US Army Corps of Engineers

U.S. ARMY CORPS OF ENGINEERS
SPRING VALLEY - BALTIMORE DISTRICT

Spring Valley
Property # C03DC0918

Final Remedial Investigation Evaluation Report

From: Contractor, Parsons Engineering Science, Inc.

To: N/A

Date: January 8, 1998

Project(s): C03DC091801 (Spring Valley - MMRP)

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FINAL
REMEDIAL INVESTIGATION EVALUATION REPORT, OPERATION SAFE REMOVAL FORMERLY USED DEFENSE SITE WASHINGTON, D.C.

PREPARED BY:

U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE,

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT;
AND

PARSONS ENGINEERING SCIENCE, INC.

JANUARY 8, 1998

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ACRONYM LIST

ABP	Agent Breakdown Products
AEC	Army Environmental Center
ANOVA	Analysis of Variance
ARARs	Applicable or Relevant and Appropriate Regulations
ARB	Anomaly Review Board
ATSDR	Agency for Toxic Substances and Disease Registry
AU	American University
AUES	American University Experiment Station
CEHNC	Huntsville Division, USACE
CENAB	Baltimore District, USACE
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CV	Coefficient of Variation
CWM	Chemical Warfare Material
CWS	Chemical Warfare Service
DANS	Data Acquisition and Navigation System
DCOEP	District of Columbia Office of Emergency Preparedness
DCRA	District of Columbia Department of Consumer and Regulatory Affairs
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	Data Quality Objectives
EE/CA	Engineering Evaluation/Cost Analysis
EM	Electromagnetic
EMS	Environmental Management Systems, Inc.
EPIC	Environmental Photographic Interpretation Center
ERDEC	Edgewood Research, Development, and Engineering Center
ESI	Expanded Site Investigation
FDES	Findings and Determination of Eligibility Study
FS	Feasibility Study
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Sites
GC/MS	Gas Chromatograph/Mass Spectrometer
GIS	Geographic Information System
GPR	Ground Penetrating Radar

ACRONYM LIST
(Continued)

HD	Distilled Mustard
INPR	Inventory Project Report
L	Lewisite
MDRD	Minimum Detectable Relative Difference
MRI	Midwest Research Institute
NTCRA	Non-time Critical removal Action
OE	Ordnance and Explosives
OEW	Ordnance and Explosive Waste
OSR	Operation Safe Removal
OSR FUDS	Operation Safe Removal Formerly Used Defense Site
OSWER	Office of Solid Waste and Emergency Response
OU	Operational Unit
PA	Preliminary Assessment
PAHs	Polynuclear Aromatic Hydrocarbons
Parsons ES	Parsons Engineering Science, Inc.
PCB	Polychlorinatedbiphenyl
PIRP	Public Involvement and Response Plan
POI	Point of Interest
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
QC	Quality Control
RAGS	Risk Assessment Guidance for Superfund Human Health Evaluation Manual
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
ROE	Right-of-Entry
RTAP	Real-Time Analytical Platform
SHERP	Safety, Health, and Emergency Response Plan
SVOCs	Semivolatile Organic Compounds
SVRO	Spring Valley Resident Office
TAL	Target Analyte List
TCL	Target Compound List
TEC	Topographic Engineering Center

ACRONYM LIST
(Continued)

TEU	Technical Escort Unit
TICs	Tentatively Identified Compounds
USACE	US Army Corps of Engineers
USACE-TEC	US Army Corps of Engineers, Topographic Engineering Center
USATHAMA	US Army Toxic and Hazardous Materials Agency (now AEC)
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds
WWI	World War I

Section 1

SECTION 1

EXECUTIVE SUMMARY

1.1 INTRODUCTION

1.1.1 The Government of the District of Columbia Department of Consumer and Regulatory Affairs (DCRA) issued a report entitled *Final Report on World War I Poison Gas Production at the American University Experiment Station* (the DCRA report) (July, 1996) that concluded the remedial investigation (RI) and remedial action performed by the US Army Corps of Engineers (USACE) at the Operation Safe Removal Formerly Used Defense Site (OSR FUDS) was not adequately completed and that substantial additional action is required to protect the health and safety of the residents of the Spring Valley area. In addition, DCRA's 30 January 1997 letter (DCRA, 1997) that transmitted the DCRA Report to United States Environmental Protection Agency (USEPA) addressed additional items of concern at the OSR FUDS.

1.1.2 The OSR FUDS investigation was properly conducted in accordance with the Defense Environmental Restoration Program (DERP), 10 U.S.C. Sec. 2701-2707 and Section 104 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It focused on those areas with the highest probability for imminent health or safety hazards or environmental contamination. The investigation found no imminent health or safety hazards or environmental contamination associated with:

1. American University Experiment Station (AUES) ordnance testing;
2. chemical warfare material (CWM), CWM unique breakdown products, or laboratory contaminants associated with CWM research and development at AUES; or
3. subsequent Department of Defense (DoD) activities at the OSR FUDS.

The Remedial Investigation Report, Site Closure Plan, and Record of Decision were reviewed and approved by the public and appropriate government agencies. The Record of Decision was signed June 2, 1995.

1.1.3 The following Investigation Evaluation Report provides the comprehensive USACE response to the DCRA Report and Letter and objectively evaluates and responds to the issues raised in these documents. Wherever possible, citations to documents previously

prepared for Operation Safe Removal are provided in support of the responses to DCRA's items of concern.

1.1.4 The DCRA Report (DCRA, 1996) and Letter (DCRA, 1997) contained over 50 separate statements/issues. These issues were evaluated and grouped into nine major topical areas, as follows:

- Regulatory Framework for the OSR FUDS Investigation and Remediation;
- Historical Framework for the OSR FUDS Investigation and Remediation;
- Investigation Foundation;
- Point of Interest Identification and Selection Process;
- Unexploded Ordnance Investigation/Removal Program;
- Environmental Sampling Program;
- Risk Assessment Process;
- Other Reports; and
- Agencies and Responsibilities.

Each major topic is addressed in a separate section in this report.

1.2 DCRA ISSUES RESPONSE SUMMARY

1.2.1 Regulatory Authority

1.2.1.1 The investigation of the OSR FUDS Site was conducted in accordance with Defense Environmental Restoration Program (DERP), 10 U.S.C. Sec. 2701-2707 and Section 104 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601 et seq. The OSR FUDS investigation was properly conducted within the usual sequence of events outlined by the CERCLA process described in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (USEPA, 1988a). The USACE encouraged public participation in the decision making process throughout the OSR FUDS investigation through the Public Involvement and Response Plan developed and implemented by the USACE, Baltimore District (CENAB) public affairs office. All OSR FUDS investigation documents were reviewed by the appropriate parties.

1.2.2 OSR FUDS Investigation Basis

1.2.2.1 The investigation was designed to locate:

- Caches of buried munitions associated with DoD activities at the OSR FUDS, focusing on American University Experiment Station (AUES) activities; and
- Residual surficial soil contamination from CWM or CWM unique breakdown products from static firings or persistence testing of CWM or residual contamination from laboratory contaminants associated with CWM research and development at AUES.

1.2.2.2 The scientific basis of the investigation was to investigate those areas of highest probability of hazards and expand the area of investigation only if hazards were detected in these high probability areas. These areas, termed Points of Interest (POIs), were identified in the historical record as associated with CWM research, development, testing and evaluation. If unexploded ordnance (UXO) or CWM was not located in those areas of documented use, the likelihood of UXO or CWM in other areas of the OSR FUDS is remote.

1.2.3 OSR FUDS Investigation Results

1.2.3.1 The only munitions cache was the initial find at 52nd Court which was associated with an identified POI, POI 14. Following the initial find, over 1,900 anomalies (including pits, trenches, single items) in 518 properties throughout the OSR FUDS were investigated. All anomalies were evaluated following an established procedure, including an external Anomaly Review Board (ARB). The members of the ARB included experts in UXO, UXO detection, and associated UXO health and safety. The purpose of the ARB was to thoroughly review the data and determine which anomalies required further investigation.

1.2.3.2 Of the 1,900 anomalies, only ~~four~~ three UXO single items were found. Two were suspect "amnesty" rounds (turned in anonymously by local residents). One was found in plain sight by the side of a road and the other was found near the USACE Spring Valley Resident Engineer's Office at the Interim Holding Area. The first was considered a suspect CWM containing munition because it appeared to contain liquid when handled (weight shifted). However, there were no static firing attachments and CWM was not loaded into ballistically fired munitions at AUES. Although it was most likely filled with water or other inert liquid it was sent to Pine Bluff Arsenal, Arkansas, for disposal. The other amnesty round was sent to Letterkenny Army Depot, Pennsylvania. The third round was an unfuzed mortar shell

uncovered during the digging of a footer for a basement extension to a house. It was removed from the area by the 57th EOD Unit at Ft. Belvoir, detonated, and determined from detonation to be empty. The fourth was a spent Livens projectile partially filled with smoke agent which was discovered by the OSR FUDS UXO investigation team. It was sent to a RCRA permitted commercial facility in Sauget, Illinois, for incineration.

1.2.3.3 No CWM or CWM unique breakdown products were detected in over 260 environmental samples. Several naturally occurring metals which could be associated with CWM, and others which were not associated with CWM, were detected at levels above background. However, when subjected to a risk assessment performed in accordance with the USEPA Risk Assessment Guidelines for Superfund (USEPA, 1989a), these findings were determined to require no further remedial action.

1.2.4 OSR FUDS Investigation Conclusions

1.2.4.1 The Remedial Investigation concluded with the finding of "No Further Action Required" for the OSR FUDS, excluding OU-2, the Spaulding and Captain Rankin area. The Record of Decision (ROD), signed June 2, 1995, documents the "No Further Action Required" for the OSR FUDS excluding OU-2. The "No Further Action Required" for OU-2 presented in the draft Site Closure Plan and draft ROD has been approved by USEPA Region III. Final close out of the entire OSR FUDS is pending resolution of the recently raised District of Columbia concerns which this report addresses.

1.2.4.2 There are no remaining imminent health or safety hazards on the OSR FUDS as a result of DoD ordnance or CWM activities.

1.3 POTENTIAL RESIDUAL HAZARDS

1.3.1 Potential Residual Hazards

1.3.1.1 The USACE identified the following potential residual hazards:

1.3.1.2 Single UXO items. The OSR FUDS investigation focused on detecting large caches of buried munitions. It was expanded to include detection of single UXO items on properties in the proximity of POIs. However, single UXO items may remain on site.

1.3.1.3 Buried mustard agent which could exist in a polymerized form. During this 1997 RI evaluation, further analysis of circa 1918 photos of AUES concluded 5 gallon

glass or ceramic containers which could have contained mustard agent may have been buried in a pit near the fenced perimeter of the AUES (See 1.3.1.4). The disposal practice at the time was to place containers in a pit, break the container, spread chlorinated lime over the mustard agent, and backfill the pit. Under these conditions, it is possible mustard agent could exist in a polymerized form.

1.3.1.4 POI 24. POI 24 was incorrectly located during the RI. As a result of the current RI evaluation, aerial and supporting photographs were reviewed by the USACE Topographical Engineering Center (TEC). Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This review also identified this location as a possible mustard agent burial pit (see 1.3.1.3).

1.3.2 Potential Risks

1.3.2.1 Undisturbed, these potential hazards pose no risk to the public. Possible single UXO items will not spontaneously detonate. If polymerized mustard exists, it is not releasing mustard vapors in its current form. To present a hazard it must contact the skin. However, if disturbed through digging such as construction activity, these potential hazards may be a risk to the public as described below:

1.3.2.2 Single UXO items. The probability of the public encountering a single round is remote. During the RI, over 1,900 anomalies were investigated in 518 properties throughout the OSR FUDS with only four intact UXO single items found. None of the intact UXO single items found were hazardous or posed any danger to the public prior to or upon discovery. All were unfuzed. In addition, with the exception of the cache found at the identified POI 14, there have been minimal UXO items uncovered, even though there has been significant land development in the OSR FUDS area since 1918.

1.3.2.3 Buried Polymerized Mustard Agent. The probability of the public coming in contact with buried polymerized mustard agent is also remote. Besides POI 24, a possible burial pit, polymerized mustard would only be associated with random locations where mustard may have been spilled and subsequently decontaminated. The polymerized form has the consistency of asphalt and minimal vapor pressure. If it exists in the polymer form, it is most likely in a relatively thin layer (from spilling from the broken containers) and must be disturbed to become a hazard. This hazard would be a potential contact hazard causing skin burns, but is not an inhalation hazard. In addition, the hazard would be very localized, affecting only those who came in direct contact with the agent. It is not a splash or vaporization hazard. Although mustard can

mustard can exist in the polymer form for many tens of years, there is an equal probability the agent completely degraded to much less toxic breakdown products. Of over 160 soil samples from known mustard agent test areas, none contained mustard agent or mustard-agent breakdown products. This indicates complete breakdown of the mustard agent.

1.3.2.4 POI 24. The Army is recommending additional investigation to determine if residual hazards, specifically mustard agent containers or polymerized mustard, exist at this location.

1.3.3 Additional Investigation

1.3.3.1 Single UXO items. No additional investigation for single item UXO is warranted. While the technology exists to locate UXO single items, in the Spring Valley urban environment, the technology does not exist to distinguish a single UXO anomaly from urban anomalies such as construction debris, ferrous rocks, etc. The OSR FUDS investigation focused on those areas most likely to contain UXO caches and was expanded to detect single UXO items within the POIs. Minimal UXO was discovered in these high probability areas. Expanding the investigation to low probability areas is unlikely to uncover additional UXO single items.

1.3.3.2 Buried Polymerized Mustard Agent. With the exception of POI 24, no other locations favor the formation of polymerized mustard. Therefore, no additional investigation for buried polymerized mustard agent is warranted.

1.3.3.3 POI 24. Based upon the additional photo interpretation and the potential for polymerized mustard to exist at POI 24, the Army recommends further investigation of POI 24. This includes additional geophysical investigation and soil sampling to determine if polymerized mustard exists at POI 24.

1.3.4 Recommendations

1.3.4.1 Perform additional investigation of POI 24 to include additional geophysical surveying and soil sampling. Develop and implement a public involvement and response plan to address the issues at POI 24.

1.3.4.2 With the possible exception of POI 24 where there is photographic evidence mustard agent may have been disposed in a pit, the possibility of public contact with single UXO items or buried polymerized mustard agent is extremely remote and will be associated with digging activities. To minimize the potential for injury in the event of a chance discovery of a single UXO item or buried polymerized mustard agent, the existing emergency response

procedures (911) should be reinforced and expanded by local authorities. The Army will prepare a fact sheet describing the UXO items (e.g., pictures of common AUES rounds) and the characteristics of buried polymerized mustard agent (e.g., would be found in conjunction with ceramic or glass fragments, has a garlic odor) and notification procedures. The fact sheet should be provided by the D.C. government to:

1.3.4.2.1 Spring Valley OSR FUDS area residents and contractors whenever a digging permit is issued.

1.3.4.2.2 Emergency response personnel.

1.3.4.2.3 All new Spring Valley OSR FUDS area residents at time of title transfer.

1.3.4.2.4 All Spring Valley OSR FUDS area residents through an annual mailing

1.3.4.2.5 Other citizens as determined appropriate by the DC Government.

1.4 CONCLUSIONS

1.4.1 The OSR FUDS investigation was properly conducted in accordance with CERCLA and DERP. It focused on those areas with the highest probability for imminent hazards or environmental contamination. The investigation found no imminent health or safety hazards or environmental contamination associated with AUES ordnance testing or CWM or CWM unique breakdown products. The Remedial Investigation Report, Site Closure Plan, and Record of Decision were reviewed and approved by the public and appropriate government agencies. The Record of Decision was signed June 2, 1995.

1.4.2 POI 24 was incorrectly located during the RI. As a result of the current RI evaluation, aerial and supporting photographs were reviewed by the TEC. Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This photographic review also concluded this location is a possible mustard agent burial pit (see 1.3.1.3). Although this does not present an imminent hazard to the public, the Army recommends additional investigation to confirm and mitigate any potential future hazard. All the other POI locations were reviewed and determined to be accurately located in the OSR FUDS RI Report and appropriately investigated.

1.4.3 There is a possibility that UXO single items or buried polymerized mustard agent remain on the site; however, there is no risk to the public if these remain undisturbed. The

possibility of public contact with single UXO items or buried polymerized mustard agent is extremely remote and will be associated with digging activities. Additional investigation to locate any potentially remaining UXO single items or buried polymerized mustard agent, with the exception of POI 24, is not warranted. The risk to the public is remote and the investigation is not technically feasible.

1.4.4 To minimize the potential for injury in the event of a chance discovery of a single UXO item or buried polymerized mustard agent, the existing emergency response procedures should be reinforced and expanded. The Army will prepare a fact sheet describing the UXO items, the characteristics of buried polymerized mustard agent, and notification procedures. This information should be provided by the D.C. Government to residents and contractors whenever a digging permit is issued, to new Spring Valley area residents, annually to Spring Valley area residents, to emergency response personnel, and to other citizens as determined appropriate by the DC Government.

1.4.5 Consistent with its obligations under CERCLA and DERP, the Army remains responsible for any additional response actions necessary in relation to buried munitions and environmental contamination associated with prior Department of Defense (DoD) activities at the OSR FUDS.

References:

DCRA, 1996. *Final Report on World War I Poison Gas Production at the American University Experiment Station.* Government of the District of Columbia Department of Consumer and Regulatory Affairs Environmental Regulation Administration, Hazardous Waste Branch.

DCRA, 1997. *Letter dated 30 January 1997 from Mr. Hampton Cross (DCRA) to Mr. Thomas Voltaggio (USEPA Region III).*

USEPA, 1989a. *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation (Part A).* Washington, DC: Office of Emergency and Remedial Response. EPA/540/1-89/002.

Section 2

SECTION 2

INTRODUCTION

2.1 REPORT DESCRIPTION AND OBJECTIVES

2.1.1 DCRA issued the DCRA Report (DCRA, 1996) that concluded the RI and remedial action performed by USACE at the OSR FUDS was not adequately completed and that substantial additional action is required to protect the health and safety of the residents of the Spring Valley area. In addition, DCRA's 30 January 1997 letter (DCRA, 1997) that transmitted the DCRA Report to USEPA addressed additional items of concern at the OSR FUDS.

2.1.2 This Comprehensive Report provides the USACE response to the DCRA Report (DCRA, 1996) and Letter (DCRA, 1997) and objectively evaluates and responds to the issues raised in these documents. Wherever possible, citations to documents previously prepared for Operation Safe Removal are provided in support of the responses to DCRA's items of concern.

2.2 DESCRIPTION OF DCRA ISSUES

2.2.1 The DCRA Report and Letter were reviewed and a matrix of issues was developed by listing each statement made in the DCRA Report (DCRA, 1996) and Letter (DCRA, 1997) regarding the efficacy of the OSR FUDS investigation and remediation program and identifying the issue associated with the statement. Over 50 separate statements/issues were identified in the DCRA Report (DCRA, 1996) and Letter (DCRA, 1997). The issues were then evaluated and grouped into nine major topical areas, with each major topic area assigned a section number in this report, as follows:

3 Regulatory Framework for the OSR FUDS Investigation and Remediation;

4 Historical Framework for the OSR FUDS Investigation and Remediation;

5 Investigation Foundation;

6 Point of Interest Identification and Selection Process;

7 Unexploded Ordnance Investigation/Removal Program;

8 Environmental Sampling Program;

9 Risk Assessment Process;

10 Other Reports; and

11 Agencies and Responsibilities.

Each DCRA issue was assigned to one of these identified topics. Similar issues within these broad topic headings were then grouped to minimize redundancies.

2.3 OBJECTIVE OF THE OSR FUDS RI

2.3.1 The objective of the OSR FUDS investigation was to determine if potential hazards exist in the OSR FUDS area as a result of past DoD activities during World War I. The OSR FUDS investigation area encompasses the location of two facilities occupied by the DoD during the World War I period: the former AUES and Camp Leach. AUES was established in 1918 as a "chemical warfare research center" (USACE, 1994a). The neighboring Camp Leach, previously named Camp American University, was also established in 1918 to train the 6th Engineer Regiment (USACE, 1995b).

2.3.2 The OSR FUDS RI focused on two potential hazards associated with DoD activities at the site: 1) the potential presence of buried UXO, and 2) potential surficial soil contamination by CWM, CWM unique breakdown products, or laboratory, or laboratory contaminants associated with AUES CWM research and development. This was accomplished by identifying and investigating POIs, which are OSR FUDS locations identified in the historical record as the areas most likely to be impacted by AUES or Camp Leach activities.

2.3.3 The UXO investigation focused on the detection of pits and trenches potentially containing caches of UXO. Geophysical surveys were performed at POIs identified in the historic record as pits or trenches. In addition to these POI surveys, a "spot check" of approximately ten percent of the properties not located within the boundaries of a POI were also geophysically surveyed for UXO caches to confirm the hypothesis that potential UXO burial at the OSR FUDS was limited to POIs (USACE, 1995a).

2.3.4 The investigation of potential surficial soil contamination focused on those POIs identified in the historical record as having potentially been used for, or impacted by, static test firing of CWM munitions (remote detonation of a stationary munition), application of CWM to

the ground surface for persistency testing, and documented accidental releases of hazardous laboratory compounds. A statistically-based sampling strategy was utilized to select sampling locations at each POI, and in the case of naturally-occurring compounds, the generated data were statistically compared to background concentrations.

In addition, soil samples were taken from sidescan boreholes (boreholes adjacent to suspect UXO items used for sidescan magnetometer access to investigate the anomalies) and in the areas surrounding UXO removals.

2.4 REPORT ORGANIZATION

2.4.1 This report includes sections for each of the nine major topical areas identified in the DCRA Report and Letter described above, this introduction, a conclusions section, and a references section. Each section that addresses identified DCRA issues includes the following:

- **DCRA Comments/Issues:** direct quotation of comments of a similar theme from the DCRA Report and Letter are listed in tabular format at the top of each page, and include page, paragraph, and line number references for the statement/issue in the DCRA Report;
- **Salient Issues** - this portion provides the USACE interpretation of the critical issue(s) raised by the statement(s) quoted in the table;
- **Response** - this portion provides the USACE response to the salient issues raised by the quotes from the DCRA Report and Letter listed at the top of the page; and
- **Reference** - this portion provides document references cited in the response.

In addition to the twelve sections in the main body of the report, this report also includes the following appendices.

- **Appendix A** - is a cross reference that lists the DCRA comments in the order presented in the DCRA Report and Letter and the corresponding location(s) in this report of the USACE response;
- **Appendix B** - is a signed copy of the Record of Decision and approval for OU-2;
- **Appendix C** - is a cross reference of zones, POIs and key locations mentioned in the text (i.e., initial find, 4801 Glenbrook, AU President's house); and

- **Appendix D -** is a copy of the notice submitted to the OSR FUDS residents at the completion of the project and a USACE flow chart outlining the notification procedures within the D. C. Government.

Figure 2.1 shows all POIs and locations mentioned in this report.

References:

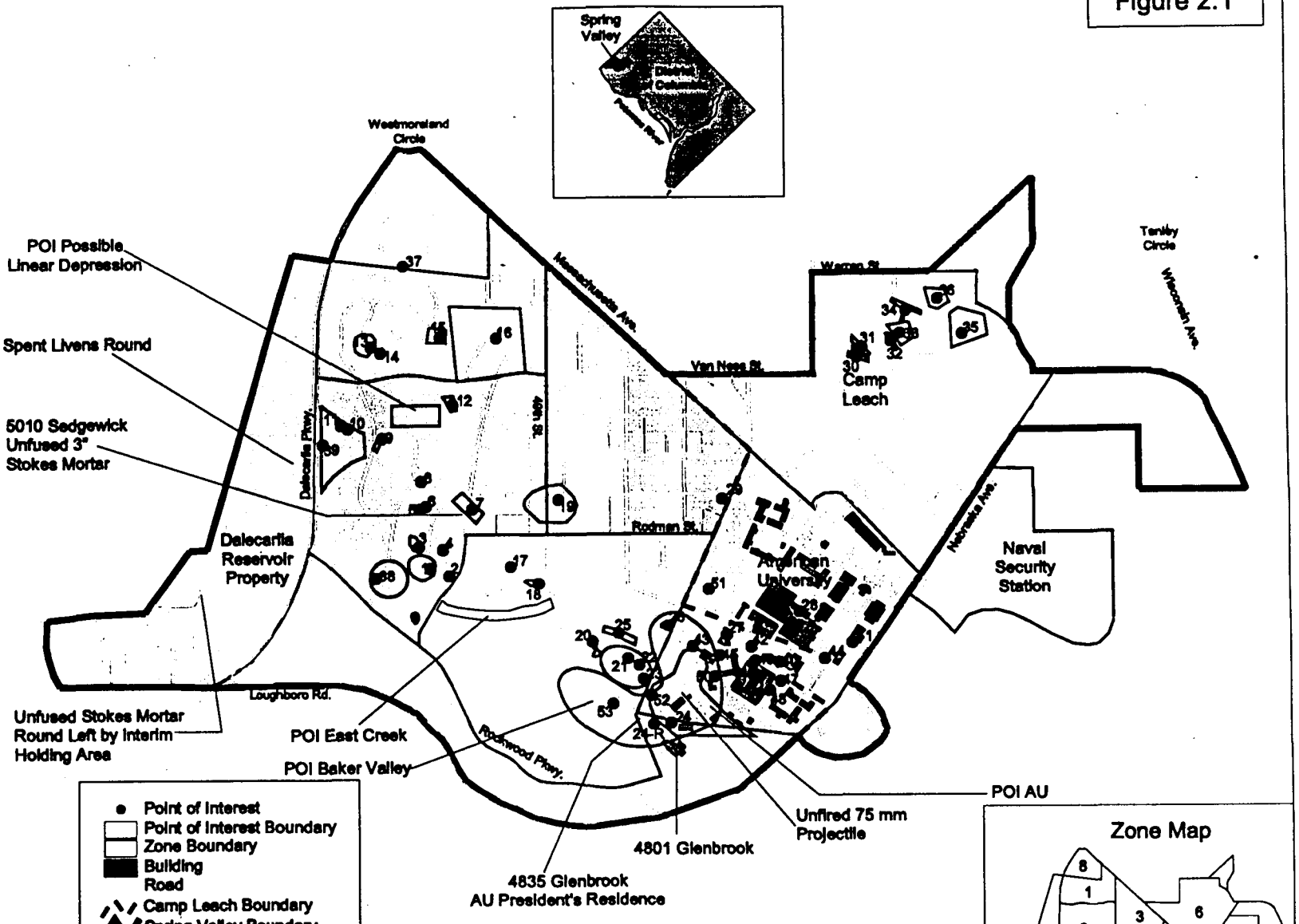
DCRA, 1996. *Final Report on World War I Poison Gas Production at the American University Experiment Station.* Government of the District of Columbia Department of Consumer and Regulatory Affairs Environmental Regulation Administration, Hazardous Waste Branch.

