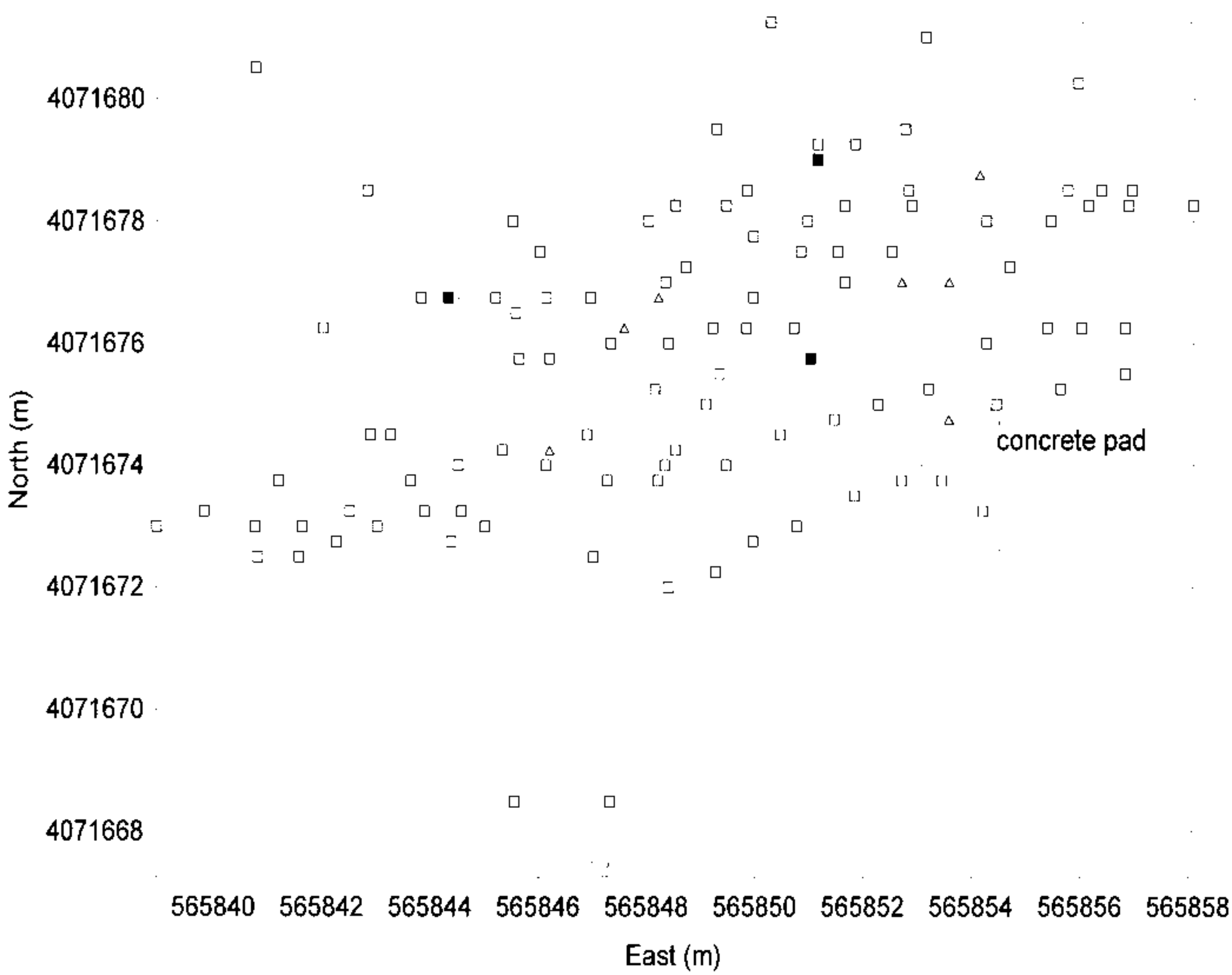
Concrete 110	Soil 45	Background Type
		Mean
□ 11 to 170	□ 11 to 100	Background Mean + 2 SD
△ 170 to 201		Background Mean + 3 SD
■ 201 to 250		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 2