DCRA, 1997. *Letter dated 30 January 1997 from Mr. Hampton Cross (DCRA) to Mr. Thomas Voltaggio (USEPA Region III).*

USACE, 1994a. *A Brief History of the American University Experiment Station and US. Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE.

USACE, 1995a. *Zone 2 Report, Operation Safe Removal Project, Washington DC* February 1995. Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

Figure 2.1



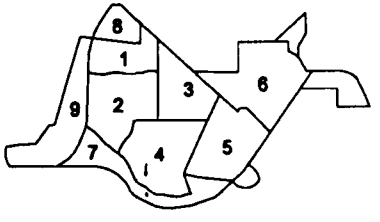
Numbered Points of Interest

1. Circular Trenches
2. Possible Pit
3. Small Crater Scars
4. Possible Pit
5. Possible Pit
6. Possible Target or Test Site
7. Possible Test Area
8. Possible Target or Test Site
9. Possible Firing or Observation Stalls
10. Possible Target or Test Site
11. Scattered Ground Scars
12. Possible Graded Area
13. Circular Trenches
14. Pit
15. Ground Scar
16. Chemical Persistency Test Area
17. Possible Pit
18. Small Crater Scars
19. Old Mustard Field
20. Ground Scar
21. Shell Pit
22. Shell Pit
23. Shell Pit
24. Probable Pit
24-R. Probable Pit, Revised Location
25. Possible Trenches
26. Small Crater Scars
27. Probable Trench or Ditch
28. Probable Trench or Ditch
29. Ground Scar
30. Training Trenches
31. Training Trenches
32. Training Trenches
33. Training Trenches
34. Training Trenches
35. Training Trenches
36. Training Trenches
37. Mill Creek
38. Bradley Field (Major Tolman's Field)
39. Static Test Fire Area
40. Ohio Hall
41. History Building
42. Physiological Laboratory
43. Gun Pit
44. Chemical Research Laboratory
45. Explosives Laboratory
46. Canister Laboratory
47. Bacteriological Laboratory
48. Dispersole Laboratory
49. Pharmacological Laboratory
50. Gun Pit
51. Fire and Flame Laboratory
52. Electrolytic Laboratory
53. Baker Valley

Named Points of Interest

American University
Possible Linear Depression
East Creek

Zone Map



This map was prepared for use of the U.S. Army Corps of Engineers for illustrative purposes only. This map was created using data prepared from various sources. It does not represent a survey of the site. The scale, accuracy, and completeness of the data is not guaranteed. No liability is assumed as to the sufficiency or accuracy of the data collected hereon.

SOURCE: USDA 1976

PARSONS ENGINEERING SCIENCE, INC.

Approximate Scale
0 400 800
Feet

POINT OF INTEREST
OSR FUDS

OPERATION SAFE REMOVAL

JOB NUMBER: 731771
DOCUMENT NO.:
DAS SHEET:

US Army Corps of Engineers

Section 3

SECTION 3

REGULATORY FRAMEWORK

3.1 RANGE RULE APPLICABILITY

No.	Location in Document			Statement in Document
	pp	¶	Lines	
1	1	2	1-6	".... this urgency did not permit the orderly and usual sequence of operations for remediation of formerly used military sites. The Draft Proposed Military Range Rule (hereinafter, Range Rule), 32 CFR 339 4/15/96 stresses the need to examine the entire range after a range assessment/accelerated response (RA/AR) is completed."
51	17	3	8-12	"Our view on the need for a complete site investigation with a study of environmental contamination, health impacts, and a search of the entire area for individual UXO and buried stockpiles is also confirmed by the proposed Range Rule."
57	2	3	1-2	Letter to USEPA from DCRA "Many of the recommended procedures in the DoD's Proposed Range Rule, 32 CFR 178, including a Site Specific Response Evaluation, were not completed.
59	2	4	1-5	Letter to USEPA from DCRA Finally, new technology, such as microgravity analysis, soil gas surveys with color contour maps, and Pulsed Fast Neutron (PINS) Analysis are now available. The Proposed Range Rule allows for reopening of a range when new technology would be helpful in clearance activities. Also, a deep seeking magnetometer with a data recording system and global positioning system (GPS), designed specifically for locating deep burial areas, could be used."

Salient Issue:

Determine the applicability of the Draft Proposed Military Range Rule to the OSR FUDS.

Response:

3.1.1 The OSR FUDS investigation was properly conducted under the applicable laws in effect during the investigation - the Defense Environmental Restoration Program (DERP), 10 U.S.C. Sec. 2701-2707 and Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq. The Draft Military Range Rule (MRR), recently published in the Federal Register for public comment, was initially proposed April 15, 1996, while the OSR FUDS RI was being finalized. Until the MRR is promulgated and becomes an enforceable regulation, it is inappropriate to apply the MRR to the OSR FUDS investigation, or other current projects, since it is subject to potentially significant revision prior to finalization. However, the Army is confident the OSR FUDS RI was conducted within the intent of the MRR as it is currently proposed.

Reference:

Department of Defense, 1997. *Draft Proposed Military Range Rule.* Department of Defense. 32 CFR 178.

3.2 REGULATORY FRAMEWORK

No.	Location in Document			Statement in Document
	pp	¶	Lines	
1	1	2	1-6	".... this urgency did not permit the orderly and usual sequence of operations for remediation of formerly used military sites. The Draft Proposed Military Range Rule (hereinafter, Range Rule), 32 CFR 339 4/15/96 stresses the need to examine the entire range after a range assessment/accelerated response (RA/AR) is completed."
58	2	3	2-3	Letter to USEPA from DCRA "Neither a CERCLA Preliminary Assessment nor a RCRA Facility Assessment was completed"

Salient Issue:

1) Determine if there was an orderly and usual sequence to the operations associated with investigation of the OSR FUDS. 2) Determine if a CERCLA Preliminary Assessment or Resource Conservation and Recovery Act Facility Assessment (RCRA) is applicable to the OSR FUDS investigations.

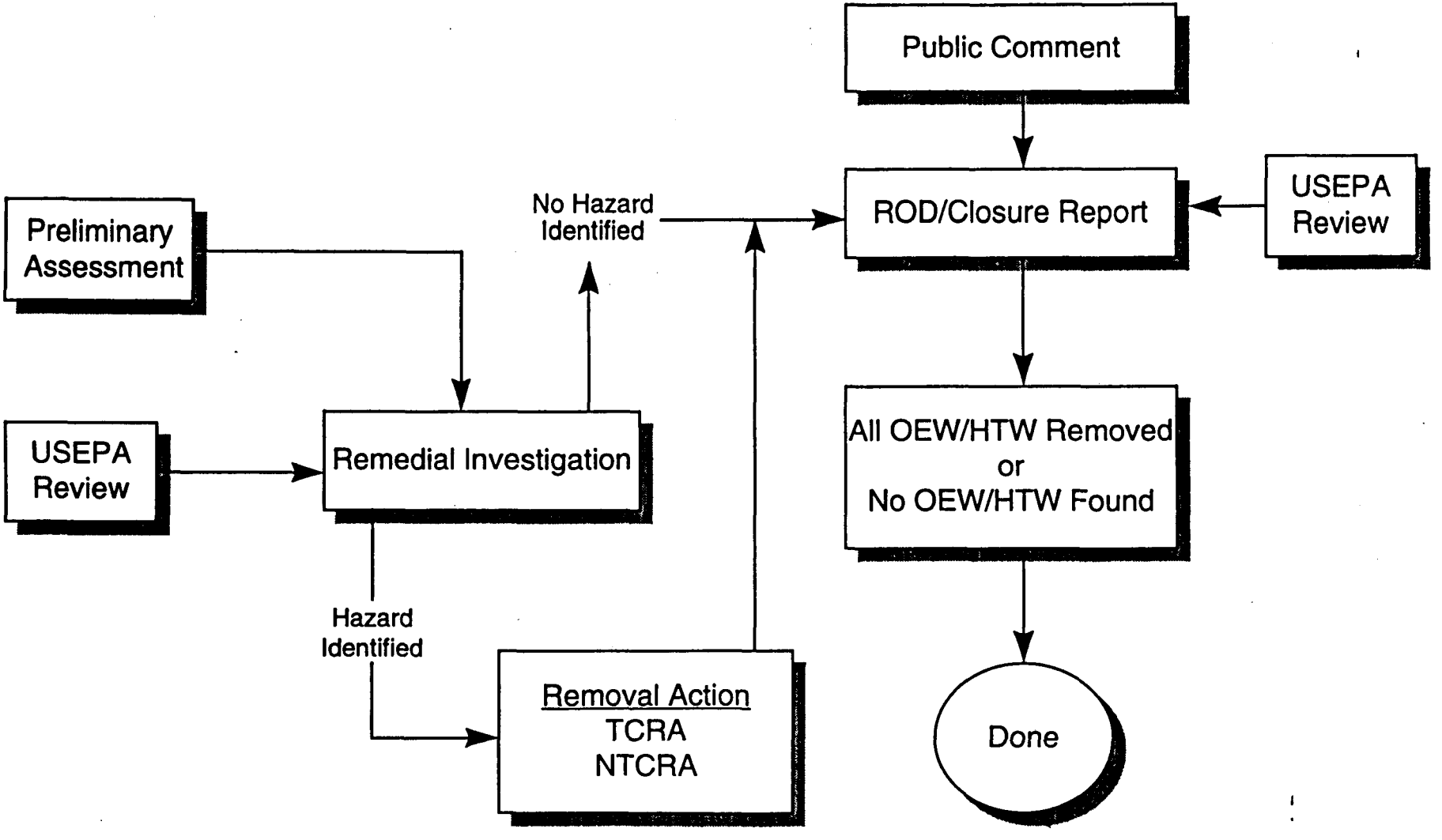
Response:

3.2.1 The investigation of the OSR FUDS Site was conducted in accordance with DERP, 10 U.S.C. Sec. 2701-2707 and Section 104 of CERCLA, 42 U.S.C. 9601 et seq. A RCRA Facility Assessment was not applicable to the OSR FUDS investigation because RCRA applies to current hazardous waste facilities. The OSR FUDS is not a current hazardous waste facility.

3.2.2 The RI process followed during the OSR FUDS investigation was properly conducted within the usual sequence of events outlined by the CERCLA process described in USEPA OSWER Directive 9355.3-01 (USEPA, 1988a) as shown in Figure 3.1

3.2.3 After the discovery and removal of the UXO at 52nd Court, the Army performed a thorough investigation for contamination in accordance with the CERCLA process. The investigative process at the OSR FUDS followed the standard CERCLA sequence of preliminary assessment, (expanded) site inspection/remedial investigation, and record of decision. A feasibility study was not performed because no hazard was identified.

FIGURE 3.1
CERCLA PROCESS
OSR FUDS RI



3.2.4 A preliminary assessment (PA) was performed, which included: 1) a review of the historical record; 2) the photointerpretation of 1918 and 1927 aerial photographs relative to current aerial photographs; 3) the collection of existing site data; 4) the identification of investigation area boundaries; and 5) a review of potential remedial action objectives. The PA also included the generation of the Inventory Project Report (INPR) with 2 addendums (See Section 3.3). A summary of the information generated during the historical review is presented in *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University* (The Historical Summary) (USACE, 1994a). The historical record report summarized the past uses of the OSR FUDS, reviewed existing information on the site, preliminarily identified site hazards, and identified the need for remedial action. The historical documents that were reviewed are located in the national archives. The technical reports used during the PA are located in the Fisher Library, Ft. McClellan, Alabama, and in the Chemical and Biological Defense Agency historian's office at the Edgewood Arsenal, Maryland. The five tasks mentioned above, the INPR with 2 addendums, and the report *The Historical Summary* (USACE, 1994a) are the PA, as outlined by the CERCLA process for a preliminary assessment.

3.2.5 Based upon the PA, an Expanded Site Inspection (ESI) was begun. The purpose of an ESI, as explained by OSWER Directive 9345.1-02 (USEPA, 1988b), is to generate comprehensive data on the existence, sources and extent of environmental contamination at a site, and to provide the foundation for the remedial investigation focus. The ESI included development of:

- Data Quality Objectives (DQOs) (USACE, 1994b);
- Health and Safety Plan (USACE, 1994c). This was a thorough plan to meet the requirements of the USACE Safety, Health, and Emergency Response Plan (SHERP) due to the potential for UXO and CWM;
- Quality Assurance Project Plan (QAPjP) (USACE, 1994b). This was a thorough planning document to meet the DQOs and the requirements to use a laboratory approved by the Army to handle CWM. Since calibration of the analytical instruments for CWM requires access to CWM, the Army requires special security and health and safety procedures. Very few laboratories have this approval.
- Field Sampling Plans: Volumes I and II (FSP) (USACE, 1994d and 1994e). The FSP was developed to measure those CWM and breakdown products most likely associated with the activities of the specific POI. Refer to Section 8.4.1.2 for a discussion of the statistical sampling strategy.

During the ESI investigation over 260 soil, surface water and groundwater samples were collected at nineteen POIs throughout the OSR FUDS. Eleven time critical removal actions (TCRA) were performed to excavate 74 suspect anomalies.

3.2.6 The data collected during Operation Safe Removal supported a "No Further Action Determination." However, rather than declare "No Further Action Required," the Army continued through the CERCLA process. A major consideration was the desire for public participation in the process.

3.2.7 The results of the investigation were subjected to the more rigorous evaluation of a RI. This included all appropriate steps required by CERCLA. Specifically, USACE conducted the field investigation, determined the nature and extent of contamination, identified applicable or relevant and appropriate requirements (ARARs), and conducted a baseline risk assessment in accordance with Risk Assessment Guides for Superfund (USEPA, 1989a). The results of the investigation are presented in Section 6 of the *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* (OSR FUDS RI Report) (USACE, 1995b). The OSR FUDS RI was reviewed by USEPA Region III.

3.2.8 A Feasibility Study, which usually accompanies a Remedial Investigation, was not conducted at OSR FUDS based upon the results of the risk assessment. The ESI\RI investigation did find a potential hazard in POIs 21 and 23 based on soil debris samples collected from inside the abandoned bunkers as well as the potential for UXO to be found in the bunkers. These POIs were initially identified as shell pits. However, they were actually concrete bunkers used for testing. They were further investigated separately as OU-2. POI 22, a similar bunker structure that is included in the structure of the existing residence (it is the utility room), was included in OU-2.

3.2.9 Following the Remedial Investigation, USACE followed the CERCLA process and selected a remedial action based upon the OSR FUDS investigation. The remedial action selected for OSR FUDS excluding OU-2 was "no further action." USACE prepared a Proposed Plan for the OSR FUDS which outlined the rationale for the selection of the remedial alternative and presented a summary of the information generated during the OSR FUDS investigation. The proposed plan was prepared in accordance with USEPA Guidance on Preparing Superfund Decision Documents (USEPA, 1989b). Following the Public Comment period, USACE moved to the final step in the CERCLA remediation process by finalizing the Record of Decision (ROD) for OSR FUDS, excluding OU-2, documenting the no further action decision. The ROD is dated June 2, 1995 and is included as Appendix B.

3.2.10 Based on the potential hazard at OU-2 (POIs 21, 22 and 23), an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time critical removal action (NTCRA) was performed. The removal action took place between October 11, 1994 and January 19, 1995. No CWM, CWM unique breakdown products, or UXO items were found within POIs 21, 22, or 23. The results of the EE/CA and NTCRA are summarized in Section 5.3 of the OSR FUDS RI Report (USACE, 1995b). Following the EE/CA and NTCRA, a RI was performed on OU-2. Following the RI, USACE followed the CERCLA process and selected a remedial action based upon the OU-2 investigation. The remedial action selected for OU-2 was "no further action." USACE prepared a Proposed Plan for the OU-2 which outlined the rationale for the selection of the remedial alternative and presented a summary of the information generated during the OU-2 investigation. The public comment period is complete and the USEPA Region III has approved the draft site closure plan and draft record of decision. Final site close out is pending the resolution of the current DCRA issues.

3.2.11 An orderly and usual sequence of events was performed during the OSR FUDS. All applicable regulations were followed and the steps taken to perform this investigation were reviewed and approved by the USEPA.

Reference:

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE. June 1994a.

USACE, 1994b. *Quality Assurance Project Plan, Spring Valley Operation Safe Removal Project, Washington, D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USACE, 1994c. *Health and Safety Plan, Spring Valley Operation Safe Removal Project, Washington, D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USACE, 1994d. *Field Sampling Plan for Remedial Investigation, Spring Valley Operation Safe Removal Project, Washington, D.C. Volume I: General Protocols.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USACE, 1994e. *Field Sampling Plan for Remedial Investigation, Spring Valley Operation Safe Removal Project, Washington, DC Volume II: Site-Specific Plans.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USEPA, 1988a. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* OSWER Directive 9355.3-01.

USEPA, 1988b. *Expanded Site Inspection Transitional Guidance.* OSWER Directive 9345.1-02.

USEPA, 1989a. *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation (Part A).* Washington, DC: Office of Emergency and Remedial Response. EPA/540/1-89/002.

USEPA, 1989b. *Guidance on Preparing Superfund Decision Documents: The Proposed Plan, The Record of Decision, Explanation of Significant Differences, The Record of Decision Amendment, Interim Final* (EPA 540-G-89-007).

3.3 TIMING OF OSR FUDS INVESTIGATION

No.	Location in Document			Statement in Document
	pp	¶	Lines	
4	1	3	8-14	"Although the American University site was identified by the Federal government in 1985, stakeholders were not informed until the buried munitions story emerged in the press in 1993. Indeed, it was not until 1994 that the Department of Defense recognized the need to refine its community involvement policy."

Salient Issue:

Determine when the AUES was identified as a Formerly Used Defense Site (FUDS) with potential for environmental issues.

Response:

3.3.1 Although the current OSR FUDS was established in January 1993, research into American University (AU) past roles was conducted prior to this date. In early 1986, a reporter began investigating the use of radium 226 and radium 228 at AU in the early part of the 20th century. In response, AU hired contractors to evaluate potential contamination resulting from AU research activities. This research resulted in the discovery of historical references to the AU's contributions to the war effort during World War I. After conducting limited research, AU contacted US Army Toxic and Hazardous Materials Agency (USATHAMA) (now known as the Army Environmental Center [AEC]) and reported their findings.

3.3.2 In July 1986, USATHAMA requested the USEPA's Environmental Photographic Interpretation Center (EPIC) perform an analysis of aerial imagery dating back to 1918. In this EPIC report two potential burial locations were identified (US Army, 1993). On October 6, 1986, USATHAMA requested that Dr. James Williams, the historian at the US Army Chemical School, review historical documents stored at the Military History Institutes at Carlisle Barracks, Pennsylvania. After completing his review of records, Dr. Williams concluded:

a) "The source that says munitions were buried is historically suspect;

b) There is no evidence of any such burial. Official correspondence from the period strongly suggests that all munitions were removed to Edgewood Arsenal;

c) If any materials were buried, they would probably have been small quantities of laboratory or experimental materials; and

d) We could not disprove the possibility that some materials remain buried on or near Camp American University (sic)."

The conclusion of the USATHAMA investigations was there was no evidence to support the notion of large scale burial of munitions. The USATHAMA investigations identified two sites that would be potential burial locations if large scale burial operations had taken place (identified as the trenches POIs 01 and 13) (See Section 6.3.2). However, there was no documentation to support the notion of large scale burial (USACE, 1994a).

3.3.3 In the fourth quarter of the fiscal year 1992, the USACE Huntsville Division tasked the USACE St. Louis District to prepare a list of former CWM sites nationwide for possible inclusion into the FUDS program. The actual search for former CWM sites did not begin until October 1992 (3 months prior to the initial find) when funding became available. The St. Louis District found the first mention of AUES in a 1959 series of books, in a volume entitled *Technical Services, Chemical Warfare Service: From Laboratory to Field* (US Army, 1959) on pages 5, 6, and 7. Based on this reference, the St. Louis District listed the AUES as a research facility on their list of former CWM sites. On January 5, 1993, Phase I of operation Safe Removal began. The site was formally listed as both AUES and Camp Leach on January 13, 1993.

3.3.4 For a site to be listed as a FUDS, the Department of the Army prepares a Findings and Determination of Eligibility (FDE). The FDE entails archival research of records to determine if the site was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or military components that predate DOD. Once a determination is made that the site is eligible as a FUDS, the Department of the Army then determines if there are any hazards generated by DOD remaining at the site that are eligible for project approval. The analysis of DOD generated hazards and any project eligibility determinations are included along with the FDE in the Inventory Project Report (INPR). The INPR therefore establishes site eligibility and identifies potential hazards that may be present at the site as a result of past DOD activities (USACE, 1995b).

3.3.5 On January 21, 1993, the initial INPR was approved, thereby establishing the OSR FUDS. The FDE determined 509 acres were eligible as part of the OSR FUDS. The FDE and INPR concluded CWM hazards could potentially be present at the OSR FUDS. Consequently, the Army determined it was necessary to conduct additional investigations to determine if Ordnance and Explosive Waste (OEW) or CWM remained at the OSR FUDS and posed

potential adverse health risks. This occurred during Phase II of Operation Safe Removal (USACE, 1995b). On October 10, 1993, an INPR addendum was completed expanding the OSR FUDS by 107 acres. On January 4, 1995, a second INPR addendum was completed expanding the site by an additional 45 acres to a total of 661 acres. Although the additional 45 acres was not included in the RI, there is no archival evidence the area contained POIs associated with CWM research or testing.

Reference:

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE. (Page 4).

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc. (Section 1).

US Army, 1959. *Technical Services, Chemical Warfare Service: From Laboratory to Field.* Office of Chief of Military History, US Army.

US Army, 1993. *American University, Summary of USATHAMA Investigations Conducted In 1986*, 25 January 1993.

Section 4

SECTION 4

HISTORICAL FRAMEWORK

4.1 SCALE AND NATURE OF OPERATIONS

4.1.1 Quantities Generated

No.	Location in Document			Statement in Document
	pp	¶	Lines	
5	2	1	2-4	"In addition to the large variety of substances, large quantities [of dangerous substances] also existed."
19	4	1	1-5	"In our opinion, the immense quantity of gas there, the lack of information indicating that any CWM were moved, the buried CWM already found, the numerous trenches providing convenient burial, compel the conclusion that more CWM still exist on the site."
20	4	3	3	"There is mounting evidence that the American University Site encompassed a massive production facility for poison gas in addition to its development and experimentation functions."
43	14	1	1-3	"Second, as we have seen above, the production of chemical warfare agents was very large. The operation had 1200 chemists and engineers, and 700 support personnel."

Salient Issue:

Determine if there is evidence that "large" or "immense" quantities of potential hazardous substances were stored at the AUES. Determine if historical record supports assertion that AUES was a "massive (CWM) production facility."

Response:

4.1.1.1 The mission of the AUES as a research facility is repeatedly confirmed in The Historical Summary (USACE, 1994a). The Historical Summary indicates that the AUES researchers developed methods and procedures for large scale manufacturing of chemical agent; it was not a "massive CWM production facility." For example, in 1918, the Secretary of War explained to the DC Board of Commissioners that "the work at the Experiment Station was confined to research problems and that larger experiments were being conducted at Lakehurst, New Jersey and other proving grounds." (USACE, 1994a). The Historical Summary also states the Bureau of Mines "aimed to establish a large-scale chemical warfare research center at American University with laboratories, test sites, and other facilities for studying the various chemical, physiological, and mechanical aspects of gas warfare. (USACE, 1994a). During this time, there were 12 research sections at AUES with the following mission: the investigation, development, testing, and manufacture of substances, materials, equipment, and weapons to

determine their suitability for use in offensive and defensive gas warfare." Once the AUES researchers developed a process, the responsibility for actual chemical agent production was turned over to Edgewood Arsenal (Bancroft, 1919 and Heller, 1984). These references from the Historical Summary (USACE, 1994a) confirm that: 1) the work conducted at AUES was for research and development; 2) any chemical production at AUES was conducted with the intent of on-site testing; and 3) large scale production of CWM was conducted at other installations.

4.1.1.2 The Historical Summary also explains the Research Division of the Gas Service, of which the Experiment Station was a central focus, had approximately "1,900 military and civilian personnel. Of these, 1,200 were scientists and engineers, while the remaining were stenographers, clerks, accountants....." (USACE, 1994a). "As many as 1,000 of these personnel, principally scientists and engineers, were stationed at the Experiment Station by the end of the war." (USACE, 1994a).