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Beta Measurements
dpm/100 square centimeters



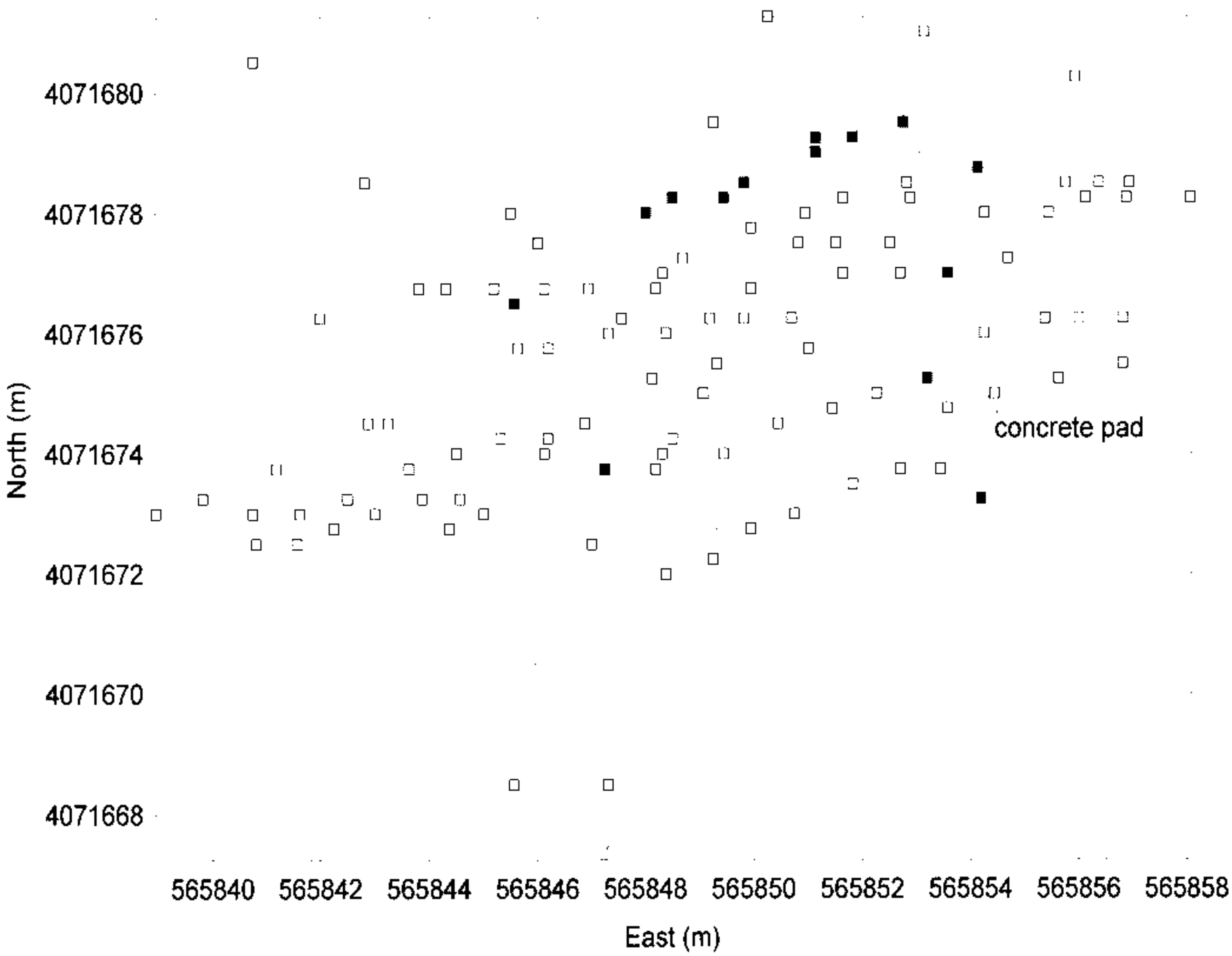
Concrete 1030	Soil 1763	Background Type Mean
□ 886 to 1179	□ 1222 to 1940	Background Mean + 2 SD
△ 1179 to 1254	△ 1940 to 2030	Background Mean + 3 SD
■ 1254 to 1384		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
dpm- Disintegrations per minute
SD- Standard Deviation