4.1.1.3 The Historical Summary indicates that chemical materials were manufactured at AUES to support the research mission of the facility (USACE, 1994a). The production records document the manufacturing of tens or hundreds of pounds of various chemical materials on a monthly basis. Whereas, large scale production facilities such as Edgewood Arsenal, manufactured hundreds of thousands to over a million pounds of chemical materials per month (Bancroft, 1919). The chemical agent at AUES would have been stored on site until it was consumed in field testing. Furthermore, the amount of explosive material kept at the AUES was reduced as a safety measure following an accidental release of chemical agent from the Experiment Station on August 3, 1918. The accident was a result "from an explosion of lab apparatus in the station's Manufacturing Shack No. 8..." (USACE, 1994a) Two individuals received medical treatment as a result, otherwise, there were no other "ill affects" from this release (USACE, 1994a) (See Section 6.3.1).

4.1.1.4 Historic documentation also confirms that materials used at AUES were moved from the site and shipped to Edgewood Arsenal at the closing of AUES. A February 10, 1919 memorandum from Ordnance Officer, Research Division, American University, Washington, DC references a shipping manifest of material from AUES to Edgewood Arsenal, Aberdeen, MD. This memo, which also references storing material at Curtis Bay Depot in Glen Burnie, Maryland states "We have considerable personal equipment at this station and it is requested that we be advised to whom we should address a letter giving a list of materials we desire to ship, and thus secure shipping orders." A memorandum dated March 1, 1919 presents the following

response from the Director of the CWS: "You are directed to ship the bombs, incendiary and smoke, and shell Mark II and II (sic) to Commanding Officer, Edgewood Arsenal for storage."

4.1.1.5 Based upon the above referenced documentation, we conclude:

a) AUES was a research facility to test CWM, CWM protective measures and develop production processes;

b) Actual large scale production was performed at other facilities (e.g., Edgewood Arsenal); and

c) Materials were shipped to Edgewood Arsenal as part of the AUES closure activities.

Reference:

Bancroft, Lt Col W.D, 1919. *Bancroft, History of the Chemical Warfare Service in the United States, May 31, 1919, Research Collections.* Office of History, Headquarters, US Army Corps of Engineers, Fort Belvoir, VA.

Heller, Charles E, 1984. *Chemical Warfare in World War I: The American Experience, 1917-1918,* Leavenworth Papers, 10. Combat Studies Institute. *p.4-5.*

Memorandum dated 10 February 1919. *Memorandum from Ordnance Officer, Research Division, American University, Washington, DC.* American University Experiment Station.

Memorandum dated 1 March 1919a. *Memorandum from Office of Director of Chemical Warfare Service to Chief, Research Division, Attention: Lt. Moulton.*

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE. Pgs. 12-20.

4.1.2 Lewisite -

No.	Location in Document			Statement in Document
	pp	¶	Lines	
23	7	3	4-6	"The process for making large quantities of Lewisite was perfected at American University."

Salient Issue:

It is implied that large quantities of Lewisite were produced at AUES. Determine if the historical record supports this assertion.

Response:

4.1.2.1 The historical archives search did not produce any reference to large quantity lewisite production at AUES. Researchers were experimenting with producing small quantities of lewisite at AUES during July 1918. The 3 August 1918, accidental release was during the pilot plant production of lewisite. After this accident, production research was relocated due to the secret nature of the work. In addition, the archives search recovered four laboratory reports that identified the use of lewisite (referred to as "Mustard I" and "L-1") at American University for laboratory testing only. The archives search did, however, confirm the process for making lewisite was researched at Catholic University in the Organic Research Lab #3 (USACE, 1995c).

Reference:

Laboratory Report Undated. *Undated Lab Report on Use of L-1 (Lewisite) and G-34 (Mustard) as toxic smokes.* American University Experiment Station.

AU Archives, copy of letter from Burton Logue to his sister dated Sept. 24, 1971.

Lauder Jones "Offense Research Section Report" no date, discusses experimental production of lewisite. (p.12)

John Paul Jones "The Role of Chemists in Research on War Gasses in the United States During World War I" Ph.D. dissertation (p. 149).

Laboratory reports dated 28 June 1918. *Penetration of Fabric by Mustard I.* American University Experiment Station.

Laboratory Report dated 15 July 1918. *Lab Report on Penetrating Power of L-1 - Mustard Oil.* American University Experiment Station.

USACE, 1995c. *Defense Environmental Restoration Program for Department of Defense Sites, Ordnance and Explosive Waste, Chemical Warfare Materials, Archives Search Report,*

Findings, Catholic University. Prepared for US Army Corps of Engineers, Huntsville Division. Prepared by US Army Corps of Engineers, St. Louis District. *Pg. 6-1.*

4.1.3 Shells and Munitions Testing

No.	Location in Document			Statement in Document
	pp	¶	Lines	
27	9	6	1-5	"Numerous documents detail tests of chemical shells at the American University site. Some shells were attached to the top of poles or placed in the ground and fired electrically. Others were fired from mortars, designed to detonate on impact."
28	10	1	1-4	"We found trench maps and test reports from American University indicating that many Livens projectiles as well as smaller 75-millimeter artillery shells were tested with poison gas (Appendices E, F, and G)."
31	10	2	2-7	"Tremendous amounts of gas could be stored in even small cylinders. Some of the shells experimented with at American University were also very large. For example, a 12-inch Naval chemical shell was developed. The 8-inch Livens projectile was another large shell, developed primarily to carry poison gas."
37	12	1	3-6	"There are two potential sources for gas exposure at American University: (1) individual unexploded ordnance resulting from the dispersion testing; and (2) gas shells and cylinders, intentionally buried, when the operation ended."
38	12	3	1-2	"There were many shells fired during the dispersion testing which must have left many isolated dud or UXO rounds."

Salient Issue:

Determine if the historical record supports the implied assertion that large artillery shells containing CWM could still be present at the OSR FUDS. Determine if the historical record supports the implied assertion that Livens projectiles and/or artillery shells containing CWM were launched during testing (as opposed to static fired).

Response:

4.1.3.1 The historical record supports the assertion that both static and ballistic tests of small shells, such as the Stokes and Liven's projectiles, were conducted at AUES [Chemical Testing in the Great War: American University, p.37 (Gordon et al. 1994)]. Some of the 75mm shell casings that were found in Zone 9 had static fire attachments however, there is no evidence of a 75mm howitzer battery (Gordon et al. 1994). Historical photographs show a Liven's Gun Pit built inside the AUES fenced perimeter, as well as a Stokes mortar battery. In the 1918 aerial photograph, impact craters are visible approximately 1,500-feet down range from the mortar battery (POI 18). These photographs and the historical report indicated that Stokes and Liven's projectiles were launched during testing activities. When these mortar shells were ballistically tested, the projectiles were filled with water to document how carrying liquid material affected their flight (Memorandum Dated 7 June 1993). There is no archival or photographic evidence indicating that shells containing CWM were ballistically fired (i.e., ballistically firing rounds while in chemical protective gear). Since AUES staff were conducting scientific field tests on the efficiency of chemical agents and chemical agent protective

equipment, ballistically firing a CWM shell would have added an additional and uncontrolled parameter to a test. For example, ballistic rounds could fall long or short of a target; thereby adding an element of uncertainty to field tests.

4.1.3.2 Statically firing CWM containing shells was more appropriate to support AUES's research initiatives. All of the field test documents in the archives indicate that shells containing CWM were statically fired (Laboratory Reports dated; 29 July 1918, 5 August 1918, 23 September 1918, and 21 November 1918). In addition, one historical photograph depicts two soldiers inside a test trench and shows the wiring used to statically fire rounds (Gordon et al., 1994 p. 28).

4.1.3.3 Additionally, the OSR investigation focused on all known potential UXO cache locations at the OSR FUDS. Artillery shell caches at OSR FUDS would have been detected during Phase II of OSR (see Sections 6 and 7).

Reference:

Gordon,. M. K., Sude, B. R., Overbeck, R. A., 1994. *Chemical Testing in the Great War: The American University Experiment Station.* Washington History, Magazine of The Historical Society of Washington DC, 6. (pages 28 and 37)

Laboratory Report dated 29 July 1918. *Report Pharmacological and Pyrotechnic Sections, subject: Firing of Livens Projectile Filled with Cyanogen Chloride in a Trench, Richter et al., July 29, 1918.* American University Experiment Station.

Laboratory Report dated 5 August 1918. *Report Pharmacological and Pyrotechnic Sections, subject: Firing of Livens Projectile Filled with Cyanogen Chloride in Front of a Double Line Trench, Richter et al., August 5, 1918.* American University Experiment Station.

Laboratory Report dated 23 September 1918. *Report B. M. XXX-61, Firing a Liven's Projectile Loaded with Cyanoge Chloride, Richter, et al., September 23, 1918.* American University Experiment Station.

Laboratory Report dated 21 November 1918. *Report B. M. XXX-15, Pyrotechnic Section, Gas Shell Unit, Mustard Gas Field Test, November 21, 1918.* American University Experiment Station.

Memorandum dated 7 June 1993. *Memorandum for Record (Baker, Mark): "Firing and Detonation of Chemical Munitions at American University Experiment Station. 7 June 1993.* USACE Baltimore District.

4.2 DISPOSAL PROCEDURES

No.	Location in Document			Statement in Document
	pp	¶	Lines	
19	4	1	1-5	"In our opinion, the immense quantity of gas there, the lack of information indicating that any CWM were moved, the buried CWM already found, the numerous trenches providing convenient burial, compel the conclusion that more CWM still exist on the site."
26	9	5	3-5	".... the second largest expenditure for a cylinder storage building, indicating a very large structure. This could have been an extensive burial site."
42	13	3	6-13	"There are five areas of research findings which bear on the issue of whether of not a potential for more buried CW munitions exists: (1) burial occurred at other sites; (2) gases and shells were produced in extremely large quantities; (3) the entire site was shut down quickly at wars end; (4) there were rumors of large scale burial operations; and (5) there is a lack of evidence that the leftover munitions were turned over to other departments or moved elsewhere."
45	15	1	1-10	"A letter dated November 8, 1918, in response to concerns raised by the Commissioners of the District of Columbia, stated, ... supports the concept that shells ordered earlier may not have been completely used up."
46	16	2	1-7	"The use of the word 'dispose' for supplies means burial to us. Whereas, 'salvage' for property means to sell or keep. Since there did not appear to be much interest in surplus poison gas after the war, a reason cited by chemical companies for declining the offer of production contracts, it does not seem that existing stockpiles could be sold, leaving only the alternative of disposal."
48	16	5	1-2	"Fifth, the munitions apparently could not and were not turned over to the Ordnance Department."
49	17	2	1-5	"Not only is there no evidence that the 'enormous quantities' of toxic substances and munitions known to have been there, were moved, but these two memoranda seem to indicate that the chemical and explosive munitions were not moved to the ordnance department facilities at Aberdeen."
53	1	4	1-7	Letter to USEPA from DCRA "....a large amount of chemical ordnance was manufactured at, or sent to, the site shortly before the site was rapidly decommissioned at the end of World War I. Documents suggest that leftover supplies were buried. However, the buried chemical ordnance recovered to date by the U.S. Army Corps of Engineers appears to be less than 5% of what we believed to be present at the end of the war. With the lack of any hard evidence that this material was disposed of properly, we are concerned that there are still large amounts of buried ordnance at the site."
44	14	3	1-3	"Thus twelve hundred shells may have been sent to American University, shortly before its closing. From test reports and the shells recovered, we are only able to account for 107 of these, leaving 1093 unaccounted for gas shells in just the 75 mm size (Appendix T). We were unable to locate any information on the number of Livens, Stokes or other gas shells sent to American University."
39	13	0	1-2	"In all probability, there are numerous isolated dud rounds which must be located and cleared"
40	13	3	1-6	"A very significant risk at the American University site is the likelihood that many chemical munitions and cylinders were buried when the project was abandoned at war's end."
41	13	3	1-6	"Because the remediation efforts at American University did not address all of the areas of concern reflected in the historical report, serious questions remain over the adequacy of the search for unexploded ordnance as well as the survey for residual contamination from the toxic substances used in the research."

Salient Issue:

Determine if historical record supports assertion that CWM was not moved from AUES during/after closure. Is the conclusion that more undetected CWM cylinders are buried at the OSR FUDS supported by the historical record? Determine if the historical record supports assertion there was a [large scale] burial site for cylinders. Determine if the historical record supports allegations of a) Burial at other sites; b) Quick shutdown resulted in burial of UXO/CWM; c) Large scale burial operations; d.) Leftover munitions at AUES closure were not transferred off-site and therefore, presumably disposed on-site. Determine if the historical record shows evidence that the unaccounted for shells were disposed of on-site. Do we agree that disposal means burial? Determine where the historical record states that munitions "could not and were not" removed from the AUES at closure? Were munitions moved off of AUES? Determine if large amounts of ordnance were buried upon the decommissioning of AUES.

Response:

4.2.0 The comments in this section focus on the following five issues: 1) large scale storage of cylinders at AUES; 2) burial of CWM cylinders at AUES; 3) removal of ordnance from AUES; 4) fate of CWM upon the decommissioning of AUES and Camp Leach; and 5) potential for unaccounted for shells to still exist at the OSR FUDS. The responses to these issues were generated by a review of historical evidence.

4.2.1 Large Scale Storage of Cylinders at AUES

4.2.1.1 There is an undated memorandum that identifies a request for $85,000 for the construction of "Storage houses for gas cylinders, inflammable chemicals, acids, general warehouse, refrigeration plant, pyrotechnic laboratory, and other miscellaneous construction not previously anticipated..." This document suggests a funding request for multiple large buildings; however, no large cylinder storage area was constructed.

4.2.2 Burial of CWM Cylinders at AUES

4.2.2.1 The UXO aspect of the OSR FUDS investigation was specifically focused on finding large quantities of metallic objects such as cylinders buried in pits or trenches identified as points of interest (POI). All pit or trench POIs were:

a) Eliminated as POIs due to extensive land disturbances post AUES closure (i.e., POIs 30,31 and 32 are currently under a reservoir).

b) Cut/fill - Areas with greater than 10 feet of cut or 12 feet of fill were eliminated (See Section 5.2.3).

c) Geophysically investigated. The only large metallic item identified and removed was the metal gate removed near Wesley Seminary.

4.2.2.2 Other than the initial find at 52 Court, associated with an identified POI (POI 14), no large caches of weapons were found. The Army is confident, no such caches remain in the OSR FUDS.

4.2.3 Removal of Ordnance from AUES

4.2.3.1 A series of memoranda exist which strongly suggest that the majority of shells and bombs were shipped to Edgewood Arsenal. A memorandum dated 10 February 1919 from AUES references "Shipping Orders" and has a list of 6,000+ items on hand. A 1 March 1919 memo from Office of Director Chemical Warfare Service (CWS) to Chief --Research Division states "You are directed to ship the bombs, incendiary and smoke, and shell Mark II and Mark II (sic) to Commanding Officer, Edgewood Arsenal, Edgewood Maryland, for storage." This accounts for several thousand rounds.

4.2.4 Decommissioning and Fate of Remaining CWM

4.2.4.1 The historical records search did not produce documentation to support the following assertions: 1) UXO/CWM were buried as a result of quick shutdown; and 2) large amounts of ordnance were buried upon the decommissioning of AUES. A 10 February 1919 memorandum requesting permission to "send from this station", indicates that ordnance was transferred to Edgewood for storage. As previously explained above, this memorandum requested the transfer of materials (bombs/artillery shells) totaling 6,300 items from AUES. A response dated February 12, 1919, indicates that the Ordnance Office took responsibility for disposition of most of the material. A memorandum dated 1 March 1919, from the Director of CWS instructs the Research Division to ship shells and bombs to Edgewood Arsenal for storage. Furthermore, no large scale burial, with the exception of the pit at 52nd Court (POI 14), was identified during OSR.

4.2.5 Mustard Agent Disposal by Burial

During this 1997 RI evaluation, further analysis of circa 1918 photos of AUES concluded 5 gallon (approximately) glass or ceramic containers which could have contained mustard agent may have been buried in a pit near the fenced perimeter of the AUES (see 8.8).

The photograph shows an AUES soldier in gas mask possibly preparing to dispose of ceramic or glass agent containers in a pit. The annotation on the back of the photograph identifies the agent as mustard. There are three potential scenarios if the mustard agent was buried:

1. Mustard containers were buried intact in the pit and the pit was backfilled;
2. Mustard agent was poured from the containers into the pit, chlorinated lime was added, and the pit was backfilled; or
3. Mustard containers were placed into the pit, the containers were then broken, chlorinated lime was added, and the pit was backfilled.

The second or third scenario is more likely. This was the decontamination/disposal procedure for leaking or rupture munitions (US Army, 1917, pg. 224).

There is minimal likelihood of personnel coming in contact with mustard agent disposed of through burial.

1. In the first scenario, the large number of mustard containers shown would have been detected in the pit during the geophysical investigation of the pits and trenches during the OSR FUDS investigation.
2. In the second and third scenarios, the mustard agent, which hydrolyzes in the presence of moisture, should degrade. Supporting this conclusion, no mustard or mustard breakdown products were detected in any of the samples collected during the OSR FUDS investigation. The sample locations included POIs where there is documented evidence of direct mustard application to soils. However, if the mustard agent pooled prior to hydrolyzing, it can polymerize to a consistency similar to asphalt and can exist for many tens of years (Southwest Research Institute 1994, p38). Buried mustard agent in this form only presents a potential hazard if it is disturbed. This would be primarily a contact, rather than vapor, hazard.

In the unlikely event buried ceramic or glass 5 gallon-size containers, or pieces potentially from broken containers (relatively thick) are uncovered, the appropriate agency should be contacted to investigate. The public should be informed on the possible existence of polymerized mustard agent associated with ceramic or glass fragments, and appropriate notification procedures.

4.2.6 Unaccounted Shells at AUES

4.2.6.1 The historical records search did not provide any evidence to support the assertion that a large amount of chemical ordnance was manufactured or sent to AUES shortly before the site's decommissioning. A June 4, 1918, memorandum discusses the shipment of 200 shells to American University. However, the subsequent memorandum dated March 1, 1919, from the Director of the Chemical Warfare Service directs the Research Division at AUES to ship shells and bombs to Edgewood Arsenal for storage. There is no documentary evidence to confirm that unaccounted shells were disposed of on-site.

4.2.6.2 AUES was strictly a research and development facility; whereas other sites, such as Edgewood Arsenal and Lakehurst, New Jersey, were used for larger scale experiments and production. As a research facility, the AUES staff was scientific in their tests and methodical in accounting for munitions (Laboratory reports dated; 16 September 1918, 19 October 1918; and December 1918). A 26 June 1918 report of "Standard Methods on Gas Shell Experimentation" recommended the standardization of methods to ensure consistency in test results. This report recommends procedures to document the use of munitions during testing, including rounds which failed to detonate in the test report. This information leads to the inference that AUES kept track of their tests and material in support of their mission as a research facility.

4.2.6.3 In conclusion, the above referenced documentation supports the following: 1) AUES was a chemical warfare research facility, not a large scale production facility; 2) upon its decommissioning, materials from AUES were moved to Edgewood Arsenal, and 3) AUES was a research and development facility; therefore, the staff implemented a scientific approach to testing and accounting for materials and 4) all POIs identified as potential burial sites were properly investigated and with the exception of POI 14, no large burial caches were found.

Reference:

Laboratory Report dated 26 June 1918. *Report on Standard Methods on Gas Shell Experimentation.* American University Experiment Station.

Laboratory Report dated 16 September 1918. *BM Report XXIV Pyrotechnic & Pharmacological Sections, Richter, et al., Mustard Gas Field Test, September 16, 1918, p. 4.* American University Experiment Station.

Laboratory Report dated 19 October 1918. *Report, Pyrotechnical Section, Richter, et al., Gas Shells - Firing a Liven's Projectile Loaded with Chloricrin, October 19, 1918, p. 3.* American University Experiment Station.

Laboratory Report dated December 1918. *BM Report XXXVI-28, "Use of War Gases in Liven's Projectors," Burrell, December 1918.* American University Experiment Station.

Memorandum dated 10 February 1919. *Memorandum from Ordnance Officer, Research Division, American University Experiment Station, Subject: Shipping Orders.* American University Experiment Station.

Memorandum undated. *Subject: ...Funds Required for Gas Investigations Work of the Bureau of Mines Experiment Station at American University..* American University Experiment Station.

Memorandum dated 12 February 1919. *Memorandum from Ordnance Office, Office of the Chief of Field Service.* American University Experiment Station.

Memorandum dated 1 March 1919. *Memorandum from Office of Director of Chemical Warfare Service to Chief, Research Division, Attention: Lt. Moulton.*

Southwest Research Institute, 1994. *Environmental Chemistry and Fate of Chemical Warfare Agents Prepared by Southwest Research Institute.* Prepared for USACE Huntsville Division.

US Army, 1917. *Field Service Pocket Book.* p. 234. Washington Government Printing Office.

Section 5

SECTION 5

INVESTIGATION FOUNDATION

5.1 ENVIRONMENTAL SAMPLING FOUNDATION

No.	Location in Document			Statement in Document
	pp	¶	Lines	
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sampled for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."

Salient Issue:

Should the entire site be sampled, or just the POIs?

Response:

5.1.1 The historical research of the OSR FUDS was limited to DoD activities at AU and the surrounding area as a Formerly Used Defense Site. No research was conducted to identify environmental problems not associated with the military activities (USACE, 1994a). It is the Army's conclusion that the remedial investigation addressed all potential UXO burial cache locations and areas of potential surficial soil contamination.

5.1.2 Rather than perform random grid sampling of the entire OSR FUDS, the remedial investigation focused on those POIs identified through historical research and evaluation of aerial photographs as most likely to be contaminated with ordnance and explosive waste (OEW), CWM, or CWM unique breakdown products, or laboratory contaminants associated with AUES CWM research and development. Section 5 and 7 OSR FUDS RI Report (USACE, 1995b) provide a summary of the investigation rationale. The overall strategy was to first look for environmental contamination in areas where it was most likely to be, and then, if found, expand the sampling program to fully characterize any contamination detected in the initial sampling. The Historical Summary (USACE, 1994a) addressed three potential types of contamination sites: permanent structures abandoned at the close of the mission, temporary building facilities destroyed or removed, and field test areas. The Historical Summary also discussed field testing of CWM and listed the locations of known areas where CWM was tested. These areas were investigated during the RI. The report also discussed potential contamination on the AUES campus; soil was tested there as well (USACE 1994a).

5.1.3 In addition to the archives search and development of the list of POI, an extensive cut and fill analysis of the AUES and Camp Leach area was conducted (See Section 5.2). In general, in those areas where it was determined that there was more than 10-feet of cut since the WWI time-frame the area was deleted from any further study. The rationale for this exclusions was that any potential surficial contamination no longer existed because the source material had been removed.

5.1.4 The POIs associated with CWM and CWM unique breakdown products, or laboratory contaminants associated with AUES CWM research and development activities were gridded and randomly sampled at the 1918 soil level [Section 1.5.2 and 1.5.3 OSR FUDS RI Report (USACE, 1995b)]. These results were then compared to background levels (for naturally occurring analytes only). Refer to Section 8 of this document for a detailed description of the rationale/procedure used for soil sample location selection. If ordnance/environmental contamination was not found in the areas most likely to be contaminated, then it was considered highly unlikely that other areas of the OSR FUDS would be affected; therefore, these other areas were not sampled.

5.1.5 The environmental sampling focused on surficial soil contamination at POIs where chemical agent activity was documented (i.e., static firing, persistence testing). These are the areas where the greatest potential contamination occurred and, therefore, the most likely areas to have residual contamination. The sampling plans were reviewed by the US Army Corps of Engineers, Parsons ES and the USEPA Region III. All potential areas of surficial soil contamination identified in the Historical Summary were tested during the RI phase.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

5.2 UXO INVESTIGATION FOUNDATION

No.	Location in Document			Statement in Document
	pp	¶	Lines	
16	3	5	1-4	".... the threat posed at the American University site requires that every part of the 600 acre site be surveyed with magnetometers and ground penetrating radar to a depth of 10-feet, with all anomalies intrusively investigated and cleared."
8	2	3	1-7	".... the final 1995 report on the American University site indicates that only 53 points of interest there were scanned with metal detectors in an effort to locate other buried munitions. During this limited scanning 2,000 anomalies were found ... Of these anomalies, approximately 87 were excavated."
10	2	4	1-7	".... since live chemical weapon munitions (CWM), as well as high explosive shells, were found buried at the American University site, and many toxic substances were released into the environment, we felt that a substantial research project was necessary in order to determine the potential for residual contamination and munitions on the site."
19	4	1	1-5	"In our opinion, the immense quantity of gas there, the lack of information indicating that any CWM were moved, the buried CWM already found, the numerous trenches providing convenient burial, compel the conclusion that more CWM still exist on the site."
34	11	1	1-6	"This raises the level of potential devastation where old explosive shells are buried together with chemical shells, as was the case at American University, because a hypersensitive explosive filler could detonate rupturing many adjacent corroded chemical munitions, greatly increasing the amount of agent released."
41	13	3	1-6	"Because the remediation efforts at American University did not address all of the areas of concern reflected in the historical report, serious questions remain over the adequacy of the search for unexploded ordnance as well as the survey for residual contamination from the toxic substances used in the research."

Salient Issue:

Determine if the remedial investigation addressed all potential UXO problems identified in the historic records search. Determine if the entire 600 acre AUES site should be geophysically investigated. Explain why 56 points of interest were surveyed instead of the entire OSR FUDS.

Response:

5.2.1 The Army conducted an extensive geophysical survey of the OSR FUDS after the discovery of the initial cache of munitions in January 1993. Because of the large size of OSR FUDS (661 acres) and the extensive nature of the improvements that had occurred in the area since the AUES and Camp Leach were disbanded in 1919, it was determined that the most productive way to proceed with a geophysical investigation of the area was to concentrate on those areas most likely to contain munitions. An extensive review of the available historical records was conducted to determine focus areas for the geophysical investigation. The evaluation of over 220 structures and earthworks resulted in the identification of 56 focus areas as potential UXO burial areas. These focus areas are known as POIs (see Section 6).

5.2.2 With the exception of fourteen POIs, all POIs (and thus all potential UXO burial locations identified in the historic record) were investigated. The 14 that were not investigated are:

- POIs 30, 31, and 32 trenches at Camp Leach - area is now a water reservoir.
- POIs 40, 41 and 42 are buildings that still exist on American University campus and are not considered to be burial locations.
- POIs 44 through 50 and 52 are located on parts of the current American University campus that have been greatly disturbed over the years as the campus has grown and are not considered potential UXO burial locations.

5.2.3 In addition to the archives search and development of the list of POI, an extensive cut and fill analysis of the AUES and Camp Leach area was conducted (see Section 6.4.1). In general, in those areas where it was determined that there was more than 10-feet of cut or more than 12-feet of fill between the 1918 and 1983 (the latest year for USGS topographical information of the Spring Valley area) surface elevations, the area was deleted from any further study. The rationale for these exclusions were:

- 10 feet cut - The Army in WWI would not have buried items deeper than 10 feet (hand digging) and ballistically fired munitions would not have impacted deeper than 10 feet.
- 12 feet fill - It was assumed normal activities, including basement construction, would not be deeper than 12 feet. Therefore, these activities would not reach the 1918 surface level in areas with 12 feet or greater fill.

5.2.4 After these evaluations were complete, right-of-entry forms were prepared and sent to property owners to obtain their permission for the Army to engage in the geophysical investigations on their property. If property owners did not grant right-of-entry, the Army did not conduct field investigations on these properties.

5.2.5 In addition to the POIs that were geophysically surveyed, "Sample Spot Check Areas" that did not correspond to a specific POI were geophysically investigated. These areas consisted of several properties or lots that were randomly selected and usually discontinuous. Based on the archival investigation, chemical or explosive ordnance was not expected to be found in these areas. If a large cache of munitions was located in a sample spot check area, the hypothesis that caches are only associated with identified POIs would be disproven. In this

event, the UXO investigation would be expanded to included the entire OSR FUDS. Sample spot check areas accounted for approximately 10% of the geophysically investigated area. No munitions caches were found in a sample spot check area. All potential areas of UXO contamination identified in the Historical Summary were investigated during the RI phase.

Reference:

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE. -

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

Section 6

SECTION 6

POI IDENTIFICATION AND SELECTION PROCESS

6.1 POI SELECTION RATIONALE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
24	9	2	1-8	"Altogether, there were about 164 structures and earthworks identified by the District and the Corps of Engineers. However, only 53 Points of Interest have been intrusively investigated. Although some of these points encompassed more than one structure, many clearly have been omitted. Indeed, many of these structures have not been located on any known maps, supporting our recommendation that the entire 600 acres needs to be examined (Appendix I)."
55	2	1	1-6, 8-11	Letter to USEPA from DCRA "....we have also learned that EPA performed their own analysis of samples taken by the Army from locations at the Spring Valley site. The analysis results indicated contamination greater than the EPA recommended Risk-Based Concentration level for arsenic and other hazardous substances. Both surface and above ground level air burst testing of experimental chemical agents, many containing arsenic, were performed at the site..... Sample results may not indicate the presence of arsenic if they were not within the downwind contamination areas of these air burst test sites, however. We are therefore concerned that arsenic and other toxic materials may be present in high concentrations throughout Spring Valley and adjacent areas at rather shallow depths.

Salient Issue:

1) Describe the rationale for the identification of the POIs and the selection of certain POIs for UXO and/or chemical contamination investigations. 2) Determine if all the potentially hazardous areas were identified and if the entire site needs to be assessed with an environmental sampling program. Could AUES activities cause contamination to be spread to areas outside the POIs.

Response:

6.1.1 POI locations were identified and located from the historic record including aerial photographs. The aerial photographs from 1918, 1927, 1991 and 1993 were merged and interpreted using state-of-the-art photogrammetric equipment and techniques. This was accomplished by the USACE Topographic Engineering Center (TEC). The evaluation of over 220 structures and earthworks resulted in the identification of 56 POIs. A POI is defined as a specific area of the AUES or Camp Leach most likely to contain UXO or CWM residual contamination. The OSR FUDS was also divided into nine zones which contain the fifty-six POIs identified for further investigation. These POIs were determined to be the areas of activity

during WWI and the areas most likely to contain contamination as a result of AUES activities. These included areas which involved the testing and development of CWM and areas that were used to support AUES activities but did not involve the use of chemicals or ordnance. The areas where CWM was tested include circular trench sites where CWM containing munitions were statically fired and the clouds of agent drifted over the test area. They also include areas where the historic record indicates CWM was deliberately sprayed or spread over an area for persistence testing. Also identified were areas near accidents which released contaminants. The list of POIs also included parts of Camp Leach which was used as a combat engineer training camp. The locations of the 56 POIs and 9 zones are shown in Figure 6.1. Table 6.1 list the POIs and summarizes the investigation activities performed at each.

6.1.2 All POIs with the potential to be UXO burial locations were investigated by geophysical instruments.

6.1.3 The environmental sampling program was focused on those POIs where CWM use or accidents were documented in the historic record. These are the areas where the highest concentrations would be expected. No CWM or CWM unique breakdown products or laboratory contaminants associated with AUES activities were detected in any samples. Naturally occurring metals which could also be associated with AUES activities were detected at levels above background concentrations and USEPA Region III Risk Based Concentrations (RBC). These metals were identified as contaminants of concern and subjected to a baseline risk assessment in accordance with USEPA Risk Assessment Guidelines for Superfund. The risk assessment determined these metals were not a hazard. Refer to Section 9 of this report.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc., (Section 5.5.4.1, Page 5-17).

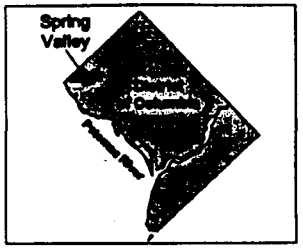
Figure 6.1

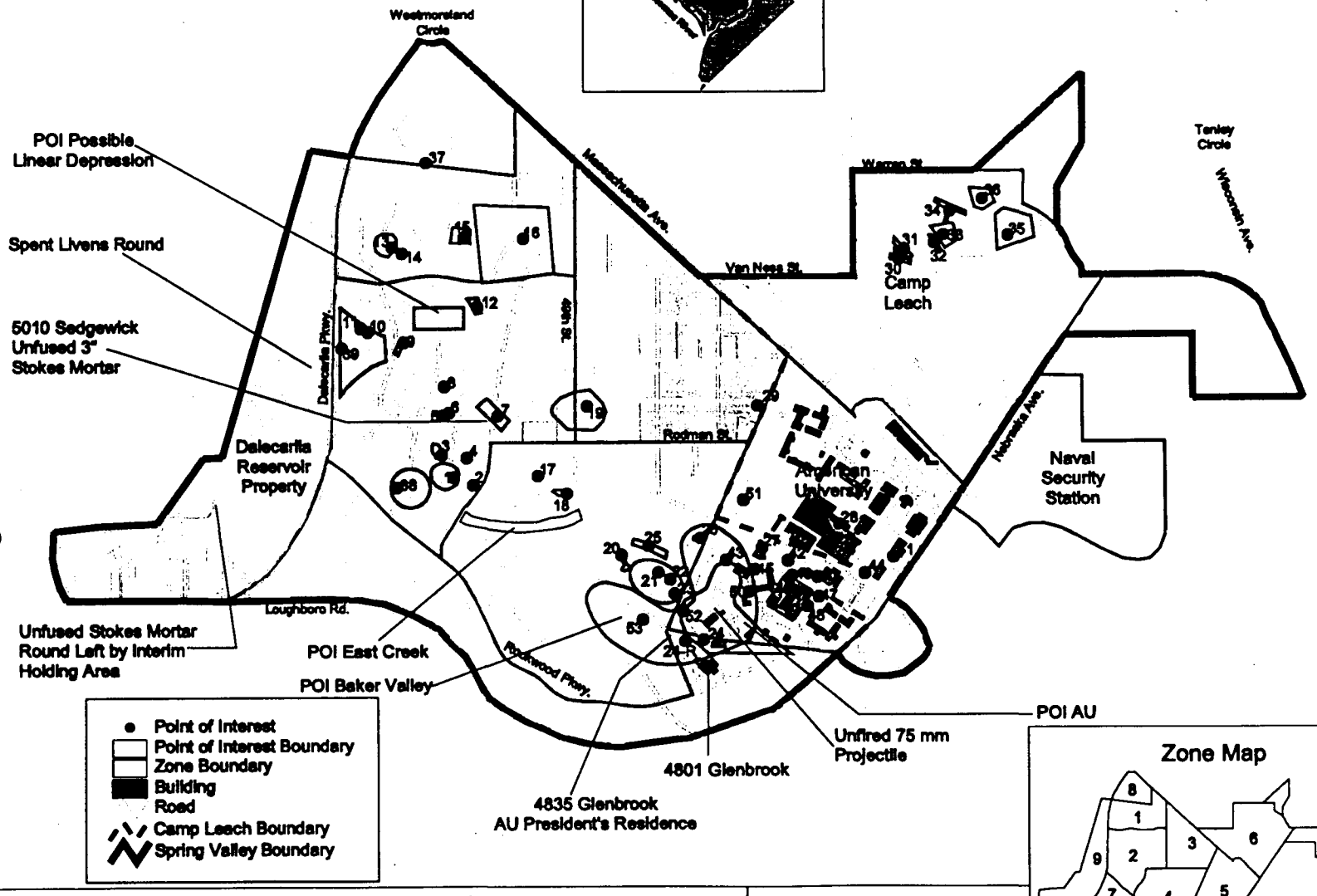
Numbered Points of Interest

1. Circular Trenches
2. Possible Pit
3. Small Crater Scars
4. Possible Pit
5. Possible Pit
6. Possible Target or Test Site
7. Possible Test Area
8. Possible Target or Test Site
9. Possible Firing or Observation Stalls
10. Possible Target or Test Site
11. Scattered Ground Scars
12. Possible Graded Area
13. Circular Trenches
14. Pit
15. Ground Scar
16. Chemical Persistency Test Area
17. Possible Pit
18. Small Crater Scars
19. Old Mustard Field
20. Ground Scar
21. Shell Pit
22. Shell Pit
23. Shell Pit
24. Probable Pit
24-R. Probable Pit, Revised Location
25. Possible Trenches
26. Small Crater Scars
27. Probable Trench or Ditch
28. Probable Trench or Ditch
29. Ground Scar
30. Training Trenches
31. Training Trenches
32. Training Trenches
33. Training Trenches
34. Training Trenches
35. Training Trenches
36. Training Trenches
37. Mill Creek
38. Bradley Field (Major Tolman's Field)
39. Static Test Fire Area
40. Ohio Hall
41. History Building
42. Physiological Laboratory
43. Gun Pit
44. Chemical Research Laboratory
45. Explosives Laboratory
46. Canister Laboratory
47. Bacteriological Laboratory
48. Dispersole Laboratory
49. Pharmacological Laboratory
50. Gun Pit
51. Fire and Flame Laboratory
52. Electrolytic Laboratory
53. Baker Valley

Named Points of Interest

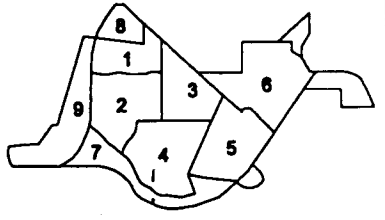
American University
Possible Linear Depression
East Creek





- Point of Interest
- Point of Interest Boundary
- Zone Boundary
- Building
- Road
- Camp Leach Boundary
- Spring Valley Boundary

Zone Map



This map was prepared for use of the U.S. Army Corps of Engineers for illustrative purposes only. This map was created using data prepared from various sources. It does not represent a survey of the site. The scale, accuracy, and completeness of the data is not guaranteed. No liability is assumed as to the sufficiency or accuracy of the data collected hereon.

SOURCE: USDA 1976

PARSONS ENGINEERING SCIENCE, INC.

Approximate Scale
0 400 800
Feet

POINT OF INTEREST
OSR FUDS

OPERATION SAFE REMOVAL

JOB NUMBER: 731771
DOCUMENT NO.:
DAS SHEET:

US Army Corps of Engineers

TABLE 6.1
OSR FUDS
POI SUMMARY

POI NUMBER	POI NAME	ZONE	GEOPHYSICAL SURVEY [1]	INTRUSIVE [2]	ENVIRONMENTAL SAMPLES COLLECTED [3]
1	Circular Trenches	2	X	X	X
2	Possible Pit	2,4	X		
3	Small Crater Scars	2	X		
4	Possible Pit	2	X	X	
5	Possible Pit	2	X		
6	Possible Target or Test Site	2	X		
7	Possible Test Area	2	X	X	X
8	Possible Target or Test Area	2	X		
9	Possible Firing or Observation Stalls	2	X		
10	Possible Target or Test Site	2	X		X
11	Scattered Ground Scars	2	X		X
12	Possible Graded Area	2	X		
13	Circular Trenches	1	X	X	X
14	Pit	1	X	X	X
15	Ground Scar	1	X	X	(6)
16	Chemical Persistency Test Area	1	X	X	X
17	Possible Pit	4	X		
18	Small Crater Scars	4	X		
19	Old Mustard Field	2,3	X	X	X

TABLE 6.1 (Continued)
OSR FUDS
POI SUMMARY

POI NUMBER	POI NAME	ZONE	GEOPHYSICAL SURVEY[1]	INTRUSIVE [2]	ENVIRONMENTAL SAMPLES COLLECTED [3]
20	Ground Scar	4	X		X
21	Shell Pit	4	X	X	X
22	Shell Pit	4	X		X
23	Shell Pit	4	X	X	X
24[5]	Probable Pit	7	X		X
25	Possible Trenches	4	X	X	
26	Small Crater Scars	4	X		
27	Probable Trench or Ditch	5	X		
28	Probable Trench or Ditch	5	X		
29	Ground Scar	3	X		
30	Training Trenches[4]	6			
31	Training Trenches[4]	6			
32	Training Trenches[4]	6			
33	Training Trenches	6	X		
34	Training Trenches	6	X		
35	Training Trenches	6	X		
36	Training Trenches	6	X		
37	Mill Creek	8	X	X	X
38	Bradley Field/Maj Tolman's Field	2	X		X
39	Static Test Fire Area	2	X		X

TABLE 6.1 (Continued)
OSR FUDS
POI SUMMARY

POI NUMBER	POI NAME	ZONE	GEOPHYSICAL SURVEY (1)	INTRUSIVE (2)	ENVIRONMENTAL SAMPLES COLLECTED(3)
40	Ohio Hall	5			
41	History Building	5			
42	Physiological Laboratory	5			
43	Gun Pit	5	X		
44	Chemical Research Laboratory	5			
45	Explosives Laboratory	5			
46	Canister Laboratory	5			
47	Bacteriological Laboratory	5			
48	Dispersoid Laboratory	5			
49	Pharmacological Laboratory	5			
50	Gun Pit	5			
51	Fire and Flame Laboratory	5	X		
52	Electrolytic Laboratory	5			
53	Baker Valley	4,5	X		X
	East Creek	4	X	X	
	Possible Linear Depression	2	X	X	
	POI American University	5	X		X

(1) POI subjected to EM-31 frequency domain electro magnetic conductivity meter survey or magnetometer survey.
(2) Investigations that required breaking the ground surface to further classify an anomaly.
(3) Locations where soil, surface water, or soil debris samples were collected.
(4) POIs covered with a reservoir.
(5) POI incorrectly located in RI.
(6) Greater than 10 feet of cut, therefore, not environmentally sampled.

6.2 OLD MUSTARD FIELD

No.	Location in Document			Statement in Document
	pp	¶	Lines	
32	10	3	1-3	".... one Point of Interest identified previously was the Old Mustard Field, a 500 foot diameter area covered repeatedly with mustard gas."

Salient Issue:

Determine if the "Old Mustard Field" referred to is POI 19.

Response:

6.2.1 POI 19 is the "Old Mustard Field". POI 19 was identified on a map titled "Range and Reservation American University Experiment Station Research Division of the Chemical Warfare Service", dated July 1918. The map was included in Vol. 2 of the 1986 EPIC report. The area was an oval circle marked "Old Mustard Field" [OSR FUDS RI report Section 3.2.5, page 3-13 (USACE, 1995b)]. POI 19 was part of the surficial soil sampling program; the thirteen soil samples collected from this 458 foot diameter POI were analyzed for mustard, mustard breakdown products, lewisite as chlorovinylarsenious acid, and total cyanide. No chemical agents or their breakdown products were detected in any of the samples collected from POI 19 [OSR FUDS RI report Section 6.3.5, page 6-15 (USACE, 1995b)].

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

6.3 POI SELECTION BASED ON HISTORICAL RECORD

6.3.1 Releases

No.	Location in Document			Statement in Document
	pp	¶	Lines	
6	2	1	7-10	"Many of these experiments involved releasing great quantities of these toxic substances into the air and on the soil to see the effects on animals placed at various distances from the release point."

Salient Issue:

Determine if there is evidence that large quantities of CWM were released into the air and drifted beyond the experiment area.

Response:

6.3.1.1 The controlled chemical agent releases were conducted in test areas northwest of the campus, a good distance away from the lab complex located on what is now American University (AU) property (POIs 01, 13, 15, 16, 19 and 38). The primary safety precaution taken during the testing was to stay 100 yards away from Massachusetts Avenue. Traffic was allowed to continue on Massachusetts Avenue during the testing because it was thought that 100 yards was far enough away that it would not bother the civilian traffic (Carleton, 1918). In addition to the controlled releases, there were also several accidents on the AU campus where CWM or CWM components were released into the air. These accidental releases were the result of building fires or explosions [OSR FUDS RI report Section 3.2.8 (USACE, 1995b)].

6.3.1.2 Only one incident, a probable accidental lewisite release on August 3, 1918, was known to have affected residents southeast of the AUES. On August 3, 1918, an explosion occurred at Manufacturing Shack #8. Manufacturing Shack #8 was located in the southwest portion of the AUES in the middle of the current American University baseball field. The explosion occurred in a still during gas distillation. Approximately 8-10 pounds of the gas were released after the still exploded. Three men working at the shack were exposed and a cloud of agent was carried by the wind in a southeasterly direction for about 1,200 feet. Although the chemical composition of the agent is not described, it is most likely that lewisite was being distilled instead of mustard as previously thought during the OSR FUDS RI report [OSR FUDS RI report Section 3.2.8, page 3-16 through 3-18 (USACE, 1995b)] (AU Archives, letter dated September 24, 1971). The residents requested immediate medical attention and received it from AUES doctors, but were not hospitalized due to the exposure (USACE, 1994a). This accidental release site was identified as Baker Valley, POI 53, Zone 4. This accidental release area was the

western edge of the Experiment Station based on a 1918 plan map of buildings on the AUES campus and the stated wind direction. Thirteen soil samples were collected from Baker Valley (POI 53) during the surficial soil sampling. The thirteen soil samples collected from POI 53 were analyzed for mustard, mustard breakdown products, lewisite as chlorovinylarsenious acid, and total cyanide. No chemical agents or their breakdown products were detected in any of the samples collected from Baker Valley (USACE, 1995b).

6.3.1.3 The majority of the accidents were confined to the AUES grounds, in the area that is now a baseball field and athletic fields of the American University. This part of the American University campus where temporary laboratories and temporary building were constructed was designated POI American University. Thirteen soil samples were collected from this POI during the surficial soil sampling. No CWM or CWM unique breakdown products or laboratory contaminants associated with AUES CWM research and development were detected in any sample collected from POI American University.

6.3.1.4 However, some metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were detected [OSR FUDS RI Section 6.6.3, pages 6-37 through 6-41 (USACE, 1995b)]. When these results were compared to screening USEPA Region III RBCs, nine metals (aluminum, antimony, arsenic, beryllium, cadmium, manganese, mercury, nickel, and vanadium) and three polynuclear aromatic hydrocarbons (PAHs) were found to be present at concentrations greater than screening RBCs.

6.3.1.5 The PAHs were detected in only one sample and are considered to be the result of more recent activities and not historical AUES activities; therefore, they are not considered "chemicals of potential concern." PAHs are commonly associated with automobile exhaust. The location of the samples was adjacent to a parking lot.

6.3.1.6 Statistical analyses of the metals determined that the concentrations of five (aluminum, beryllium, cadmium, nickel, and vanadium) of nine metals compared to background were significantly different than background at the 95 percent confidence interval; therefore, these metals were considered "chemicals of potential concern" at the American University POI. None of these elements are believed to be associated with World War I activities. The risk assessment concluded that no further remedial actions at the OSR FUDS are necessary due to the presence of these metals in Zone 5 [OSR FUDS RI Report Section 8.6.2, pages 8-38 through 8-41 and Section 9.1.5, pages 9-3 through 9-4 (USACE, 1995b)].

6.3.1.7 The environmental sampling program was focused on those POIs where chemical agent use or accidents were documented in the historic record. These are the areas where the highest concentrations would be expected. No CWM or CWM unique breakdown products were detected in any samples. Naturally occurring metals which could also be associated with AUES activities and many which could not be associated with AUES activities were detected at levels above background concentrations and USEPA Region III Risk Based concentrations. These metals were identified as contaminants of concern and subjected to a baseline risk assessment in accordance with USEPA Risk Assessment Guidelines for Superfund (USEPA, 1989a). The risk assessment determined these metals were not a hazard. Refer to Section 9 of this report.

Reference:

American University Archives, Letter dated September 24, 1971. *Letter from Burton Logue to his sister.*

Carleton, 1918. *Report of Field Experiments on Persistency of G-34.* American University Experiment Station.

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE.

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

USEPA, 1989a. *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation (Part A).* Washington, DC: Office of Emergency and Remedial Response. EPA/540/1-89/002.

6.3.2 UXO Burial Locations

No.	Location in Document			Statement in Document
	pp	¶	Lines	
19	4	1	1-5	"In our opinion, the immense quantity of gas there, the lack of information indicating that any CWM were moved, the buried CWM already found, the numerous trenches providing convenient burial, compel the conclusion that more CWM still exist on the site."
37	12	1	3-6	"There are two potential sources for gas exposure at American University: (1) individual unexploded ordnance resulting from the dispersion testing; and (2) gas shells and cylinders, intentionally buried, when the operation ended."
47	16	4	1-8	"Fourth, there were rumors of large scale burial of munitions at the site. In the Historical Report it states, The USATHAMA (US Army Toxic and Hazardous Materials Agency) study incorporated materials from American University and concluded that there was no evidence to confirm rumored large-scale burials of munitions. But it did highlight two sites that would be likely candidate locations if burial had occurred."
49	17	2	1-5	"Not only is there no evidence that the 'enormous quantities' of toxic substances and munitions known to have been there, were moved, but these two memoranda seem to indicate that the chemical and explosive munitions were not moved to the ordnance department facilities at Aberdeen."

Salient Issue:

Determine if all known potential trench locations were identified. Determine if all potential UXO burial locations were identified. Determine if all potential burial locations identified in the historical record, including the two sites identified in the USATHAMA report, were investigated.

Response:

6.3.2.1 The primary source for information on potential burial locations is the analysis of a 1918 aerial photograph. The analysis of the photograph initially identified 36 POIs. The POIs included potential burial locations identified as pits and trenches dug during AUES activities. Some of the pits and trenches were associated with Camp Leach (Zone 6), a combat engineer training camp closed before the AUES was closed. No evidence suggested that CWM was used at Camp Leach. Included in these 36 Points of Interest are the two double ring trenches identified on page 14 of the EPIC report *Historical Photographic Analysis, American University Washington, D.C.* (USEPA, 1986) as potential burial locations. These trenches were identified as POI 1 and POI 13 during the PA. The locations of additional POIs were found during the historical record investigation. At the end of the historical investigation 56 POIs were identified. Appendix A of The Historical Summary (USACE, 1994a) is a summary of the sources reviewed by USACE. Appendix B of The Historical Summary (USACE, 1994a) is a summary of the Federal record reviewed by USACE.

6.3.2.2 With the exception of fourteen POIs, all POIs (and thus all potential UXO burial locations are identified in the historic record) were investigated. The 14 that were not investigated are:

- POIs 30, 31, and 32 trenches at Camp Leach in the area that is now a water reservoir.
- POIs 40, 41 and 42 are buildings (Ohio Hall, History Building, and Physiological Laboratory) that still exist on American University campus and are not considered to be burial locations.
- POIs 44 through 50 and 52 are located on parts of the current American University campus that have been greatly disturbed over the years as the campus has grown and are not considered potential UXO burial locations.

6.3.2.4 After an exhaustive review of the historical record (i.e. photographs, military and civilian archives, test reports, military and civilian correspondence, etc.) 56 POIs were identified at the OSR FUDS. These POIs included any and all potential UXO burial locations as revealed in the historic record. All POIs with the potential to contain buried UXO caches have been investigated.

Reference:

USACE, 1994a. *A Brief History of the American University Experiment Station and US Navy Bomb Disposal School, American University.* Office of History, Headquarters USACE.

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc. (OSR FUDS RI, Section 3).

USEPA, 1986 *Historical Photographic Analysis, American University Washington, D.C.* Prepared for USATHAMA. Prepared by USEPA EPIC.