Figure 3

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Gamma Measurements
kcpm



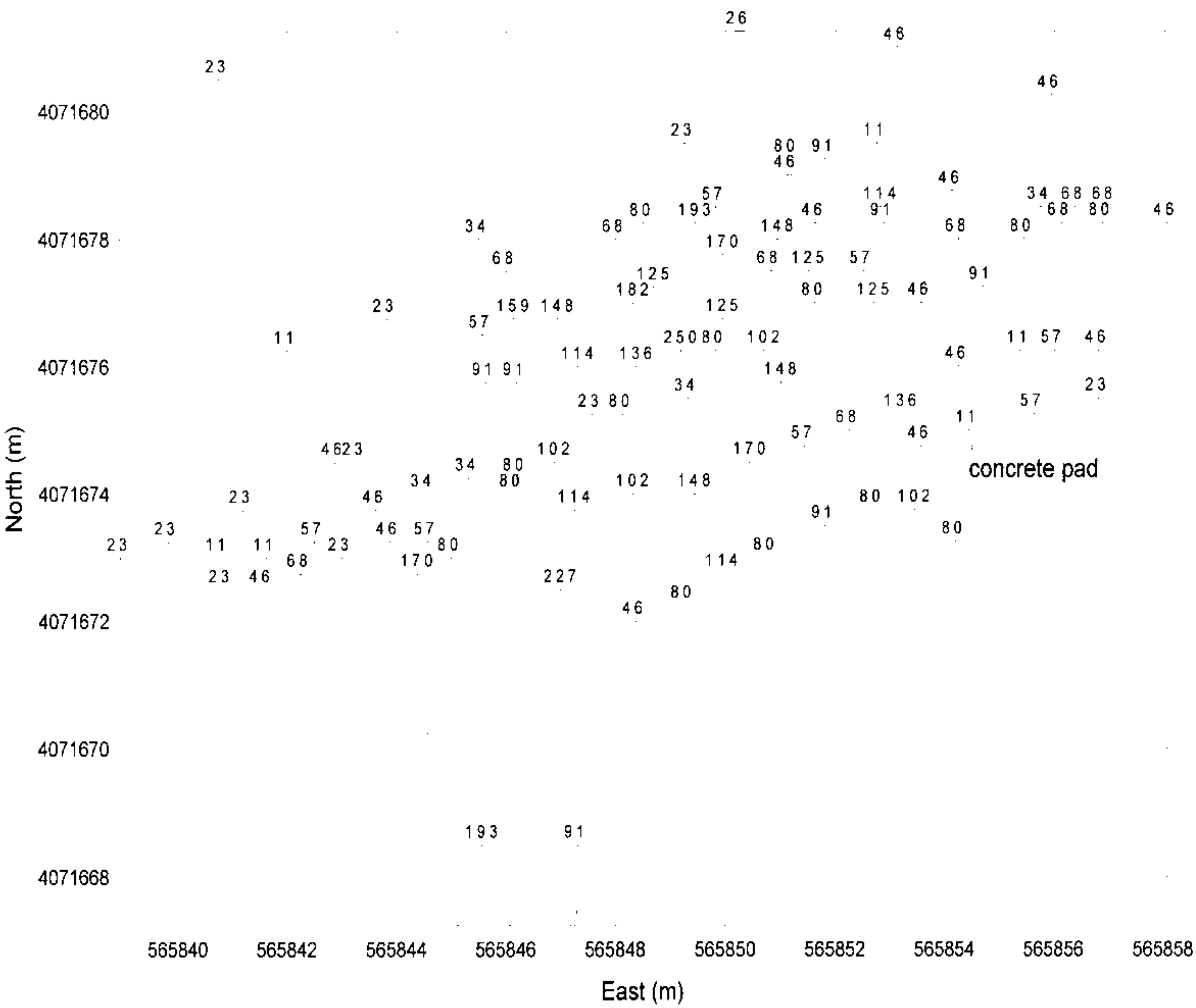
Concrete	Soil	Background Type
29.2	46.5	Mean
□ 26 to 30	□ 31 to 48	Background Mean + 2 SD
△ 30 to 31		Background Mean + 3 SD
■ 31 to 41		Over Background Mean + 3 SD