6.4 POI PLACEMENT

6.4.1 Map Accuracy

6.4.1.1 As discussed in Section 6.1, POIs were identified and located from the historic record using various photogrammetric techniques. The location of the POIs were placed relative to features common throughout the 75 year span (e.g., Massachusetts Avenue, AU building locations, and trees) and digital computations. Ground control was established through 23 photo-identifiable points in the 1991 and 1993 photographs which were surveyed. The positional accuracy of the POIs is ±2.6 meters to ±5 meters.

6.4.1.2 During this current review of the OSR FUDS RI, it was determined the location of POI 24 as environmentally sampled was based on a TEC Interim Work Product POI Location Map. TEC had further investigated the POIs and refined the POI interpretations and locations resulting in a more accurate TEC Final POI Location Map produced in April 1993. The centerpoint coordinates of fourteen POIs (12, 17, 20-24, 26-27, 29-31, 33, and 36) were refined from the locations on the interim map product.

6.4.1.3 During the current RI review, these fourteen POI locations were reviewed using an original copy of the TEC Final POI Location Map with the POIs shown on a circa 1991 aerial photo of the site and an ArcInfo Geographic Information System (GIS) coverage of the site. The POIs on the photo were compared to the POI locations on the GIS coverage with houses shown. This allowed accurate comparison of the POI locations on both products. The lots were then compared to the Surveyed Properties and POIs figures in Section 6 of the RI for geophysical investigations, and the lot report (POI 20) for soil sample locations. All the POIs, except for POI 24, were accurately located in the OSR FUDS RI Report and appropriately investigated.

6.4.1.4 The location and identification of POI 24 as a ground scar were incorrect as environmentally sampled on January 6 and 7, 1994, because it was based on the TEC Interim Work Product POI Location Map. POI 24 was identified as a probable pit on the TEC Final POI Location Map and the correct location was geophysically surveyed with an EM-31 on April 5 through April 7, 1994, as part of the 10% QA/QC sampling. All anomalies were investigated and determined to be construction debris.

6.4.1.5 Cut and fill maps were generated by merging 1918 and 1983 topographic maps. The maps were digitized and then horizontally aligned by features common to both maps (e.g.,

roads, street intersections and buildings). The vertical alignment was performed by digitally correcting for scale followed by a comparison of the contour lines. Vertical alignment was also confirmed by identifying two peak elevations with no apparent change between 1918 and 1991.

6.4.1.6 The accuracy of the cut and fill maps is not documented. However, during soil sampling in areas with fill, field geologists collected samples at the depth where noticeable changes in lithology indicated the 1918 surface had been reached as documented in the field notes. In most cases, the actual sample depth was within one-foot of the planned depth, which was based on the cut and fill map. Table 6.2 is a summary of the actual depths at which samples were collected and the depths that were planned based on the cut and fill analysis.

Reference:

Engineering Science, June 24, 1993. *Letter from Carl Drummond, Engineering Science to Spring Valley GIS File, Engineering Science. Subject: Rationale for Determining Horizontal and Vertical Datums, 1918 and 1991 Topography.* Engineering Science Inc.

USACE-TEC, 1994a. The Use of Digital Photogrammetric Methods in Historical Photo Analysis. 1994 ASPRS/ACSM Annual Convention and Exposition, Technical Papers, Reno, Nevada April 25-28, Volume 1.

TABLE 6.2
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
5	Amer. U.	SV-BAKER-04	01/05/94	Soil	AU Grid Cell H6	14	14	13.0-14.0	Baker Valley Grid Cell L1
4/5	BAKER	SV-BAKER-04	01/05/94	Soil	Baker Valley Grid Cell L13	14	14	13.0-14.0	
1	POI 16	SV-POI16-12	01/24/94	Soil	POI16 Grid Cell E12	6	6	5.5-6.5	
1	POI 16	SV-POI16-11	01/24/94	Soil	POI16 Grid Cell E13	6	6	5.5-6.5	
5	Amer. U.	SV-AU-09	01/07/94	Soil	AU Grid Cell D9	5	5	5.5-6.5	
5	Amer. U.	SV-AU-02	01/04/94	Soil	AU Grid Cell O11	4	4	3.5-4.5	
5	Amer. U.	SV-AU-03	01/04/94	Soil	AU Grid Cell O12	4	4	3.5-4.5	
5	Amer. U.	SV-AU-01	01/04/94	Soil	AU Grid Cell P11	4	4	3.5-4.5	
5	Amer. U.	SV-AU-06	01/05/94	Soil	AU Grid Cell I7	4	4	3.5-4.5	
2	BF/MTF	SV-BFMT-02	02/15/94	Soil	BF/MTF Grid Cell D7	4	4	3.5-4.5	
2	BF/MTF	SV-BFMT-06	02/16/94	Soil	BF/MTF Grid Cell G2	4	4	3.5-4.5	Analyzed as MS/MSD
4	POI21/22/23	SV-POI21/23-07	12/08/93	Soil	POI 21/22/23 Grid Cell C-4	4	4	4	
4	POI21/22/23	SV-POI21/23-06	12/08/93	Soil	POI 21/22/23 Grid Cell C-5	4	4	4	
4	POI21/22/23	SV-POI21/23-05	12/08/93	Soil	POI 21/22/23 Grid Cell E-5	4	4	4	
1	POI 16	SV-POI16-07	01/21/94	Soil	POI16 Grid Cell B12	4	4	3.5-4.5	
2/3	POI 19	SV-POI19-09	03/02/94	Soil	POI19 Grid Cell G9	4	4	3.5-4.5	
4	POI21/22/23	SV-POI21/23-08	12/08/93	Soil	POI 21/22/23 Grid Cell C-3	3	3	3	
4	POI21/22/23	SV-POI21/23-04	12/07/93	Soil	POI 21/22/23 Grid Cell E-7	3	3	2-4	
4	POI21/22/23	SV-POI21/23-03	12/07/93	Soil	POI 21/22/23 Grid Cell F-8	3	3	1-2	
4	POI21/22/23	SV-POI21/23-02	12/07/93	Soil	POI 21/22/23 Grid Cell G-9	3	3	1-2	
2	POI 10/11	SV-POI10/11-08	01/26/94	Soil	POI10/11 Grid Cell M5	3	3	2.5-3.5	
5	Amer. U.	SV-AU-04	01/04/94	Soil	AU Grid Cell J10	2	2	1.5-2.5	
5	Amer. U.	SV-AU-05	01/04/94	Soil	AU Grid Cell K9	2	2	1.5-2.5	
4/5	BAKER	SV-BAKER-05	01/05/94	Soil	Baker Valley Grid Cell I14	2	2	0.5-1.5	
2	BF/MTF	SV-BFMT-05	02/15/94	Soil	BF/MTF Grid Cell H4	2	2	1.5-2.5	
2	POI 01	SV-POI01-14	02/02/94	Soil	POI01 Grid Cell I6	2	2	2.0-3.0	
2	POI 01	SV-POI01-06	01/31/94	Soil	POI01 Grid Cell J11	2	2	2.0-3.0	

TABLE 6.2 (Continued)
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
2	POI 01	SV-POI01-04	01/31/94	Soil	POI01 Grid Cell K11	2	2	2.0-3.0	
2	POI 01	SV-POI01-05	01/31/94	Soil	POI01 Grid Cell L9	2	2	2.0-3.0	MS/MSD Sample
2	POI 01	SV-POI01-03	01/31/94	Soil	POI01 Grid Cell M11	2	2	2.0-3.0	
2	POI 01	SV-POI01-11	02/01/94	Soil	POI01 Grid Cell M15	2	2	2.0-3.0	
2	POI 01	SV-POI01-02	01/31/94	Soil	POI01 Grid Cell O13	2	2	2.0-3.0	
1	POI 16	SV-POI16-06	01/21/94	Soil	POI16 Grid Cell A9	2	2	1.5-2.5	
1	POI 16	SV-POI16-09	01/21/94	Soil	POI16 Grid Cell B14	2	2	1.5-2.5	
1	POI 16	SV-POI16-03	01/21/94	Soil	POI16 Grid Cell D8	2	2	1.5-2.5	
2/3	POI 19	SV-POI19-08	03/02/94	Soil	POI19 Grid Cell G12	2	2	1.5-2.5	
2/3	POI 19	SV-POI19-06	03/02/94	Soil	POI19 Grid Cell G15	2	2	2.5-3.5	
2/3	POI 19	SV-POI19-05	03/02/94	Soil	POI19 Grid Cell J14	2	2	1.5-2.5	
2/3	POI 19	SV-POI19-02	03/01/94	Soil	POI19 Grid Cell P12	2	2	1.5-2.5	
4	POI 20	SV-POI20-12	03/05/94	Soil	POI20 Grid Cell J10	2	2	0.5-1.5	
4	POI 20	SV-POI20-10	03/05/94	Soil	POI20 Grid Cell M14	2	2	1.5-2.5	
4/5	BAKER	SV-BAKER-10	03/09/94	Soil	Baker Valley Grid Cell P11	1	1	2.5-4.0	
2	BF/MTF	SV-BFMT-01	02/15/94	Soil	BF/MTF Grid Cell B8	1	1	0.5-1.5	
4	POI21/22/23	SV-POI21/23-09	12/08/93	Soil	POI 21/22/23 Grid Cell C-1	1	1	2-4	
2	POI 01	SV-POI01-08	02/01/94	Soil	POI01 Grid Cell G12	1	1	1.0-2.0	
2	POI 01	SV-POI01-07	02/01/94	Soil	POI01 Grid Cell H12	1	1	1.0-2.0	
2	POI 01	SV-POI01-01	01/31/94	Soil	POI01 Grid Cell O8	1	1	1.0-2.0	
2	POI 10/11	SV-POI10/11-06	01/26/94	Soil	POI10/11 Grid Cell O2	1	1	1.0-2.0	
2/3	POI 19	SV-POI19-14	03/03/94	Soil	POI19 Grid Cell N9	1	1	1.0-2.0	
4	POI 20	SV-POI20-02	03/04/94	Soil	POI20 Grid Cell E2	1	1	0.5-1.5	Analyzed as MS/MSD
4	POI 20	SV-POI20-14	03/08/94	Soil	POI20 Grid Cell G9	1	1	0.5-1.5	
5	Amer. U.	SV-POI24-12	01/06/94	Soil	AU Grid Cell N6	0	< 1.5	0.5-1.5	POI 24 Grid Cell H8
2	BF/MTF	SV-BFMT-03	02/15/94	Soil	BF/MTF Grid Cell G7	0	< 1.5	0.5-1.5	
4	POI21/22/23	SV-POI21/23-14	12/09/93	Soil	POI 21/22/23 Grid Cell M-15	0	< 1.5	4	

TABLE 6.2 (Continued)
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
2	POI 01	SV-POI01-12	02/01/94	Soil	POI01 Grid Cell C14	0	< 1.5	0.5-1.5	
2	POI 01	SV-POI01-10	02/01/94	Soil	POI01 Grid Cell H17	0	< 1.5	1.0-2.0	
2	POI 01	SV-POI01-13	02/02/94	Soil	POI01 Grid Cell L4	0	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-07	02/09/94	Soil	POI07 Grid Cell A4	0	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-04	01/25/94	Soil	POI10/11 Grid Cell D7	0	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-13	01/27/94	Soil	POI10/11 Grid Cell E5	0	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-02	01/25/94	Soil	POI10/11 Grid Cell H14	0	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-01	01/25/94	Soil	POI10/11 Grid Cell J14	0	< 1.5	0.5-1.5	
1	POI 16	SV-POI16-08	01/21/94	Soil	POI16 Grid Cell C14	0	< 1.5	0.5-1.5	
1	POI 16	SV-POI16-04	01/21/94	Soil	POI16 Grid Cell C9	0	< 1.5	0.5-1.5	Analyzed as MS/MSD
1	POI 16	SV-POI16-13	01/24/94	Soil	POI16 Grid Cell G9	0	< 1.5	1.5-2.5	
1	POI 16	SV-POI16-01	01/19/94	Soil	POI16 Grid Cell H3	0	< 1.5	0.5-1.5	
2/3	POI 19	SV-POI19-10	03/02/94	Soil	POI19 Grid Cell J9	0	< 1.5	0.5-1.5	
2/3	POI 19	SV-POI19-04	03/01/94	Soil	POI19 Grid Cell M14	0	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-04	03/04/94	Soil	POI20 Grid Cell A6	0	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-03	03/04/94	Soil	POI20 Grid Cell D4	0	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-01	03/04/94	Soil	POI20 Grid Cell F5	0	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-13	03/08/94	Soil	POI20 Grid Cell H6	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-01	01/06/94	Soil	POI24 Grid Cell B15	0	< 1.5	0.5-1.5	MS/MSD Sample
5	POI 24[1]	SV-POI24-03	01/06/94	Soil	POI24 Grid Cell C12	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-04	01/06/94	Soil	POI24 Grid Cell F13	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-05	01/06/94	Soil	POI24 Grid Cell G2	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-06	01/06/94	Soil	POI24 Grid Cell H5	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-07	01/06/94	Soil	POI24 Grid Cell J4	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-08	01/06/94	Soil	POI24 Grid Cell K7	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-09	01/06/94	Soil	POI24 Grid Cell L8	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-13	01/07/94	Soil	POI24 Grid Cell M5	0	< 1.5	0.5-1.5	

TABLE 6.2 (Continued)
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
5	POI 24[1]	SV-POI24-12	01/07/94	Soil	POI24 Grid Cell M6	0	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-10	01/06/94	Soil	POI24 Grid Cell M8	0	< 1.5	0.5-1.5	
4	POI21/22/23	SV-POI21/23-01	12/07/93	Soil	POI 21/22/23 Grid Cell G-12	-1	< 1.5	1-2	
2	POI 07	SV-POI07-03	02/08/94	Soil	POI07 Grid Cell C7	-1	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-01	02/08/94	Soil	POI07 Grid Cell D7	-1	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-07	01/26/94	Soil	POI10/11 Grid Cell M3	-1	< 1.5	0.5-1.5	Analyzed as MS/MSD
2/3	POI 19	SV-POI19-13	03/03/94	Soil	POI19 Grid Cell C9	-1	< 1.5	0.5-1.5	
2/3	POI 19	SV-POI19-01	03/01/94	Soil	POI19 Grid Cell P15	-1	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-14	01/07/94	Soil	POI24 Grid Cell O6	-1	< 1.5	0.5-1.5	
5	POI 24[1]	SV-POI24-11	01/07/94	Soil	POI24 Grid Cell O7	-1	< 1.5	0.5-1.5	
5	Amer. U.	SV-AU-07	01/06/94	Soil	AU Grid Cell M5	-2	< 1.5	0.5-1.5	MS/MSD Sample
5	Amer. U.	SV-BAKER-03	01/04/94	Soil	AU Grid Cell J9	-2	< 1.5	0.5-1.5	Baker Valley Grid Cell M1
4/5	BAKER	SV-BAKER-08	03/09/94	Soil	Baker Valley Grid Cell K7	-2	< 1.5	0.5-1.5	
4/5	BAKER	SV-BAKER-03	01/04/94	Soil	Baker Valley Grid Cell M16	-2	< 1.5	0.5-1.5	
4	POI21/22/23	SV-POI21/23-13	12/09/93	Soil	POI 21/22/23 Grid Cell 0-15	-2	< 1.5	4	
4	POI21/22/23	SV-POI21/23-15	12/09/93	Soil	POI 21/22/23 Grid Cell J-15	-2	< 1.5	4	
4	POI21/22/23	SV-POI21/23-12	12/08/93	Soil	POI 21/22/23 Grid Cell Q-14	-2	< 1.5	4	
2	POI 07	SV-POI07-08	02/09/94	Soil	POI07 Grid Cell C4	-2	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-06	02/08/94	Soil	POI07 Grid Cell D4	-2	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-05	02/08/94	Soil	POI07 Grid Cell D5	-2	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-04	02/08/94	Soil	POI07 Grid Cell D6	-2	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-11	02/10/94	Soil	POI07 Grid Cell N14	-2	< 1.5	0.5-1.5	Analyzed as MS/MSD
2	POI 07	SV-POI07-09	02/09/94	Soil	POI07 Grid Cell P14	-2	< 1.5	1.0-2.0	
2	POI 10/11	SV-POI10/11-14	01/27/94	Soil	POI10/11 Grid Cell C3	-2	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-12	01/27/94	Soil	POI10/11 Grid Cell F4	-2	< 1.5	0.5-1.5	
1	POI 16	SV-POI16-10	01/24/94	Soil	POI16 Grid Cell A16	-2	< 1.5	0.5-1.5	
1	POI 16	SV-POI16-14	01/24/94	Soil	POI16 Grid Cell Q3	-2	< 1.5	1.5-2.5	

TABLE 6.2 (Continued)
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
2/3	POI 19	SV-POI19-11	03/03/94	Soil	POI19 Grid Cell G3	-2	< 1.5	0.5-1.5	
2/3	POI 19	SV-POI19-12	03/03/94	Soil	POI19 Grid Cell I5	-2	< 1.5	0.5-1.5	
2/3	POI 19	SV-POI19-03	03/01/94	Soil	POI19 Grid Cell N15	-2	< 1.5	0.5-1.5	Analyzed as MS/MSD
4	POI 20	SV-POI20-05	03/04/94	Soil	POI20 Grid Cell C9	-2	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-08	03/05/94	Soil	POI20 Grid Cell M11	-2	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-11	03/05/94	Soil	POI20 Grid Cell P15	-2	< 1.5	0.5-1.5	
4/5	BAKER	SV-BAKER-07	03/08/94	Soil	Baker Valley Grid Cell K3	-3	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-07	02/16/94	Soil	BF/MTF Grid Cell L4	-3	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-12	02/10/94	Soil	POI07 Grid Cell N13	-3	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-03	01/25/94	Soil	POI10/11 Grid Cell G9	-3	< 1.5	0.5-1.5	
5	Amer. U.	SV-BAKER-05	01/05/94	Soil	AU Grid Cell D7	-4	< 1.5	0.5-1.5	Baker Valley Grid Cell I14
4/5	BAKER	SV-BAKER-02	12/10/93	Soil	Baker Valley Grid Cell C12	-4	< 1.5	1.5-2.5	
4/5	BAKER	SV-BAKER-12	03/09/94	Soil	Baker Valley Grid Cell I4	-4	< 1.5	1.5-2.5	Analyzed as MS/MSD
4/5	BAKER	SV-BAKER-06A	03/08/94	Soil	Baker Valley Grid Cell J3	-4	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-08	02/16/94	Soil	BF/MTF Grid Cell 08	-4	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-14	02/10/94	Soil	POI07 Grid Cell L12	-4	< 1.5	1.0-2.0	
2	POI 07	SV-POI07-10	02/09/94	Soil	POI07 Grid Cell P13	-4	< 1.5	0.5-1.5	
2	POI 10/11	SV-POI10/11-05	01/25/94	Soil	POI10/11 Grid Cell I6	-4	< 1.5	0.5-1.5	
1	POI 16	SV-POI16-02	01/19/94	Soil	POI16 Grid Cell G2	-4	< 1.5	0.5-1.5	
4/5	BAKER	SV-BAKER-01	12/09/93	Soil	Baker Valley Grid Cell G11	-5	< 1.5	1.0-2.0	
2	POI 10/11	SV-POI10/11-11	01/27/94	Soil	POI10/11 Grid Cell H3	-5	< 1.5	0.5-1.5	
5	Amer. U.	SV-AU-10	01/07/94	Soil	AU Grid Cell B9	-6	< 1.5	0.5-1.5	Baker Valley Grid Cell A1
4/5	BAKER	SV-BAKER-06	01/07/94	Soil	Baker Valley Grid Cell C15	-6	< 1.5	1.5-2.5	
4/5	BAKER	SV-AU-10	01/07/94	Soil	Baker Valley Grid Cell H16	-6	< 1.5	1.5-2.5	Also AU Grid Cell B9
4/5	BAKER	SV-BAKER-11	03/09/94	Soil	Baker Valley Grid Cell N4	-6	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-14	02/17/94	Soil	BF/MTF Grid Cell F13	-6	< 1.5	0.5-1.5	
2	POI 07	SV-POI07-13	02/10/94	Soil	POI07 Grid Cell N12	-6	< 1.5	0.5-1.5	

TABLE 6.2 (Continued)
COMPARISON OF PREDICTED DEPTH TO 1918 GROUND SURFACE WITH
OSR FUDS SOIL SAMPLE DEPTHS
OSR FUDS

Zone	Point of Interest	Sample Name	Collection Date	Sample Matrix	Sample Location	Relative Depth of 1918 (ft)	Planned Sample Depth (ft)	Actual Sample Depth (ft)	Comments
2	POI 10/11	SV-POI10/11-10	01/26/94	Soil	POI10/11 Grid Cell J4	-6	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-07	03/05/94	Soil	POI20 Grid Cell O8	-6	< 1.5	0.5-1.5	
4	POI 20	SV-POI20-06	03/05/94	Soil	POI20 Grid Cell P10	-6	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-13	02/17/94	Soil	BF/MTF Grid Cell G15	-7	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-10	02/17/94	Soil	BF/MTF Grid Cell K10	-8	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-09	02/16/94	Soil	BF/MTF Grid Cell I10	-9	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-11	02/17/94	Soil	BF/MTF Grid Cell M15	-11	< 1.5	0.5-1.5	
2	BF/MTF	SV-BFMT-12	02/17/94	Soil	BF/MTF Grid Cell K15	-12	< 1.5	0.5-1.5	

Notes:
MS/MSD = Matrix Spike/Matrix Spike Duplicate
NA = Not Applicable
POI = Point of Interest
BF/MTF = Bradley Field/Major Tolmans Field
Baker = Baker Valley
Amer. U. = American University
LTC B. = LTC Bancroft Area
[1]POI 24 Incorrect Location

Section 7

SECTION 7

UXO INVESTIGATION/REMOVAL PROGRAM

7.1 MUNITION FIND

No.	Location in Document			Statement in Document
	pp	¶	Lines	
12	3	2	1-6	"Subsequently, on April 2, 1996, another live munition (incendiary white phosphorous?) was found. The District of Columbia Department of Consumer and Regulatory Affairs, Environmental Regulation Administration (ERA) was not informed of this event until April 19, 1996. We have now been told that this shell was found inside of a house."

Salient Issue:

Determine if this munition is a documented find and is a result of AUES activities.

Response:

7.1.1 This round is a documented find and is a result of AUES activities. The OE item was located adjacent to the house at 5010 Sedgewick. The home owner was adding onto his house and the contractor dug it up. The DC Metro Police Department called the 57th EOD unit at Belvoir. The 57th EOD at Ft. Belvoir responded to the request for assistance from the DC Metro Police Department for the removal of the ordnance item at 5010 Sedgewick, Spring Valley. They found an unfuzed 3" Stokes mortar round which they subsequently removed from the area and detonated. The OE item was determined to be empty after it was destroyed.

Reference:

None.

7.2 UXO ISSUES

No.	Location in Document			Statement in Document
	pp	¶	Lines	
15	3	4	1-5	"It is our opinion that the remediation efforts did not address all of the areas of concern reflected in the Historical Report and Range Rule, and our own study, both with respect to the potential for contamination and the likelihood of more unexploded munitions on the site."
34	11	1	1-6	"This raises the level of potential devastation where old explosive shells are buried together with chemical shells, as was the case at American University, because a hypersensitive explosive filler could detonate rupturing many adjacent corroded chemical munitions, greatly increasing the amount of agent released."
41	1	3	1-6	"Because the remediation efforts at American University did not address all of the areas of concern reflected in the historical report, serious questions remain over the adequacy of the search for unexploded ordnance as well as the survey for residual contamination from the toxic substances used in the research."
16	3	5	1-4	".... the threat posed at the American University site requires that every part of the 600 acre site be surveyed with magnetometers and ground penetrating radar to a depth of 10-feet, with all anomalies intrusively investigated and cleared."

Salient Issue:

Determine if the investigation addressed all potential UXO issues

Response:

7.2.1 The UXO aspect of the OSR FUDS investigation was specifically focused on finding large quantities of metallic objects such as cylinders buried in pits or trenches identified as POI. All pit or trench POIs were:

a) Eliminated as POIs due to extensive land disturbances post AUES closure (i.e., POIs 30,31 and 32 are currently under a reservoir).

b) Cut/fill - Areas with greater than 10 feet of cut or 12 feet of fill were eliminated (see Section 5.2.3).

c) Geophysically investigated. The only large metallic item identified and removed was the metal gate removed near Wesley Seminary.

7.2.2 Other than the initial find at 52 Court, associated with an identified POI (POI 14), no large caches of weapons were found. The Army is confident, no such caches remain in the OSR FUDS.

7.2.3 The Army realizes there is a potential for single items to remain at OSR FUDS and acknowledges the responsibility for clean up of those items, as stated in Section 9.3 of OSR FUDS RI Report (USACE, 1995b).

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

7.3 TECHNOLOGY SELECTION AND RATIONALE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
9	2	3	8-10	"This failure to fully investigate all buried metal is magnified by the inadequacy of current detection equipment."
16	3	5	1-4	".... the threat posed at the American University site requires that every part of the 600 acre site be surveyed with magnetometers and ground penetrating radar to a depth of 10-feet, with all anomalies intrusively investigated and cleared."
59	2	4	1-5	Letter to USEPA from DCRA Finally, new technology, such as microgravity analysis, soil gas surveys with color contour maps, and Pulsed Fast Neutron (PINS) Analysis are now available. The Proposed Range Rule allows for reopening of a range when new technology would be helpful in clearance activities. Also, a deep seeking magnetometer with a data recording system and global positioning system (GPS), designed specifically for locating deep burial areas, could be used."

Salient Issue:

Determine if the UXO detection equipment selected for use at the OSR FUDS was adequate to detect potential UXO. Determine if the OSR FUDS should be investigated with magnetometers and ground penetrating radar (GPR). Determine if alternative technologies would be better at finding UXO at the OSR FUDS.