All positions are in Universal Transverse Mercator North American Datum of 1927.
kcpm- kilocounts per minute
SD- Standard Deviation

Figure 4

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Alpha Measurements
dpm/100 square centimeter

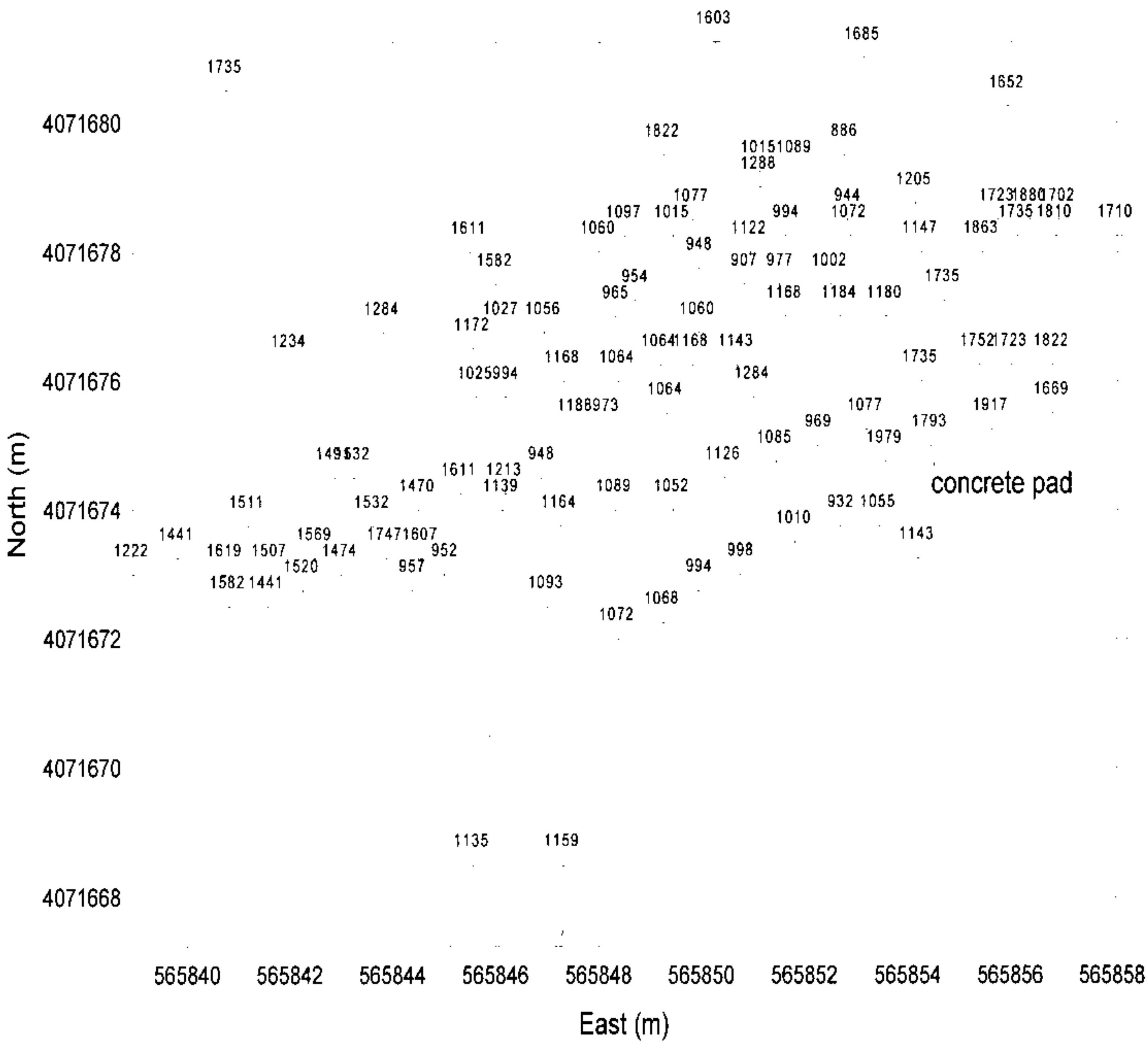


All positions are in Universal Transverse Mercator North American Datum of 1927.

Figure 5

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Beta Measurements
dpm/100 square centimeter

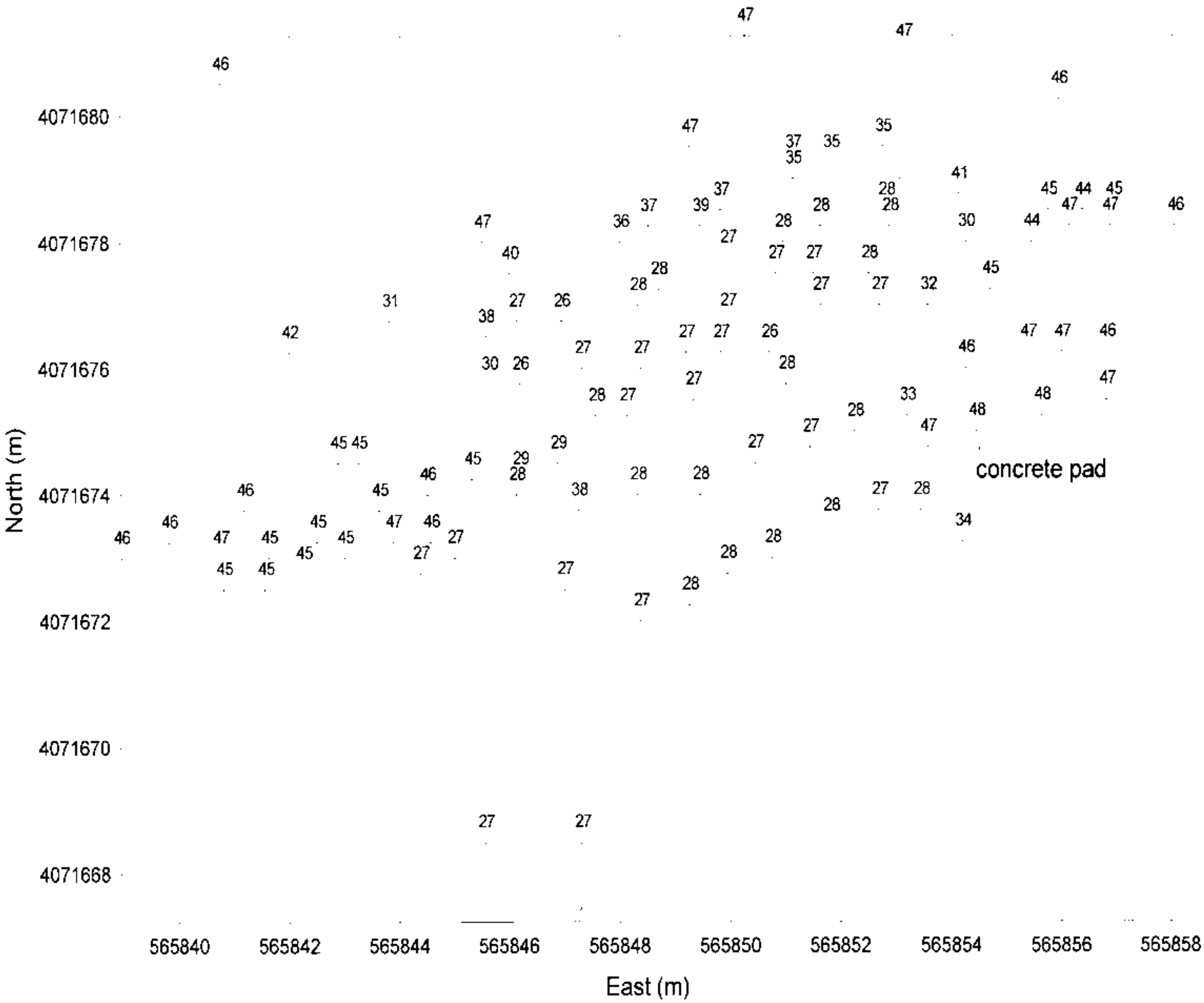


All positions are in Universal Transverse Mercator North American Datum of 1927.