Response:

7.3.1 The geophysical instruments used at OSR FUDS included:

- Geonics EM-31, a frequency domain electromagnetic conductivity meter. The EM-31 is specifically designed to detect disturbed earth and deep, large masses of metal such as would be anticipated to be found at a UXO burial site or large areas of disturbed earth as would be found in a backfilled pit or trench. It was and is the instrument of choice for locating caches or pits. The EM-31 was attached to the Data Acquisition and Navigation System (DANS), a real time data recording and positioning system. This approach enabled quicker acquisition of large quantities of data than would have been possible with GPS. The data generated by an EM-31 is capable of finding both large and small metallic items, as was seen from the OSR FUDS geophysical survey results. The EM-31 was the preferred instrument used during the geophysical investigation.
- A Schoenstedt magnetometer was used in those areas where the EM-31 could not physically operate due to its size (2 ten-foot booms).

- During side scans, the Forrester Mark-26 or Schonstedt MD-22 was used to determine the depth and orientation of an anomaly.

The geophysical instruments have been approved for ordnance detection surveys by the USACE at many active and formerly used defense sites across the nation. Appropriate geophysical instruments were used at OSR FUDS.

7.3.2 All geophysical instruments have extremely limited ability to discriminate between buried UXO and other buried metallic objects. At a site such as American University, where the vast majority of buried metal is not related to UXO (items ranging from roofing nails to buried utilities) there is no current, dependable technology that can accurately differentiate between UXO and non-UXO items. To fully evaluate the geophysical data and focus on anomalies with the greatest potential as UXO, an external Anomaly Review Board (ARB) was established. The members of the ARB are experts in UXO and UXO detection. The purpose of the ARB was to thoroughly review the geophysical data and determine which anomalies were potential UXO items and which were non-UXO items (see Section 7.5).

7.3.3 Ground Penetrating Radar (GPR) is a poor choice of geophysical instrument to detect buried UXO at this site. There is a significant amount of clay minerals in the saprolitic overburden of the site. Saturated clays attenuate GPR signals severely limiting the unit's UXO detection capability in areas like American University.

7.3.4 Pulsed fast neutron (PINS) is not considered a UXO locating device. PINS was used to evaluate the contents of suspect chemical rounds.

7.3.5 Soil gas surveys were considered during the original investigations but were considered to have a low likelihood of success. First of all, gas rounds would have to be actively leaking, not intact, for any possibility of location by soil-gas surveys. In addition, the primary CWM of concern are not good soil-gas survey candidates. The vapor pressures of mustard and lewisite at soil temperatures are too low to permit those viscous liquids to be effectively located by such surveys.

7.3.6 Appropriate geophysical instruments were used at OSR FUDS.

Reference:

None.

7.4 MISSION EXPERIENCE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
3	1	3	6-8	".... the Army lacked experience as well, because it was the first time the Army had conducted an ordnance and chemical warfare removal operation in a residential area."

Salient Issue:

Determine if this was the first time the Army had conducted an ordnance and CWM removal operation in a residential area and if it degraded the quality of the UXO operation.

Response:

7.4.1 The Army Corps of Engineers were involved in the following three UXO investigations in residential areas prior to their involvement in the OSR FUDS RI:

- Morgan Army Depot; Sayreville, New Jersey, was a project that involved time critical removal actions and removal actions in close proximity to a school and residential areas.
- Teirrasenta; San Diego, California, was an investigation performed in a suburban setting located in a subdivision of several hundred homes. The investigation included the identification and removal of ordnance items from the subdivision.
- Another project involving removal actions in an urban setting is Summit Scrap and Salvage in Akron, Ohio. The USACE while performing a hazardous and toxic waste investigation encountered and removed several hundred rounds. The Akron investigation was conducted within a hundred yards of 8 to 10 apartments.

Reference:

None.

7.5 ANOMALY REVIEW PROCESS

No.	Location in Document			Statement in Document
	pp	¶	Lines	
8	2	3	1-7	".... the final 1995 report on the American University site indicates that only 53 points of interest there were scanned with metal detectors in an effort to locate other buried munitions. During this limited scanning 2,000 anomalies were found ... Of these anomalies, approximately 87 were excavated."
11	3	1	1-3	".... we became convinced of an immediate threat to the health and safety of residents at the site."
16	3	5	1-4	".... the threat posed at the American University site requires that every part of the 600 acre site be surveyed with magnetometers and ground penetrating radar to a depth of 10-feet, with all anomalies intrusively investigated and cleared."
50	17	2	1-5	"....unexploded and buried chemical and high explosive ordnance is certain to remain at the American University site."
56	2	2	3-7	Letter to USEPA from DCRA "....neither a magnetometer (metal detector) sweep nor a grid soil sampling of the entire 600 acre site has been completed. Where magnetometer sweeps were done, only a small portion of the anomalies (indications of metallic debris) were excavated. The Army's own research states that magnetometer sweeps for the identification of suspected anomalies without excavation is only 60% reliable."

Salient Issue:

Explain why over 1,900 anomalies were not excavated. Determine if all detected anomalies should be intrusively investigated and cleared.

Response:

7.5.1 Geophysical surveys were conducted on 490 properties during the OSR FUDS field investigation with the EM-31. Another 28 properties were surveyed using the Schoenstedt. The properties that were investigated were those that were centered around the POI or were part of the Sample Spot Checks, (see discussion in paragraph 7.3), met the cut/fill criteria, and where a right-of-entry was obtained from the property owner. As a result of these surveys more than 1900 anomalies were identified.

7.5.2 An anomaly is defined as an unexplained underground feature, whether magnetic (e.g., a piece of buried metal) or disturbed earth (e.g. an abandoned pit or trench that has been filled with soil) which caused a reading on the electro-magnetic instrument. In terms of the OSR FUDS geophysical survey, an anomaly was an underground feature that may or may not have been chemical or explosive ordnance or related material. Confirmed underground cultural features, such as water and sewer lines, were not considered anomalies. Electro-magnetic readings identified during the geophysical survey underwent a rigorous review and analysis process to ensure no unexplained electro-magnetic readings were prematurely dismissed.

7.5.3 First, the geophysical survey results were plotted in plan view and analyzed by the government's geophysical survey contractor. The contractor reviewed the survey results with criteria established by the Army's Engineering and Support Center (CEHNC) - the US Army Corps of Engineers Mandatory Center of Technical Expertise for Unexploded Ordnance (UXO) and Ordnance and Explosives (OE) matters. These criteria included:

- the anomaly's location with respect to archival information;
- the anomaly's vertical location with respect to the 1918 ground elevation;
- the detected size of the anomaly;
- the detection instrument's readings (e.g., the electro-magnetic signature);
- subsurface conditions and the proximity to sources of interference that would effect the sensitivity and reliability of the detection instrument; and
- the results of any chemical analysis of soil samples that would have been taken in the vicinity of the signature, if available.

7.5.4 In addition to these criteria, known structures such as utility lines, above-ground metal objects, metal fences, and reinforced concrete pads were noted during the field survey in the survey crew's logbook and were recorded on the plan view of the geophysical survey results. The contractor also discussed the results of the geophysical survey with the local utility marking company (Miss Utility) and local property owners to determine if any of the other electro-magnetic signatures could be explained by known underground features (e.g., abandoned underground lines, sprinkler systems, etc.).

7.5.5 Upon completion of this analysis, the contractor presented the results of the geophysical survey to the Spring Valley Resident Office (SVRO) with recommendations on which geophysical readings remained unexplained with a recommendation for further study or excavation to determine the nature of the geophysical instrument's reading. SVRO personnel, in consultation with the resident CEHNC Safety Specialist, reviewed the recommendations of the geophysical survey contractor and concurred or non-concurred with the contractor's recommendations. In the event there was any question as to the nature of the electro-magnetic reading, a recommendation was made for additional study of the anomaly to determine its nature. Additional studies included Schoenstedt metal detector surveys, MAC 51 cable locating surveys, and/or the use of downhole metal detection using Schonstedt and Forrester Mark-26 metal detectors to perform sidescans. Upon completion of these additional studies and SVRO

review, the results of the investigations were submitted to the Anomaly Review Board (ARB) for review.

7.5.6 The results of the field investigations and analysis were evaluated by the members of the ARB. The ARB used four primary factors when reviewing the geophysical survey results. These factors included:

- Have the geophysical investigation data identified the item as an anomaly?
- Is the anomaly at a known or suspect POI identified in the archival research?
- If sidescan geophysics was performed, did these results indicate an anomaly?
- Are there areas not identified by geophysical techniques that would indicate past disposal (e.g., unnatural depressions, structures, stressed vegetation, etc.)?

7.5.7 A positive response to any of these four primary factors indicated a suspect anomaly required further investigation. Five additional factors considered by the ARB during their review of the geophysical data included:

- Is the anomaly located in less than 10-feet of cut or greater than 12-feet of fill based on the 1918 ground elevation?
- Is the anomaly at or within 25-feet of a known or suspect construction site, construction disposal area, etc.?
- Is the anomaly within 10-feet of a known buried utility line (water, sewer, electric, etc.)?
- Do the infrastructure maps (where available) indicate past intrusive actions, including road construction, utility burial, construction of other facilities, etc.?
- Are there any external energy sources (e.g., high voltage RF, etc.) that may interfere with the geophysical detection or ranging data information?

7.5.8 A positive response to any of these five additional factors weighed against considering the geophysical anomaly as a potential UXO; however, this did not preclude excavating the anomaly. Individual decisions concerning each anomaly were reached after evaluating all of the data available on an anomaly. If there was not enough data to positively dismiss an anomaly as a potential UXO, the ARB requested the SVRO conduct additional investigations of the anomaly to further evaluate its nature. These investigations included

additional geophysical investigations of the anomaly, additional interviews with personnel knowledgeable of the subsurface conditions in the area, (e.g. property owner, utility representatives, etc.), or a limited excavation/clearance of the first six-inches of the area by the resident Huntsville Safety Specialist. These near surface investigations included visual observations to confirm the anomaly was non-ordnance. This latter investigation technique was able to eliminate 767 anomalies that could not otherwise be eliminated through the ARB process. The results of these additional investigations were collated and reviewed by CEHNC and SVRO with a further recommendation either for no further action or for complete excavation of the anomaly. The results and recommendation were then forwarded to the ARB for review.

7.5.9 The result of this process was to dismiss the majority of the discovered anomalies as the signatures of underground utilities, magnetic rock, or some other cultural feature. Of the 490 properties geophysically surveyed with the EM-31, 445 were cleared with no further disturbance to the property owner. Of the remaining 46 properties that did require a complete excavation to determine the nature of the geophysical reading, only one - an anomaly located in Zone 9 - contained a spent livens smoke ordnance item. Five other anomalies located in Zone 2 contained ordnance-related items (e.g., shrapnel, spent ordnance, or an ordnance container). The remaining excavated anomalies consisted of either construction debris or metal bearing rock.

7.5.10 The only munitions cache was the initial find at 52nd Court which was associated with an identified POI, POI 14. Following the initial find, over 1,900 anomalies (including pits, trenches, single items) in 518 properties throughout the OSR FUDS were investigated. All anomalies were evaluated following an established procedure, including an external Anomaly Review Board (ARB). The members of the ARB included experts in UXO, UXO detection, and associated UXO health and safety. The purpose of the ARB was to thoroughly review the data and determine which anomalies required further investigation.

7.5.11 Of the 1,900 anomalies, only four UXO single items were found. Two were suspect "amnesty" rounds (turned in anonymously by local residents). One was found in plain sight by the side of a road and the other was found near the USACE Spring Valley Resident Engineer's Office at the Interim Holding Area. The first was considered a suspect CWM containing munition because it appeared to contain liquid when handled (weight shifted). However, there were no static firing attachments and CWM was not loaded into ballistically fired munitions at AUES. Although it was most likely filled with water or other inert liquid it was sent to Pine Bluff Arsenal, Arkansas, for disposal. The other amnesty round was sent to

Letterkenny Army-Depot, Pennsylvania. The third round was an unfuzed mortar shell uncovered during the digging of a footer for a basement extension to a house. It was removed from the area by the 57th EOD Unit at Ft. Belvoir, detonated, and determined from detonation to be empty. The fourth was a spent Livens projectile partially filled with smoke agent which was discovered by the OSR FUDS UXO investigation team. It was sent to a RCRA permitted commercial facility in Sauget, Illinois, for incineration.

7.5.12 The results of the anomaly review process implemented at the OSR FUDS ensured the overall success of the geophysical investigation at the site and enhanced the quality and usefulness of the resulting findings and recommendations. In particular, the anomaly review process established clear criteria to evaluate the geophysical readings; ensured that each anomaly was judged against a formal, written standard; and provided for a 100 percent quality assurance check of the results of the geophysical survey to ensure that each identified anomaly was fully evaluated and dismissed only after a rigorous review of the geophysical investigation results.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc. (Section 5, Section 6).

TABLE 7.1

SUMMARY OF INTRUSIVE AND NONINTRUSIVE ANOMALY INVESTIGATIONS

OSR FUDS RI

Zone	Number of Properties Surveyed		Number of Sidescans	Number of Test Borings	Number of Anomalies Identified	Number of Anomalies Cleared by CEHND TM	Number of Suspect Anomalies Excavated by SVRO Team	Results of Excavation
	EM31	Schoenstedt						
1	118	22	5	0	32	28	4	Machine parts, rebar, metallic rock, steel plates.
2	137	1	0	0	44	35	9	Expended projectiles (7), container, shell fragments, utility lines, metallic debris (nails, screws, rebar, plates).
3	76	0	0	0	5	5	0	Nails, glass, construction debris, concrete footing.
4	93	2	3	32	326	324	2	Construction debris, magnetic rock, sheet metal, tin cans, utility lines, piping.
5	4	0	0	0	3	2	1	Steel grate, steel, wire, rock. Unfired 75 mm projectile found on ground surface by local resident. Empty WWI era bomb nose cone found during AU sod replacement.
6	43	0	0	0	0	0	0	Not applicable.
7	1	1	0	0	4	4	0	Hinge assemblies, metal file, reinforced concrete.
8	18	1	0	0	56	0	56	Magnetic rocks, nails, residential metallic debris.
9	0	1	0	0	370	369	1	Spent livens round with smoke agent (1), expended 75 mm projectiles (3), various metallic debris. Unfuzed Stokes mortar practice round (1) on ground surface near entrance to Interim Holding Area.
Totals	**490**	**28**	**8**	**32**	**840**	**767**	**73**	

Section 8

SECTION 8

ENVIRONMENTAL SAMPLING PROGRAM

8.1 ENVIRONMENTAL SAMPLING COMPLETENESS

No.	Location in Document			Statement in Document
	pp	¶	Lines	
2	1	3	1-2	"To our knowledge a total comprehensive environmental study was not done at the American University site."
10	2	4	1-7	".... since live chemical weapon munitions (CWM), as well as high explosive shells, were found buried at the American University site, and many toxic substances were released into the environment, we felt that a substantial research project was necessary in order to determine the potential for residual contamination and munitions on the site."
15	3	4	1-5	"It is our opinion that the remediation efforts did not address all of the areas of concern reflected in the Historical Report and Range Rule, and our own study, both with respect to the potential for contamination and the likelihood of more unexploded munitions on the site."
52	1	1	5-7	Letter to USEPA from DCRA "It is the conclusion of the report that the initial investigation and remedial action performed by the US Army Corps of Engineers was not adequately completed and the substantial additional action is required to protect the health and safety of residents in the area."

Salient Issue:

Determine if a comprehensive environmental study of the AUES was conducted. Determine if the CWM/environmental investigation was sufficiently thorough to detect all potential environmental contamination at the site.

Response:

8.1.1 The surficial soil environmental sampling program at OSR FUDS focused on CWM and CWM unique breakdown products at documented CWM testing areas. The basis of the investigation was: If the contamination was not detected at those locations where CWM use was documented, the likelihood of finding CWM or CWM unique breakdown products elsewhere on the OSR FUDS was remote. The investigation also included the analyses of samples for potential laboratory contamination in those POIs, (POI American University) where temporary labs were constructed for CWM research.

8.1.2 Following removal of the buried munitions from the initial discovery, Phase I, environmental samples were taken to determine the nature and extent of any environmental

contamination. The analysis of soil samples collected from the excavated and adjacent areas and water samples collected from the vicinity of the excavated area indicated that no residual contamination was present.

8.1.3 Phase II, the remedial investigation, began immediately after Phase I. The objectives of the Phase II surficial soil environmental sampling program were:

- Determine if residual CWM or CWM unique breakdown products or laboratory contaminants remain in 1918 level surficial soils as a result of AUES CWM research, development, testing, and evaluation activities.
- Determine if residual CWM or CWM unique breakdown products are present in soils in excavations of UXO items.

8.1.4 Soil samples were collected from randomly selected grid locations at the POIs at the 1918 soil elevation. Results of these samples were statistically compared to background levels.

8.1.5 In addition, soil samples were collected from side scan borings and excavations of UXO items. Sediment and water samples were also collected from Mill Creek.

8.1.6 No CWM or CWM unique breakdown products or laboratory contaminants associated with AUES CWM research and development activities were detected in over 260 environmental samples. Several naturally occurring metals which could also be associated with CWM, and others which were not associated with CWM, were detected at levels above background. However, when subjected to a risk assessment performed in accordance with the USEPA Risk Assessment Guidelines for Superfund (USEPA, 1989a) these were determined to require no further remedial action.

Reference:

USEPA, 1989a. *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation (Part A).* Washington, DC: Office of Emergency and Remedial Response. EPA/540/1-89/002.

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

8.2 MISSION EXPERIENCE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
3	1	3	6-8	".... the Army lacked experience as well, because it was the first time the Army had conducted an ordnance and chemical warfare removal operation in a residential area."

Salient Issue:

Determine if this was the first time the Army had conducted an ordnance and CWM removal operation in a residential area and if it degraded the quality of the CWM operation.

Response:

8.2.1 The fact that the OSR FUDS RI was conducted in a residential neighborhood did not adversely impact the investigation. The Army has experience conducting operations of this type in residential neighborhoods (see Section7.4.1). The methods chosen for this investigation were no different than those used to conduct any other remedial investigation (see Section 3). The only unique aspects of this project were the need to interface with many individuals or households in order to gain access to sample locations (see Section 11) and the use of real time instruments specific for CWM.

8.2.2 During sampling and intrusive activities the Army's Real Time Analytical Platform (RTAP) was used for continuous monitoring for mustard and lewisite agents in the air. Heated sampling lines collected air samples from the area where work was being performed. The samples were then analyzed using a van-mounted gas chromatograph and other instruments. Soil samples collected from the work area were screened for mustard and lewisite prior to being released for shipment.

8.2.3 According to the SHERP, in the event CWM was encountered, the Army's Technical Escort Unit (TEU) would take control of the site. TEU is the Army's non-tactical chemical warfare unit trained in handling CWM. While on-site, TEU monitored and maintained the exclusion zone as well as the contamination reduction zone. TEU is trained in the handling and neutralization of CWM. This training also includes the collection of environmental samples for CWM screening during their operations.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc., (Section 1.4, Pages 1-9).

8.3 SOIL SAMPLING DEPTH

No.	Location in Document			Statement in Document
	pp	¶	Lines	
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sampled for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."

Salient Issue:

Were soil samples collected at various depths?

Response:

8.3.1 Since the major concern for the OSR FUDS is soil contamination resulting from testing at AUES in the 1918-1919 time frame, soil samples were collected at the depth of the 1918 ground surface in the areas most likely to be contaminated with OEW, CWM or CWM unique agent breakdown products or laboratory contaminants associated with AUES activities based on the historical uses of the POIs (see Section 5) and analyzed for the appropriate contaminants of concern (see Section 8.5). The 1918 ground surface is the most probable repository of any potential contamination resulting from past AUES activities. A cut and fill analysis of each POI was performed using a geographic information system (GIS) to calculate the depth of the 1918 ground surface relative to the current ground surface for all grid squares in a POI (see Section 6.4.1). Attainment of the 1918 ground surface was ascertained in the field by geologists examining the lithology of sample boreholes (e.g., changes in soil color, moisture content and soil type) and noted in field notes. Table 6.2 is a summary of the planned sample depths and the depths at which a sample was actually collected. If AUES-related contamination was detected in these samples, additional soil sampling at various depths would have been considered.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D.C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc., (Section 5.5.4, Pages 17, 21-23).

8.4 SAMPLE LOCATION (POI) RATIONALE

8.4.1 Surface Soil Sampling

No.	Location in Document			Statement in Document
	pp	¶	Lines	
7	2	2	3-7	"Only a few of these chemicals have been tested for at the site, and then only at isolated locations. No random grid sampling of soil and groundwater was done. No survey has been conducted to determine if there are any adverse health effects to the residents of the area."
25	9	4	1-5	".... there were 153 structures by war's end. Spills, dumping or burial of small quantities of toxic substances could have occurred at any of these structures, necessitating extensive soil and groundwater testing."

Salient Issue:

Determine if there was random sampling of soil. Determine if the soil sampling program assessed all potential areas of soil contamination.

Response:

8.4.1.1 The goal of the soil sampling program was to determine if the areas of the OSR FUDS most likely to be contaminated were indeed contaminated. The basis of the 1918 surface soil sampling program was a statistically-based random soil sampling within all POIs identified as having the greatest potential for residual environmental contamination based on past use as identified in the historical record (see Section 5). Field activities were performed in accordance with the approved Work Plans, Quality Assurance Project Plan, and Health and Safety Plan (USACE, 1994 b, c, d, and e) to ensure that data of known quality were generated. Details on these activities, including sampling and quality assurance/quality control (QA/QC) protocols, are documented in the above-referenced plans. The elements of the surficial soil sampling program are described in the following sections.

8.4.1.2 Statistical Sample Program Design

8.4.1.2.1 A sufficient number of samples was collected to statistically determine if a chemical was present and to determine if the average concentration of a chemical detected in a POI is significantly different than the average concentration of that chemical in the background samples. The minimum number of samples required to statistically test this problem was based upon the confidence level, power, minimum detectable relative difference, and the coefficient of variation of the data set (USACE 1995b, Section 5.5.4.3 page 5-21).

8.4.1.2.2 Confidence Level: The confidence level is the probability of accepting the null hypothesis when it is true. This is the probability of accepting that the soil is contaminated when in effect it is not. In statistical terms, a Type I error rejects the null hypothesis when the null hypothesis is true. The probability of a Type I error is α and the confidence level is $1-\alpha$. USEPA recommends a confidence level of 90 to 95 percent (Barth, 1989), and these tests were run with a confidence level of 95 percent (USACE 1995b, Section 5.5.4.3 page 5-21).

8.4.1.2.3 Power: The power is the probability of accepting the null hypothesis when it is false. This is the probability of accepting that the soil is not contaminated when in fact it is contaminated. In statistical terms, a Type II error is not rejecting the null hypothesis when the null hypothesis is false. The probability of a Type II error is ß and the power of a test is 1-ß. USEPA recommends a power of 90 to 95 percent (USACE 1995b, Section 5.5.4.3 page 5-21).

8.4.1.2.4 Minimum Detectable Relative Difference (MDRD): The MDRD is the relative increase over background level to be detected with a probability of 1-ß. USEPA guidance is 10 to 20 percent (Barth, 1989). However, since the contaminants of interest are unique to chemical agents and the contamination will be isolated to small areas, a higher MDRD of 30 percent is acceptable (CWM and CWM unique breakdown products are not present in background soils, therefore, any detectable contamination is a direct result of CWM activities) (USACE 1995b, Section 5.5.4.3 page 5-21).

8.4.1.2.5 Coefficient of Variation (CV): The CV is a measure of the amount of "variation" in a sample with respect to the average of the samples in the population (i.e., the ratio of the standard deviation to the average of the samples within the POI for a specific contaminant). A CV of 35 percent was accepted as a reasonable and conservative initial value (Barth, 1989). However, the actual CV for the samples were much higher (65 to 120 percent). Therefore, it was not possible to calculate the power of the statistical tests (USACE 1995b, Section 5.5.4.3 page 5-22).

8.4.1.2.6 Thirteen samples were collected in each POI to provide an MDRD of 30 percent between the potentially contaminated area and background soil at a 90 percent confidence level, with a power of 95 percent, assuming a coefficient of variation of 35 percent. These data were tested to determine the actual values for these parameters. However, as discussed above, high CV prevented power from being calculated. These samples were randomly selected from the suspected areas of potential contamination. This selection method assumes concentrations are normally distributed. Subsequent tests on the sample distributions

indicated that the samples conformed to a lognormal distribution. However, the fact that the distributions were lognormal did not effect the random selection process (USACE 1995b, Section 5.5.4.3, page 5-22).

8.4.1.3 Random Sample Location Procedure

8.4.1.3.1 Using a GIS, each POI was gridded with a 17 x 17 grid. The dimensions of the grid were varied to closely match the dimensions of the POI. This produced enough grid squares to ensure that samples were drawn from less than 5 percent of the available squares, thus minimizing sample selection bias. The grid squares were numbered and 13 specific squares were selected using a random number generator. Seven additional grid squares were also randomly selected to serve as alternate grid squares to replace those grid areas where sampling was not possible (e.g., houses, streets, etc.) or properties where property owner consent was denied. The sample location state plane coordinates and depth to 1918 level were determined from the GIS (USACE 1995b, Section 5.5.4.3 page 5-22).

8.4.1.4 Sample Depth Determination

8.4.1.4 Much of the OSR FUDS was cut or filled during construction activities after the AUES closed. A cut and fill analysis of each POI was performed using a GIS to calculate the depth of the 1918 ground surface relative to the current ground surface for all grid squares in a POI. Since the major concern for the OSR FUDS is soil contamination resulting from testing at AUES in the 1918-1919 time frame, soil samples were collected at the depth of the 1918 ground surface. Attainment of the 1918 ground surface was ascertained in the field by geologists examining the lithology of sample boreholes (USACE 1995b, Section 5.5.4.3 page 5-22).