Figure 6

Vehicle Washdown Station
CAU 240, CAS 25-07-03

Gamma Measurements
Kilocounts per minute



All positions are in Universal Transverse Mercator North American Datum of 1927.

Appendix D

NDEP Document Review Sheet

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Corrective Action Investigation Plan for CAU 240: Area 25 Vehicle Washdown, Nevada Test Site, Nevada	2. Document Date:
3. Revision Number: Draft	4. Originator/Organization: IT Corporation
5. Responsible DOE/NV ERP Subproject Mgr.:	6. Date Comments Due:
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No.: Michael McKinnon/NDEP/(702)486-2863	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1. Page ES-1, Ex. Summary, 3rd Para.		*"...animals associated with activities at Sedan Crater..."* Please provide the reference concerning this statement.	(Sorom, 1998) reference provided.	Yes
2. Page ES-1, Ex. Summary, 5th Para, 3rd Bullet		*"...limited to the proximity of the site elements..."* Please elaborate as to the definition of site elements.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
3. Page ES-1, Ex. Summary, 5th Para, 4th Bullet		*"...no release mechanisms..."* The fact that vehicles were decontaminated at these sites provides the release mechanism.	Bullet reading "Release mechanisms" was modified to "current driving forces." Also added "due to former intermittent use" between "limited and because..."	Yes
4. Page ES-2, Ex. Summary, 3rd Para, 1st Bullet		*"...elements of the Corrective Action Unit..."* Please elaborate as to the definition of elements of the CAU.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
5. Page ES-2, Ex. Summary, 3rd Para, 3rd Bullet		*"...potential limitations in field screening capabilities will be addressed through laboratory analysis..."* Please elaborate as to the meaning of this statement.	Statement was removed from Executive Summary. An explanation is provided in Section 4.1, seventh bullet in the sentence stating: "Because field-screening techniques are not readily available for some of the COPCs (i.e., SVOCs and PCBs), they will be evaluated through laboratory analysis."	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
6. Page ES-2, Ex. Summary, 3rd Para, 6th Bullet		*"...locate site elements..."* Please define site elements.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
7. Sect. 1.2, Scope, 1st Bullet		See Comment 4.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
8. Sect. 1.2, Scope, 3rd Bullet		See Comment 5.	The text was revised as follows: "...(potential limitations in field screening capabilities [i.e., for SVOCs and PCBs] will be addressed through laboratory analysis)..."	Yes
9. Sect. 1.2, Scope, 6th Bullet		See Comment 6.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
10. Sect. 2.1, Physical Setting, 2nd Sentence		Please spell out CSA before using it as an acronym.	Acronym is defined on page 1.	No
11. Sect. 2.2.3, Corrective Action Site 25-07-03 (RADSAFE Pad), 1st Para, 2nd Sentence		*"...concrete pad which is covered by a metal grate..."* This sentence is worded such that the concrete pad is covered by a metal grate (instead of the drain/trench).	Text revised as follows: "There is a drain/trench covered by a metal grate located along the north edge of the concrete pad."	Yes
12. Sect. 2.2.3, Corrective Action Site 25-07-03 (RADSAFE Pad), 1st Para, Last Sentence		*"...contaminated and radiated materials..."* The term "radioactive" versus "radiated" is more appropriate here.	The word "radiated" was changed to "radioactive."	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
13. Sect. 2.2.3, Corrective Action Site 25-07-03 (RADSAFE Pad), 2nd Para, 6th Sentence		*"...not believed to have been the actual reactor parts..."* This statement contradicts Section 2.3, 3rd Sentence: *"...decontaminating reactor parts..."* and Section 2.4, 6th Sentence: *"...decontaminating vehicles, reactor parts,..."* NDEP requires clarification as to whether reactor parts were decontaminated at these CASs.	The following sentence, "Actual reactor parts were reported as possibly being decontaminated at the F and J Roads Pad" was added to Section 2.2.3 after the sentence in question. According to interviews with site workers, the (F and J Roads Pad) CAS was used to decontaminate reactor parts and the RADSAFE Pad CAS was used to decontaminate parts associated with the reactor runs as well as animals.	No
14. Table 2-1 in Sect. 2.5.1, Previous Sampling Effort		The Preliminary Remediation Goal (PRG) listed for Aroclor-1254 should be 1,300 μg/kg, not 18,000 μg/kg.	The Preliminary Remediation Goal (PRG) listed for Aroclor-1254 is 18,000 μg/kg (EPA, 1998), but the cancer endpoint is 1,300 μg/kg. Changed value to 1,300 μg/kg.	Accepted in part
15. Sect. 2.5.1, Previous Sampling Effort, 3rd Sentence		This section indicates that Cs-137 and Am-241 were detected at levels exceeding regional background levels. The following section (Section 2.5.2, last bullet) indicates that in a subsequent survey radiological measurements were consistent with background levels in the vicinity. This discrepancy should be addressed.	A sentence was added in Section 2.5.2 stating "However, laboratory results indicated elevated levels of cesium-137 and americium-241" addresses that CS-137 and Am-241 were detected by laboratory results, not by radiological survey.	Yes
16. Sect. 3.1, Conceptual Site Model, 3rd Bullet		*"...site elements..."* This term should be defined.	"Site elements" was modified to "components" and these components are defined in Section 1.0 following each bulleted CAS.	Yes
17. Sect. 3.3.1, Field Screening Levels, Last Sentence		*"...this data may also be used..."* This data <u>will</u> be used to select discretionary laboratory sample locations.	Changed "may" to "will."	Yes
18. Sect. 4.0, Field Investigation, 3rd Para, 1st Sentence		*"...may be conducted..."* Excavation <u>will</u> be conducted if the video survey fails...	Changed "may" to "will."	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
19. Sect. 4.1, Technical Approach, 5th Bullet		Tables A.3-1, A.3-2, and A.3-3 in Appendix A indicate that background sample readings will be taken at each CAS for the development of the FSL. Therefore, this section should specify the collection of background samples per CAS.	Bullet added stating that 20 background sample readings at each CAS will be taken to determine radiological field screening levels.	Yes
20. Sect. 4.1, Technical Approach, 7th Bullet		The NaI detector is too general an instrument to specify “or equivalent”. If the requirement was for a particular manufacturer of NaI instruments, the “or equivalent” could be used.	The “or equivalent” refers to the use of the intrinsic germanium detector. The term “...or equivalent” was deleted. Text was changed to read “NaI detector or intrinsic germanium detector” instead of “NaI or equivalent.”	Yes
21. Sect. 4.4, Surface and Near-Surface Sampling, F&J Roads Pad		One sample should be collected beneath the metal grate.	Sample will be taken downgradient from grate. The fourth bullet states, “Two sample locations from the soil strip on the north edge of the concrete pad downgradient from the grate.”	No
22. Sect. 4.4, Surface and Near-Surface Sampling, F&J Roads Pad, Last Sentence		*“...extra soil remaining after the direct-push activities will be placed back in the direct-push hole...”* Add the following to the end of this sentence “provided the soil is not contaminated above Field Screening Levels (FSLs).	Added the following sentence instead: “If contamination is present, any contaminated soil will be addressed during the corrective action.”	Accepted in part
23. Sect. 4.6, Field Screening, 1st Para, 2nd Sentence		See Comment 20.	The “or equivalent” refers to the use of the intrinsic germanium detector. The term “...or equivalent” was deleted. Text was changed to read “NaI detector or intrinsic germanium detector” instead of “NaI or equivalent.”	Yes
24. Sect. 4.7, Sampling Criteria, 3rd, 4th, and 5th Para, last sentence		For each of the three CASs, the final bullet indicates that Uranium and Plutonium isotopic analyses will be conducted only if the results of the gamma-spectroscopy test exceeds PALs. This bullet should specify that the isotopic analyses will be conducted only if the results of the gamma-spectroscopy testing for the appropriate Uranium and Plutonium progeny exceed PALs.	Sentence added after last bullet below each CAS stating, “The gamma-spectrometry is being used to detect fission and activation products. If fission and activation product concentrations exceed PALs, then alpha spectrometry will be used to quantify uranium and plutonium.”	No