Reference:

Barth, D. S., B. J. Mason, T. H. Starks, and K. W. Brown, March 1989. Soil Sampling Quality Assurance User's Guide. *Las Vegas: US Environmental Protection Agency. EPA/600/8-89/046.*

USACE, 1994b. *Quality Assurance Project Plan, Spring Valley Operation Safe Removal Project, Washington, D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Engineering Science, Inc.

USACE, 1994c. *Health and Safety Plan, Spring Valley Operation Safe Removal Project, Washington, D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Engineering Science, Inc.

USACE, 1994d. *Field Sampling Plan for Remedial Investigation, Spring Valley Operation Safe Removal Project, Washington, D C. Volume I: General Protocols.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Engineering Science, Inc.

USACE, 1994e. *Field Sampling Plan for Remedial Investigation, Spring Valley Operation Safe Removal Project, Washington, D C. Volume II: Site-Specific Plans.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Engineering Science, Inc.

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

8.5 CONTAMINANT SELECTION

No.	Location in Document			Statement in Document
	pp	¶	Lines	
7a	2	2	3-7	"Only a few of these chemicals have been tested for at the site, and then only at isolated locations. No random grid sampling of soil and groundwater was done."
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sampled for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."
21	5	1	1	"Specific Quantities and Types of Toxic Substances"

Salient Issue:

Determine if all the potential contaminants were included in the analyte list. Determine if the analyte lists used were appropriate. Determine if the list and quantity of toxic substances is accurate.

Response:

8.5.1 During the scoping phase of the RI the analytes of concern for the OSR FUDS were identified. All chemical warfare agents and explosives (including their breakdown products) known to be used at AUES were included on the analyte list for the OSR FUDS. Table 8.1 is a summary of the chemicals of concern by POI. In addition, the compounds determined in the PA as being used at AUES were evaluated to ensure that the appropriate analyses were performed at each POI (*Memorandum For Record, Subject: Chemical Agents, Toxins, Smoke, Incendiary, and Detonator Materials Investigated at American University Experiment Station During World War I*, Jeffery K. Smart, 1993. Historical Division, Corporate Information Office, Chemical Biological Defense Agency).

8.5.2 CWM such as sulfur mustard and its degradation products (oxithiane. dithiane and thiodiglycol) were thoroughly investigated at all POIs where it was determined that agent testing occurred. Analyses to detect lewisite (as chlorovinylarsenious acid) also were conducted for in locations where agent was tested. The presence of lewisite is determined by the presence of chlorovinylarsenious acid a lewisite breakdown product. Chlorovinylarsenious acid was analyzed for at all POIs were agent testing had occurred. Adamsite was analyzed for where the historic record indicated adamsite testing. Cyanide another CWM was tested for at all locations where CWM was used. Phosgene was not sampled since phosgene vaporizes when released from the container rapidly degrading in the presence of moisture. Explosives were tested for at those locations where the PA determined that explosives were tested or where munitions were detonated for testing purposes. Metal analyses were also performed where the PA indicated the potential for metals contamination (USACE, 1995b, Section 5.5.4.2, page 5-19 through 5-21).

TABLE 8.1
CHEMICALS OF CONCERN BY POINT OF INTEREST
OSR FUDS RI

Point Of Interest	Chemicals of Concern[1]								Rationale for Selecting Chemicals(s) of Concern
	Sulphur Mustards	Lewisite /CVAA	Adamsite	Total Cyanide	Explosives	Metals	Volatile Organic Cmpnds.	Semivol. Organic Cmpnds.	
POI 1	X	X		X	X				Used as static test firing area for CWA.
POI 7	X	X		X					Used as a CWA persistence testing area.
POI 10/11	X	X		X	X				Used as static test firing area for CWA.
POI 15									Greater than 10 feet of cut, therefore, not environmentally sampled.
POI 16	X	X		X					Used as a CWA persistence testing area by spraying CWA over field.
POI 19	X	X		X					Used for testing of CWA.
POI 20	X	X		X	X				Former location of two powder magazines.
POI 21/22/23	X	X		X	X	X			Used for testing of explosives and CWA.
POI 24	X	X	X	X	X				Location of a probable pit.
American University	X	X		X		X	X	X	Location of numerous laboratories and fabrication

TABLE 8.1 (Continued)
CHEMICALS OF CONCERN BY POINT OF INTEREST
OSR FUDS RI

Point Of Interest	Chemicals of Concern[1]								Rationale for Selecting Chemicals(s) of Concern
	Sulphur Mustards	Lewisite /CVAA	Adamsite	Total Cyanide	Explosives	Metals	Volatile Organic Cmpnds.	Semivol. Organic Cmpnds.	
									buildings where documented releases of CWAs and laboratory chemicals occurred.
Baker Valley	X	X		X					Location of a documented release of lewisite.
Bradley Field/ Major Tolman's Field	X	X	X	X	X				Used for testing of CWA. Eight shells containing adamsite were fired here.
Background				X		X			
Mill Creek	X	X			X	X[2]			Located near POI 16 (CWA persistence testing area)
Bunker Samples (POI 21 & 23)	X	X		X	X	X	X	X	Used for testing of CWA and explosives.
Sidescan Samples	X	X		X	X	X	X	X	Samples collected from near anomalies.
Excavation Samples	X	X		X	X	X			Samples collected in excavations for anomalies/ munitions.

[1] Sulphur mustards - mustard agent, oxathiane, dithiane, and thiodiglycol

[2] Analyzed for arsenic only

Lewisite - Lewisite as chlorovinylarsenious acid (CVAA)

Adamsite - Adamsite as diphenylarsenious acid (DPAA)

Explosives - Tetryl, trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, nitroglycerin, and nitrobenzene

Metals - 23 hazardous substance list metals.

Volatile Organic Compounds - USEPA Method SW-846 8240 list

Semivolatile Organic Compounds - USEPA Method SW-846 8270 list

8.5.3 Potential laboratory contaminants were analyzed for at American University where most of the laboratories were located. It was determined that many (approximately 80-90 percent) of the compounds listed in the historical report as being VOC and SVOC compounds associated with laboratory activities are not on the analyte lists of standard USEPA analytical methods such as SW-846 8240 and 8270. Therefore, all VOC and SVOC analyses had tentatively identified compounds (TICs) reported in addition to the target compounds already being analyzed for. TICs are checked by computer against a spectrum library of known compounds. Compounds which could not be identified from this library were reported as unknowns. A comparison of the list of compounds from the historical report with the laboratories spectrum library found that a majority of the compounds listed in the historical report were in the gas chromatograph/mass spectrometer (GC/MS) library. Therefore, the analyte list included as many of the compounds listed as being used at AUES as was possible.

Reference:

Smart, 1993. *Memorandum For Record, Subject: Chemical Agents, Toxins, Smoke, Incendiary, and Detonator Materials Investigated at American University Experiment Station During World War I.* Historical Division, Corporate Information Office, Chemical Biological Defense Agency).

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

8.6 SAMPLE MEDIA SELECTION

8.6.1 Soil

8.6.1.1 Soil was selected as the primary environmental media of concern at the OSR FUDS based on the evidence provided in the historical record regarding releases of hazardous materials at the AUES. Releases of hazardous materials at the AUES were primarily static detonations of CWM-containing munitions or the direct application of CWM to ground surface during persistency testing. Other releases occurred during accidents, explosions, and/or fires at the AUES. The CWMs of concern all hydrolyze quickly into their respective breakdown products. Chlorovinylarsenious acid is a breakdown product that is not very mobile in soils. Explosives and metals are also potential chemicals of concern that are not readily mobile in soils. Thus, the most likely source of contamination would be those surfaces (i.e., ground surface in 1918) that were known to have been exposed to OEW, CWM or agent breakdown products. The presence of OEW, CWM or their breakdown products at the 1918 ground surface would indicate the potential for contamination migration. (USACE 1995b, Section 7).

8.6.2 Groundwater

No.	Location in Document			Statement in Document
	pp	¶	Lines	
7a	2	2	3-7	"Only a few of these chemicals have been tested for at the site, and then only at isolated locations. No random grid sampling of soil and groundwater was done."
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sampled for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."
25	9	4	1-5	".... there were 153 structures by war's end. Spills, dumping or burial of small quantities of toxic substances could have occurred at any of these structures, necessitating extensive soil and groundwater testing."

Salient Issue:

Determine if groundwater should have been addressed during this investigation.

Response:

8.6.2.1 Groundwater was not considered to be an environmental media of concern at the OSR FUDS because no surficial (i.e., source) contamination was discovered. Also since the District of Columbia residents are supplied with drinking water via municipal sources that draw water from the Potomac River and would not come in contact with groundwater a detailed study of the groundwater was not warranted. However, if significant AUES-related soil contamination had been detected, potential groundwater contamination would have been evaluated.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

8.6.3 Surface Water

8.6.3.1 In addition to the surficial soil samples seven water samples were collected from POI 38, Mill Creek. The water samples were collected at seven different locations along the length of Mill Creek. The water samples were analyzed for mustard, mustard breakdown products, lewisite (as chlorovinylarsenious acid), explosives, arsenic and total cyanide. No chemical agents, explosives, or their breakdown products were detected in any of the water samples collected along Mill Creek.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc. (Section 6.9.2, page 6-46 through 6-49).

8.7 SAMPLE ANALYSIS PROCEDURES

8.7.1 Analytical Method Selection

8.7.1.1 The analytical methods used were selected to ensure the highest potential for detection of CWM, CWM unique breakdown products, explosives, and potential laboratory chemicals in the soil. Due to the potential for CWM, a US Army approved chemical surety laboratory, Midwest Research Institute (MRI) of Kansas City, Missouri, was selected. MRI is one of a select few chemical surety laboratories in the country. They are experienced in handling and analyzing CWM and CWM unique breakdown products. MRI is also an USACE Missouri River Region approved laboratory for environmental samples. (The USACE Missouri River Region is the USACE Center of Expertise for environmental matters.) All CWM and CWM breakdown product analyses were performed using Army-approved methods for chemical surety materials. All other methods used to detect the remaining potential contaminants were analyzed by standard USEPA methods such as SW-846 Methods 6010, 7060, 8330, 8240, and 8270. In the case of VOC and SVOC analyses for potential laboratory chemicals, tentatively identified compounds (TICs) were reported to ensure that as many of the chemicals known to be used at the AUES could be identified.

8.7.2 Data Quality Objectives

8.7.2.1 Data quality objectives for precision and accuracy, representativeness, completeness and comparability were specified in the approved QAPjP (USACE, 1994b). The QAPjP complied with USEPA Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80 (USEPA, 1988c) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01 (USEPA, 1988a), Data Quality Objectives for Remedial Response Activities , and OSWER Directive 9399.0-79 (March 1987) (USEPA, 1987). The QAPjP was reviewed by USEPA.

8.7.3 Data Validation

8.7.3.1 All analytical results generated for this project were validated to ensure they complied with the quality assurance (QA) objectives listed in the QAPjP (USACE., 1994b) and the United States Environmental Protection Agency's functional guidelines for validation of organic and inorganic data. The validation process assessed and summarized the quality and reliability of the data (usability) and documents the factors affecting usability.

8.7.3.2 Criteria assessed during data validation included holding times, target reporting limits, blank contamination, precision, accuracy, representativeness, completeness, and comparability. Data validation was conducted in three stages: examining each data package for completeness, legibility, and compliance with the analytical, QA/QC, and reporting procedures described in the QAPjP; reviewing and verifying of all results reported for environmental and quality control (QC) samples; and preparing the data validation report. All data validation reports and validated data was reviewed by the USEPA Region III laboratory.

8.7.3.3 The data validation report summarized nonconformances to the QA objectives. For each nonconformance, the nature and extent of the nonconformance, the target analytes and samples affected, and the effect of the nonconformance on the usability of the data are described in the data validation report. Data validation qualifiers have been applied to the results reported by the laboratory to signify the effect of the nonconformance on data usability.

8.7.4 Data Quality Assurance/Quality Control Issues

8.7.4.1 No major quality assurance/ quality control issues effected the results used to determine the presence of chemical warfare agents, agent breakdown products, explosives and potential laboratory contaminants at the OSR FUDS.

Reference:

USACE, 1994b. Quality Assurance Project Plan, Spring Valley Operation Safe Removal Project, Washington, D.C. *Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.*

USEPA, 1987. Data Quality Objectives for Remedial Response Activities. *OSWER Directive 9399.0-79.*

USEPA, 1988a. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. *OSWER Directive 9355.3-01.*

USEPA, 1988c. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. *QAMS-005/80.*

8.8 POI 24

8.8.1 POI 24 was incorrectly located during the RI. As a result of the 1997 RI evaluation, aerial and supporting photographs were reviewed by the TEC. Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. The previous and corrected POI 24 locations are shown on Figure 8.1. All the other POI were accurately located in the OSR FUDS RI Report and appropriately investigated.

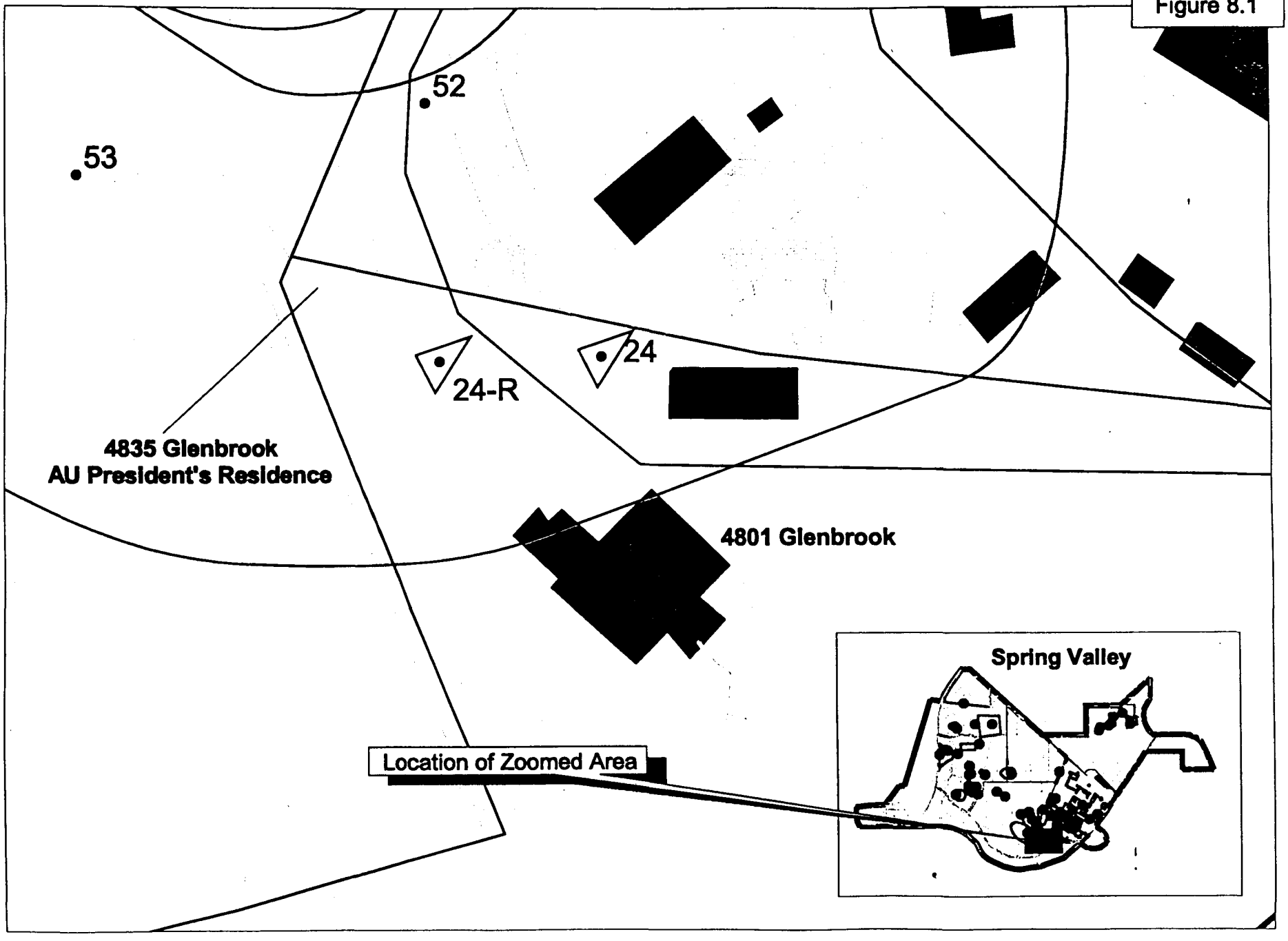
8.8.2 POI 24 was also initially identified as a ground scar or a pit. As a result, environmental sampling was performed at the incorrectly identified location. The results of this sampling were presented in the RI report.

8.8.3 During this 1997 RI evaluation, further analysis of circa 1918 photos of AUES concluded 5 gallon (approximately) glass or ceramic containers which could have contained mustard agent may have been buried in a pit near the fenced perimeter of the AUES. This review also identified POI 24 as a possible mustard agent burial pit. The disposal practice at the time was to place containers in a pit, break the container, spread chlorinated lime over the mustard agent, and backfill the pit. Under these conditions, it is possible mustard agent could exist in a polymerized form. Undisturbed, this potential hazard poses no risk to the public. However, the following alternatives are available to address the long-term impacts of the potential polymerized mustard or CWM related environmental contamination at POI 24.

- No action.
- Notify and coordinate with the public and take no action.
- Notify and coordinate with the public and initiate institutional controls (e.g. notify the property owner, red tag any construction permits for this specific area).
- Notify and coordinate with the public and conduct additional geophysical investigation and soil sampling for polymerized mustard or other CWM related environmental contamination.

8.8.4 Based upon the new photographic interpretation, the Army recommends further investigation of POI 24. This recommendation includes additional geophysical investigation and soil sampling to determine if polymerized mustard or other CWM related environmental contamination exist at POI 24.

Figure 8.1


52
53
24-R
24
4835 Glenbrook
AU President's Residence
4801 Glenbrook
Spring Valley
Location of Zoomed Area

Section 9

SECTION 9

RISK ASSESSMENT PROCESS

9.1 HEALTH SURVEY

No.	Location in Document			Statement in Document
	pp	¶	Lines	
7b	2	2	3-7	"No survey has been conducted to determine if there are any adverse health effects to the residents of the area."
18	3	7	1-3	".... a health survey of the residents should be conducted to determine if there is any elevated incidence of any disease processes, related to the hazardous substances listed."

Salient Issue:

Would a formal causal relationship study (i.e., health effects survey) for Spring Valley residents be appropriate?

Response:

9.1.1 A Health Consultation performed by Agency for Toxic Substances and Disease Registry (ATSDR) for AUES under the authority of CERCLA (Joe and Hughart, 1997) concluded:

> "Since health outcome data was not provided for evaluation, formal causal relationship studies are not recommended at this time. ATSDR, Centers for Disease Control (CDC), and District public health representatives should discuss the extent and types of health outcome data available, and determine an appropriate course of action."

9.1.2 A second Health Consultation performed by ATSDR focused on assessing soil sampling results at the American University (Abouelnasr, 1997) and concluded:

> "The most recent sampling information available from the US Army and the EPA do not indicate that adverse health effects might occur as a result of exposure to these soils. However, many of the suspected chemical warfare agents, laboratory reagents, and their degradation products were not analyzed for in the samples. Because of the volatile and reactive nature of many of these chemical warfare agents, it is not likely that much remains as soil contamination.

Chemical and conventional ordnance may remain buried at the American University or in the vicinity. In addition, laboratory or storage vessels may also be buried in these areas. These discarded weapons and glassware may hold explosives or noxious agents, and could pose serious health threats if they are unearthed."

Reference:

Joe, P. and J. Hughart. 1997. Health Consultation: American University Experiment Station. Memorandum to Chief Medical Officer, Special Programs Activity, NCEH/CDC/HHS and Deputy Director, Office of Federal Programs, ATSDR/HHS. June 3, 1997. Agency for Toxic Substances and Disease Registry.

Abouelnasr, D, 1997. Public Health Consultation Assessing Soil Sampling Results at the American University, Office of Federal Programs, ATSDR/HHS. August 26, 1997. Agency for Toxic Substances and Disease Registry.

9.2 VAPOR EXPOSURE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
33	10	4	1-4	"Some of the munitions previously found contain liquefied poison gas which is designed to vaporize when the shell ruptures on impact and likewise will vaporize if it rusts through."

Salient Issue:

Determine if vaporization of CWM from rusted AUES ordnance is a viable exposure pathway.

Response:

9.2.1 Exposure to CWM via inhalation of vapors from rusting munitions is not likely at the AUES because:

1. The likelihood of a resident coming in contact with a stray leaking chemical munition or a stray ruptured phosgene munition is remote. The historical record shows that the chemical rounds used during testing activities were individually accounted for (see Section 4), so the potential for a stray chemical round to exist is slight. To date, four single rounds have been found at OSR FUDS. Only one was a suspect, not confirmed CWM round. The UXO investigation focused specifically on locating munition caches. Any potential cache of munitions would have been detected during the geophysical investigation of the OSR FUDS.

2. Mustard is a liquid at ambient temperatures and freezes at 14.5°C, so exposure to this compound from a leaking munition would be predominantly through direct contact and not through exposure to vapors.

3. Phosgene is the only CWM at the AUES that vaporizes when released from the container. It is considered an unlikely inhalation hazard. In the scenario of a leaking container, the release would likely be slow (these are not pressurized cylinders) and phosgene would rapidly degrade in the presence of moisture.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

9.3 BACKGROUND LEVEL ASSESSMENT

No.	Location in Document			Statement in Document
	pp	¶	Lines	
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sample for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."

Salient Issue:

Were sample results compared to naturally occurring background levels?

Response:

9.3.1 Sample results for all naturally-occurring analytes, i.e., metals, were statistically compared to background levels as part of the risk assessment process. This analysis was designed to determine if the concentrations at the POIs were higher than background levels from the same soil type. Kruskal-Wallis and one-tailed Analysis of Variance (ANOVA) tests were performed on the data at the 95% confidence level. Metals with concentration means that exceeded background were carried forward to the risk assessment.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington D C.* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc.

9.4 RISK ASSESSMENT

9.4.1 The risk assessment for the OSR FUDS was conducted in accordance with USEPA guidance including the *Risk Assessment Guidance for Superfund Human Health Evaluation Manual* (RAGS) (USEPA, 1989a) and supporting documents. The guidance provides information on determining the nature of chemical releases from a site, the potential pathways for human exposure, and a measure of the potential threat to public health and the environment as a result of such releases. The following steps were completed sequentially for the evaluation with respect to carcinogenic and non-carcinogenic effects:

- Identification of potential chemicals of concern;
- Exposure assessment;
- Toxicity assessment; and
- Risk characterization.

9.4.2 In accordance with USEPA Region III guidance (USEPA, 1993), detected chemicals from the POI were compared to screening RBCs for the residential scenario (USEPA, 1994). A screening RBC is defined as an acceptable concentration based on a one in a million risk level for a carcinogen and on an adjusted target hazard index of 0.1 for noncarcinogens. The noncarcinogenic target hazard index was adjusted to one tenth of the published USEPA Region III RBC to account for potential additive effects of a multiple chemical exposure. In this report, screening RBC refers to the appropriate screening RBC for carcinogens and noncarcinogens. If the maximum detected chemical concentration did not exceed the screening RBC, no further evaluation of that chemical was performed. However, if a detected chemical concentration exceeded the screening RBC value, then a statistical comparison to background concentrations was performed.

9.4.3 Inorganic chemicals naturally present in soil and those potentially present as a result of contamination were statistically compared. The analysis was performed with respect to POI and soil type. The statistical mean and upper 95 percent confidence interval of background inorganic chemical concentrations was compared to the corresponding statistical evaluations of inorganic chemical concentrations sampled at each POI. Sample concentration means and upper 95 percent confidence interval values for each POI that did not exceed background were removed from the risk assessment. Sample concentration means and upper 95 percent

confidence interval values that exceeded background were carried forward to the risk assessment. Arsenic concentrations, of particular interest due to arsenic use at AUES were not significantly different from naturally occurring background concentrations.

9.4.4 Chemicals that are essential human nutrients or are toxic only at high doses were not considered as "chemicals of potential concern" for the human health evaluation (USEPA, 1989b). These chemicals included calcium, iron, magnesium, potassium, and sodium.

Chemicals of potential concern identified through the above screening process include:

- aluminum;
- beryllium;
- cadmium;
- manganese;
- mercury;
- selenium;
- thallium
- vanadium; and
- zinc.

9.4.5 Using the "chemicals of potential concern" identified in the data evaluation, the baseline risk assessment calculated potential health risks associated with potential exposure for two groups of people: residents and construction workers. Residents were evaluated for continuous individual exposure over a 30-year period to the "chemicals of potential concern" through incidental soil ingestion, dermal contact while gardening, and ingestion of home-grown vegetables. Construction workers were evaluated for potential risks for individual exposure over a period of two years through incidental soil ingestion, soil inhalation, and dermal contact while engaged in surface and subsurface excavation.

9.4.6 The risk assessment of the OSR FUDS, identified chemicals of potential concern at POIs 21/22/23 and POI 25 in Zone 4; at American University in Zone 5; and at the LTC Bancroft Area in Zone 9. In Zone 4, the following chemicals were evaluated:

- Aluminum;
- Beryllium;
- Manganese;
- Nickel;
- Selenium;
- Thallium; and
- Vanadium.

9.4.7 Results of the risk assessment for Zone 4 concluded that no further remedial actions are necessary at the OSR FUDS due to the presence of these metals.