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
25. Sect. 4.8, Background Samples, 1st Sentence		*"...Background surface samples will be collected from two background locations at each CAS..."* As pointed out in Comment 19, Appendix A specifies 20 background samples per CAS.	Surface and near-surface samples will be collected using the direct-push method from two background locations at each CAS and sent to the laboratory for analysis as stated in the first sentence of Section 4.8. Twenty background sample readings will be taken at each CAS to determine the radiological field screening levels. The fifth and sixth bullets of Section 4.1 were modified to state, "Collect two background samples and two near-surface background samples from two nearby undisturbed locations at each CAS (a total of four samples per CAS) using direct-push method and submit them for laboratory analysis" and "Determine radiological field-screening level by taking 20 background sample readings at each CAS and calculating the mean plus two standard deviations for each CAS." Tables A.3-1, A.3-2 and A.3-3 of the Appendix state that 20 background field screening samples will be taken at each CAS.	No
26. Sect. 5.0, Waste Management, 2nd Para, 3rd Sentence		*"...rinsate samples may be taken..."* This sentence should indicate that rinsate samples will be taken to support waste management activities.	Rinsate samples may be taken at the discretion of waste management personnel. If laboratory results indicate contamination in soil, then a rinsate sample may be taken to facilitate waste management and QA/QC. If no contamination is present above levels of concern, a rinsate sample is likely to be unnecessary. Text was revised as follows: "Rinsate may be analyzed separately to determine final disposition if soil contamination is present above FSL."	Yes
27. Sect. 5.3.4, Mixed Wastes, Last Para.		Mutual Consent Order should be changed to Mutual Consent Agreement (MCA).	Text was modified to read "Mutual Consent Agreement."	Yes

[a] Comment Types: M = Mandatory, S = Suggested.

Return Document Review Sheets to DOE/NV Environmental Restoration Division, Attn: QAC, M/S 505.

Distribution

*Provide copy in distribution of Rev. 0 and subsequent revisions if applicable. Copies of only the NDEP-approved document will be distributed to the others.

	Copies
Paul J. Liebendorfer State of Nevada Bureau of Federal Facilities Division of Environmental Protection 333 W. Nye Lane, Room 138 Carson City, NV 89706-0851	2 (Controlled)*
Michael McKinnon State of Nevada Bureau of Federal Facilities Division of Environmental Protection 555 E. Washington, Suite 4300 Las Vegas, NV 89101	1 (Controlled)*
Sabrina Lawrence Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Controlled)*
Janet Appenzeller-Wing Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*
Sabine Curtis Environmental Restoration Division DOE/Nevada Operations Office P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled)*

Dave Madsen Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*
Steve Nacht Bechtel Nevada P.O. Box 98521, M/S NTS306 Las Vegas, NV 89193-8521	1 (Uncontrolled)*
Beatriz Bordelois SAIC P.O. Box 93838 Las Vegas, NV 89193	1 (Controlled)*
Cheryl Rodriguez IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
Mary Todd SAIC P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
Dustin Wilson SAIC P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
IT Corporation Central Files IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)*
Technical Information Resource Center DOE/Nevada Operations Office 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	1 (Uncontrolled, electronic copy)
Manager Southern Nevada FFACO Public Reading Room P.O. Box 98521, M/S NLV040 Las Vegas, NV 89193-8521	1 (Controlled) 1 (Uncontrolled)
Manager Northern Nevada FFACO Public Reading Room c/o Rosa Silver IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Uncontrolled)
FFACO Public Reading Room Coordinator Rosa Silver IT Corporation P.O. Box 93838 Las Vegas, NV 89193	1 (Controlled)