In Zone 5, the following chemicals were evaluated:

- Aluminum;
- Beryllium;
- Cadmium;
- Nickel; and
- Vanadium.

9.4.8 Results of the risk assessment for Zone 5 concluded that no further remedial actions are necessary at the OSR FUDS due to the presence of these metals.

In Zone 9, the following chemicals were evaluated:

- Beryllium;
- Cadmium; and
- Zinc.

9.4.9 Results of the risk assessment for Zone 9 concluded that no further remedial actions are necessary at the OSR FUDS due to the presence of these metals.

Reference:

USACE, 1995b. *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington DC* Prepared for US Army Corps of Engineers, Huntsville Division and Baltimore District. Prepared by Parsons Engineering Science, Inc. *Section 8, Pages 1-49.*

USEPA, 1993. Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening. Region III, Office of Superfund Programs. EPA/903/R-93-001.

USEPA, 1994. Risk-based Concentration Table. Region III, Technical Support Section. (April).

Section 10

SECTION 10

OTHER REPORTS

10.1 COMPARISON TO WORLD WAR I BATTLEFIELD

No.	Location in Document			Statement in Document
	pp	¶	Lines	
35	11	2	1-4	"Experience with the leftover gas shells found on the WWI European battlefields conclusively demonstrates that the gas in these shells remains viable, and that the shells will corrode through releasing the gas."
36	11	2	4-8	"A very definitive article on the hazards of remaining WWI gas munitions is titled, 'The Soldiers Moved On. The War Moved On. The Bombs Stayed' by Donovan Webster, from the Smithsonian Magazine, February, 1994."

Salient Issue:

Determine if it is appropriate to compare a former battlefield from two world wars with AUES testing operations.

Response:

10.1.1 There is no valid comparison between the activities at AUES and the carnage of the First World War in France. Historical documents of activities at AUES suggest an orderly and scientific approach. The 1918 aerial photograph is a good record of how the Spring Valley area appeared in late 1918. There are the two circular test trench rings, some trenches associated with Camp Leach and a few scattered areas where cratering is visible. Field reports indicated that scrap metal was cleared from a test area before it was used again. Researchers at AUES seemed to have kept track of most of the material that was on hand.

10.1.2 The WWI battlefield environment was a picture of chaos. The volume of UXO collected in France is staggering. After the initial attempt to outflank the French Army in 1914 and the subsequent race to the coast, armies on the western front settled into four years of trench warfare. Hundreds of thousands of tons of shells were exchanged. Artillery barrages lasted for hours and even several days prior to the onset of major offensive operations. France and Flanders was a morass of mud. Once a shell was fired from a tube it was impossible to account for what happened to it. Dud or not, once a shell left a gun it was gone. This is a very different picture from the test activities at AUES. The Smithsonian article focuses on the Verdun

battlefield. The battle for Verdun lasted six months, and the Germans attempted to bleed the French Army to death there. There was intensive combat and artillery fire nearly everyday. The article states that 700,000 German shells were fired in a 4 hour period to blow a hole in the French front line in 1918, as opposed to the static firing of single rounds during the testing activities at the AUES. The volume of activity at AUES pales in comparison.

Reference:

None.

10.2 APEX ENVIRONMENTAL

10.2.1 Apex findings

No.	Location in Document			Statement in Document
	pp	¶	Lines	
13a	3	3	1-7	"Additionally, on June 10, 1996, we were informed that a full glass chemical bottle with glass stopper had been unearthed along with the remains of several more, at the American University site."
13b	3	3	1-7	"While we are awaiting a laboratory analysis, soil samples contained arsenic levels as high as 1200 parts per million, as well as other pollutants. To date, 40 cubic yards of contaminated soil have been removed."
14	3	3	7-12	"We were also informed that, 5 years ago, several workers were overcome during excavation procedures at the same site and hospitalized for respiratory problems. We feel strongly that these workers may have been exposed to poison gas from these broken bottles or a leaking munition disturbed during the excavation process."
54	1	5	2-7	Letter to USEPA from DCRA Recently, a hot spot of 1200 ppm arsenic (background level is approximately 3 ppm) was found at a private residence adjacent to American University (report enclosed). We have learned that in 1992 five (5) construction workers required medical treatment after being overcome while digging the foundation for this residence. The residence is in close proximity to the site of an arsenic laboratory which was in operation during World War I."

Salient Issue:

Determine if the high arsenic concentrations and laboratory bottleware are the result of AUES activities or potentially other activities. Are the elevated arsenic concentrations found near AU the result of past AUES activities. Where the workers exposed to a leaking munition.

Response:

10.2.1.1 On May 7, 1992 a construction firm, Brandt, began excavation activities at American University President's house at 4835 Glenbrook. Workers encountered "rotten odor" and unearthed laboratory jars, closed rusty empty 55-gallon drum, lab equipment, and ceramic materials. Environmental Management Systems Inc. (EMS) was contracted by American University to perform a site inspection. EMS conducted soil vapor probes and borings. (Apex, 1996, page 3)

10.2.1.2 On May 21, 1992 EMS concluded that "there are no hazardous, volatile, or controlled substances present at the site." Based on the EMS findings Brandt was allowed to continue the excavation. (Apex, 1996, page 4).

10.2.1.3 On May 27, 1992 Brandt workers begin working again and experience irritation to their eyes and faces while loading dirt into a dump truck. Workers reported a very acrid smell

emanating from the dirt. EMS re-inspected the site and noticed white granular layers in the soils. Samples of the white material were collected by EMS. The white granular substance was later identified as the herbicide 2-(2,4,5-trichlorohenoxy) propionic acid also know by the brand name Silvex. According to the *Herbicide Handbook, Weed Science Society of America, Fifth Edition.* (Weed Science Society of America, 1983) page 434 states that Silvex was introduced by DOW in 1952.

10.2.1.4 Based on this information, it is unlikely that the irritation experienced by the workers was due to exposure to AUES-era chemicals. It is most likely that the odors noticed in the excavated soils were from Silvex (which can be a white, granular material) detected in the EMS samples.

10.2.1.5 On 7 June 1996, several laboratory-type glass bottles were unearthed at the residence of the President of the American University, and landscape workers were forced to cease operations due to eye and respiratory irritations. Initial soil samples revealed elevated levels of VOCs and certain metals, with arsenic being of most concern. After delineating the contaminated area, Apex removed 30 cubic yards of the contaminated soil in sealed containers that were shipped to the treatment facility in Belleville, Michigan. Confirmatory samples collected after excavation demonstrated no detectable level of contamination. The samples collected included samples collected from the backyard. The following is a summary of the soil testing that was performed at the site.

10.2.1.6 Soil samples collected by Apex were analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, and metals. The following analytes were detected in one or more soil samples:

- **VOCs**: benzene, carbon tetrachloride, chloroethane, 1,1-dichloromethane, 1,2-dichloroethane, cis-1,2 dichloroethene, methylene chloride, 1,1,1,2-tetrachloroethane, toluene, 1,1,2-trichloroethane, and trichloroethylene.
- **SVOCs**: bis(2-chloroethoxy)methane and hexachlorobenzene; and
- **Metals**: antimony, **arsenic**, beryllium, chromium, copper, lead, nickel, and zinc.

PCBs, pesticides, and herbicides were not detected in any sample. After the initial excavation "No significant levels of metals or VOCs were revealed by the laboratory analysis of the samples collected" (Apex 1996, page 48).

10.2.1.7 Air samples collected by Apex detected "low levels" of sulfuric acid. Based on their finding Apex concluded that the sulfuric acid was the result of vehicle emissions (Apex, 1996, page 35).

10.2.1.8 The contents of the bottle were analyzed for Lewisite and Lewisite by-products by Edgewood Research, Development, and Engineering Center (ERDEC), Chemical Support Division, Analytical Chemistry team ([410]671-4202/3380) on 25 Nov. 1996. Neither dichloro-(2 chlorovinyl)arsine (Lewisite) nor its analog were detected (ERDEC, 1996). However, the major analytes detected were methylated benzenes, chloroalkyl benzenes, and chlorinated hydrocarbons which were first manufactured in the 1940's. These results are consistent with the analytical results of the soil samples described above.

10.2.1.9 Based on the fact that many of the chemical compounds found during the Apex and EMS investigations were not introduced until post World War I the contamination is not AUES related and the irritants the workers were exposed to were also not AUES related.

References:

Apex Environmental, Inc., 1996. *Final Report Conducted on President's Residence, 4835 Glenbrook Road, Washington, D.C.*

Weed Science Society of America, 1983. *Herbicide Handbook, Weed Science Society of America, Fifth Edition.*

ERDEC, 1996. *Analytical Results Report for Sample COE-L-6320-1.* By Analytical Chemistry Team, George L. Smith, SCBRD-ODC-O.

10.3 NAVAL SECURITY STATION

No.	Location in Document			Statement in Document
	pp	¶	Lines	
29	10	1	10-12	"Unfortunately, the arsenic soil test data we have available is for areas away from many of the probable test sites."
30	10	1	12-16	"Arsenic soil test data from the Naval Security Station, leeward from American University, reveals an elevated arsenic level approximately 1 foot underground, which could be compatible with a 75 year old deposition. Soil above and below this narrow bank shows very little arsenic (Appendix L)."

Salient Issue:

1) Determine if the Naval Security Station is downwind of the AUES. 2) Determine if the 1 foot horizon at the Naval Station was present at ground surface in 1918. 3) Further investigate this report.

Response:

10.3.1 It is inappropriate to use the Naval Security Station Report. Extensive evaluation of the arsenic levels at the primary impacted POIs of the AUES has revealed no health hazards where the deposition of the metal from AUES activities should be the greatest. Therefore there is no reason to suspect that the downwind hazard of arsenic would be suspected at the Naval Security Station.

10.3.2 There is no evidence in the Navy Site Inspection Report, dated February 1993, to support there is widespread arsenic contamination at the 1918 ground surface elevation (Haliburton NUS, 1993, Page 5-3, Item 5.1.1.2, and Tables D-1 & D-2). Tables D-2 through D-20 show a higher background arsenic concentration of 73.1 mg/kg versus the actual soil sample concentrations that ranged from 38.4 mg/kg to 1.9 mg/kg. By comparison, the US Geological Survey (USGS) reported average arsenic concentration for the Washington, DC area is 6.5 ppm and the current RI reported arsenic average was 3.5 ppm.

10.3.3 The executive summary, page ES-1 of the Navy SI Report, identified PCBs as the only contaminants that will require further delineation. Lead was detected in a single soil sample collected near Building 20, a former lead type casting shop. The report neither singled out arsenic as a contaminant of concern nor speculated that AUES was the origin for the inorganic findings.

10.3.4 To state there is a thin band of soil containing high arsenic levels is not supported by the data presented in the Naval Security Station Report. The arsenic concentration in question is the sample collected from SB01-00 (73.1 ppm) and identified as the site background sample. This background sample was reportedly collected between the inner and outer security fence. It is likely that on military sites, the area between the fences could have been sprayed with herbicides to suppress vegetation. Many early herbicides were arsenic based. In addition, since the field team reportedly used a 20 inch split spoon (2-inch inner diameter tube 20-inches long) to collect the samples it would not be possible to attribute the arsenic to a narrow band of soil.

Reference:

Haliburton NUS Environmental Corporation, 1993. *Site Inspection for the Naval Security Station Washing ton D.C.* Contract No. n62472-90-D-1298, Contract Task Order 0048.

Shacklette, H. T., and J. G. Boerngen, 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States*, US Geological Survey Professional Paper, 1270.

10.4 USEPA SPLIT DATA

No.	Location in Document			Statement in Document
	pp	¶	Lines	
55	2	1	1-6, 8-11	Letter to USEPA from DCRA "....we have also learned that EPA performed their own analysis of samples taken by the Army from locations at the Spring Valley site. The analysis results indicated contamination greater than the EPA recommended Risk-Based Concentration level for arsenic and other hazardous substances. Both surface and above ground level air burst testing of experimental chemical agents, many containing arsenic, were performed at the site..... Sample results may not indicate the presence of arsenic if they were not within the downwind contamination areas of these air burst test sites, however. We are therefore concerned that arsenic and other toxic materials may be present in high concentrations throughout Spring Valley and adjacent areas at rather shallow depths.

Salient Issue:

Do split samples analyzed by the USEPA show different results and produce different conclusions than those samples analyzed by USACE during the RI.

Response:

10.4.1 USEPA split samples were analyzed for Target Compound List (TCL) VOCs and SVOCs and Target Analyte List (TAL) metals. The results showed the presence of certain SVOCs, pesticides, PCBs and metals at concentrations above USEPA Region III Risk-based Concentrations (RBCs). These data are discussed in the following paragraphs.

10.4.2 Semivolatile Organic Compounds

10.4.2.1 The SVOCs detected at concentrations above RBCs are all PAHs. The six detected PAHs are components of petroleum-based fuels and their combustion products. In the urban environment such as OSR FUDS, it is highly likely that these PAHs are the result of releases that occurred subsequent to the closing of the AUES; therefore, they are not considered to be chemicals of potential concern for the OSR FUDS.

10.4.3 Pesticides and PCBs

The pesticide (chlordane) and polychlorinatedbiphenyl (PCB) (Arochlor 1260) are both compounds that were not manufactured until after World War II (approximately). Therefore, AUES cannot be the source of these compounds in these samples.

10.4.4 Metals

10.4.4.1 Metals were the only common analytes analyzed for in both the USACE samples and USEPA samples. A comparison of these metals data is provided in Table 10.1 which shows there are (not unexpectedly) differences in the results between a sample and its split. Potential sources of this variability are as follows:

- Natural Variability in Soils: Many metals are naturally present in soils and there is a wide natural variability in their concentrations. Barth *et al.* (1989) states that "soil is by its very nature is extremely variable. Superimposed on this natural variability are other sources of variation or error that can be introduced into the final result by the sampling and analytical efforts." USEPA (1996) also states that "environmental data commonly exhibit frequency distributions that are non-negative and skewed with long right tails."
- Variability Inherent to the Sample Analysis: The accuracy requirement for metals in the approved QAPjP was 75% to 125%. Therefore, there is an acceptable ±25% variability inherent in the sample analysis itself that contributes to differences between split sample results.
- Variability Between Laboratories: The USACE and USEPA split samples were analyzed by different laboratories. Analytical results, and in particular metals analysis results, tend to vary between laboratories (sometimes widely) due to slight differences in sample extraction, analysis, and reporting procedures.

Therefore, the variability between USACE and USEPA split sample data is not a concern for this site.

Reference:

Barth, D.S., Mason, B.J., Starks,, T.H., and K.W. Brown. 1989. Soil Sampling Quality Assurance User's Guide, Second Edition. US Environmental Protection Agency Document EPA/600/8-89/046, March 1989.

USEPA, 1996. Guidance for Data Quality Assessment: Practical Matters for Data Analysis, EPA QA/G-9, QA96 Version. EPA/600/R-96/084, July 1996.

TABLE 10.1
COMPARISON OF USEPA AND USACE METALS DATA
OSR FUDS RI

	Concentration (ug/kg) in Samples:					
	Arsenic		Beryllium		Chromium	
	USEPA	USACE	USEPA	USACE	USEPA	USACE
BACK-01	2,800	2,180	1,100	1,630		
BACK-02	4,100	1,860	1,500	1,980		
BACK-03			550	850	5.2E+05	5.7E+05
BACK-04	2,300	1,290	1,400	1,550	4.0E+04	4.8E+04
BACK-05	3,700	3,790	1,400	2,120		
BACK-06	2,900	810	1,600	2,460	1.2E+05	2.5E+05
BACK-07	3,000	2,880	1,500	1,980	3.9E+04	5.4E+04
BACK-08	17,000	16,500	680	1,750	7.0E+04	9.4E+04
BACK-09	3,500	1,250	1,500	2,030		
BACK-10	4,300	4,090	190	230 U		
BACK-11	2,700	2,790				
BACK-12	5,400	4,280				
BAKER-03	8,400 L	5,930	840 L	970	9.5E+04	4.4E+04 J
BAKER-04	4,800 L	980	3,200	3,040	6.3E+04	4.9E+04
BAKER-05	14,000 L	6,690	1,800	1,970	9.2E+04	7.8E+04
AU-01			1,300	1,960 U	4.2E+05	4.8E+05 J
AU-02	2,600 L	460	2,000	2,700	3.9E+05 J	4.1E+05 J
AU-03	11,000 L	4,230	3,300	2,380	6.5E+05	3.8E+05 J
AU-04	9,000 L	5,640	510	1,030		
AU-05	11,000 L	7,320				
AU-06	9,600 L	1,750	1,800	1,760	5.6E+04	4.1E+04 J
AU-07/08	5,000 L		1,700	1,670	5.8E+05	5.2E+05 J
AU-09		2,290	1,500	1,950	1.4E+05	1.5E+05 J
AU-10	4,300 L	1,680	960	1,100	5.6E+04	5.6E+04 J
HOLMES-07			1,100	1,720 J	9.9E+05	2.1E+06
HOLMES-10			630	2,760 B	3.3E+05	1.6E+06
HOLMES-12			870	1,370	4.5E+05	6.9E+05
HOLMES-13			890	1,350 J	4.7E+05	8.3E+05
HOLMES-15/16	2,500 J		700	1,850 B	4.5E+05	9.3E+05

Notes:
J = Estimated Value
K = Biased High
L = Biased Low
U = Not detected

TABLE 10.1 (Continued)
COMPARISON OF USEPA AND USACE METALS DATA
OSR FUDS RI

	Concentration (ug/kg) in Samples:					
	Manganese		Vanadium		Antimony	
	USEPA	USACE	USEPA	USACE	USEPA	USACE
BACK-01	4.3E+05	5.2E+05				
BACK-02	2.2E+06	2.6E+06				
BACK-03	8.2E+05	7.6E+05	6.6E+04	8.4E+04		
BACK-04	3.7E+05	3.4E+05				
BACK-05	6.8E+05	4.2E+05				
BACK-06	3.1E+05	7.6E+05				
BACK-07	4.1E+05	4.3E+05				
BACK-08	4.2E+05	7.5E+05				
BACK-09	9.7E+05	1.1E+06				
BACK-10	5.4E+04	7.2E+04				
BACK-11	1.1E+05	1.4E+05				
BACK-12	1.1E+05	2.0E+05 J				
BAKER-03	2.9E+05	4.1E+05 J				
BAKER-04	9.6E+05	9.1E+05	2.4E+05	2.3E+05	29,000 L	9,720 U
BAKER-05	6.7E+05	5.3E+05	6.5E+05	5.5E+04		
AU-01	1.8E+06 J	3.1E+06 J	1.3E+05	1.5E+05	16,000 L	9,150 UJ
AU-02	1.6E+06 J	2.6E+05 J	1.8E+05	2.1E+05	19,000 L	10,340 UJ
AU-03	7.0E+05 J	9.7E+05 J	6.2E+05	4.9E+05	40,000 L	9,290 UJ
AU-04	7.4E+04 J	6.9E+04 J			11,000 L	9,010 UJ
AU-05						
AU-06	3.7E+05 J	3.8E+05 J				
AU-07/08	3.4E+05 J	4.1E+05 J	1.2E+05	1.1E+05	23,000 L	9,600 UJ
AU-09	5.5E+05 J	9.8E+05 J	7.9E+04	8.6E+04	33,000 L	9,300 UJ
AU-10	4.8E+05 J	4.5E+05 J	7.8E+04	1.7E+04	36,000 L	8,980 UJ
HOLMES-07	4.1E+05	4.5E+05	8.1E+04	1.4E+05		
HOLMES-10	7.1E+05	2.5E+06	1.5E+05	1.9E+05		
HOLMES-12	3.7E+05 K	3.5E+05	9.3E+04	1.1E+05		
HOLMES-13	6.4E+05	7.4E+05	6.9E+04	1.2E+05		
HOLMES-15/16	3.0E+05	4.8E+05	1.0E+05	1.8E+05		

Notes:
J = Estimated Value
K = Biased High
L = Biased Low
U = Not detected

TABLE 10.1 (Continued)
COMPARISON OF USEPA AND USACE METALS DATA
OSR FUDS RI

	Concentration (ug/kg) in Samples:					
	Thallium		Nickel		Mercury	
	USEPA	USACE	USEPA	USACE	USEPA	USACE
BACK-01						
BACK-02						
BACK-03						
BACK-04						
BACK-05						
BACK-06						
BACK-07						
BACK-08						
BACK-09						
BACK-10						
BACK-11						
BACK-12						
BAKER-03						
BAKER-04						
BAKER-05						
AU-01						
AU-02						
AU-03						
AU-04						
AU-05						
AU-06						
AU-07/08						
AU-09						
AU-10						
HOLMES-07					20,000	120 J
HOLMES-10			250,000	312,510	26,000	120 UJ
HOLMES-12					17,000	130 UJ
HOLMES-13					14,000	110 J
HOLMES-15/16					18,000	180 J

Notes:
J = Estimated Value
K = Biased High
L = Biased Low
U = Not detected

10.5 LEWISITE RESIDUE

No.	Location in Document			Statement in Document
	pp	¶	Lines	
22	7	3	2-4	"Lewisite was found on glassware apparatus recovered during the removal operations which also testifies to its long term viability."

Salient Issue:

Confirm that the sample contained Lewisite.

Response:

10.5.1 In the Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Section 3.3, Summary of Phase I Sampling, Analysis, and Removal Activities, it is stated that "recovered glass fragments contained a residue of lewisite breakdown products." The DCRA letter is in error by stating that lewisite was found on recovered glassware. The Glassware was found in the area designated as POI 14. The initial report identified arsenic, a possible lewisite breakdown product and ubiquitous naturally occurring metal. However, confirmation sampling did not identify lewisite or lewisite unique breakdown products. In addition, 64 soil samples, 4 water samples, 1 sediment sample and 1 groundwater sample were collected at POI 14. All samples were analyzed for BNAs, metals, and explosives, certain soil samples were analyzed for chemical agents and their breakdown products. No chemical warfare agents or chemical warfare agent unique breakdown products were found.

Section 11

SECTION 11

AGENCIES & RESPONSIBILITIES

11.1 REVIEW PROCESS

11.1.1 In general, the production, review, and approval of all OSR FUDS plans and reports was organized into two phases. The first phase was the production of the document and internal review by various Army agencies. Upon incorporation of all Army comments, the documents were then submitted to various non-Army agencies and personnel for review and comment. Agencies/personnel to whom the documents were forwarded for review and comment included the US Environmental Protection Agency Region III, the District of Columbia Office of Emergency Preparedness, and concerned Spring Valley residents and businesses (primarily the Zone Captains). Upon receipt and incorporation of all modifications resulting from comments received from these agencies/personnel, the reports were then submitted to USEPA Region III and the District of Columbia Office of Emergency Preparedness for final review.

11.1.2 In addition to the above, the review and approval process for the RI Report, Proposed Plan, and Record of Decision added formal public comment periods and public meetings as required under CERCLA. All documents in the Administrative Record were available for review at the document repositories located at USACE in Baltimore and at the District of Columbia public libraries (Palisades Branch and Tenley Branch). These documents were then revised based on comments received during the public comment periods and public meetings prior to finalization. Upon completion of these documents the ROD was signed by the Department of the Army and USEPA Region III at a Pentagon ceremony attended by representatives of the Army, USEPA Region III, and the District of Columbia government.

11.2 PUBLIC INVOLVEMENT

No.	Location in Document			Statement in Document
	pp	¶	Lines	
4	1	3	8-14	"Although the American University site was identified by the Federal government in 1985, stakeholders were not informed until the buried munitions story emerged in the press in 1993. Indeed, it was not until 1994 that the Department of Defense recognized the need to refine its community involvement policy."

Salient Issue:

1) Determine when the property owners were informed. 2) Describe the extensive public relations program performed by SVRO.

Response:

11.2.1 CENAB's public affairs office developed a Public Involvement and Response Plan to support OSR FUDS RI (See Appendix D). This plan was extensive and began in January 1993 with a series of public meetings to inform residents of the follow on investigation, goals, objectives, methods, and timelines. Public meetings were a staple of CENAB's public involvement plan. During the lifecycle of the project more than 100 public meetings were conducted to address every aspect of the project and numerous private meetings when residents requested. The work site area was divided into 9 zones, and a Neighborhood Advisory Board was established with a representative from each zone (a "Zone Captain") serving on the board. During the project the board met with USACE weekly and became the eyes and ears of the community for the project. At each meeting, project information was discussed and board members provided input and contributed to the decision making process. They had the responsibility to keep their neighborhoods informed, which they did.

11.2.2 A Public Affairs Office was established at the work site, enabling residents to visit anytime with questions or concerns. A monthly newsletter was ("The Heirs Response") mailed to the entire Spring Valley neighborhood, keeping everyone up-to-date on the project. When necessary, additional flyers were distributed with time-sensitive information. Information was provided regularly to the media in the form of news releases and media days. The local media covered the story for the entire project. Coverage was fair and balanced. All government agencies involved with the project were invited to attend regular meetings to discuss the project. Deskside briefings were provided to heads of District of Columbia and federal agencies in addition to elected officials. Public repositories for project documents were established in two local libraries. The Public Affairs Office established a presence in the community and

maintained a public dialogue throughout the entire project. A follow up survey testified to that. Thus, it is reasonable to state that all OSR FUDS stakeholders were very well informed regarding the status of all phases of the project.

Reference:

USACE, 1993. *Public Involvement and Response Plan (PIRP) for Spring Valley Study Area, Washington, DC, November 12, 1993 (2nd Revision).* USACE Baltimore District.

11.3 EMERGENCY RESPONSE PROCEDURES

No.	Location in Document			Statement in Document
	pp	¶	Lines	
12	3	2	1-6	"Subsequently, on April 2, 1996, another live munition (incendiary white phosphorous?) was found. The District of Columbia Department of Consumer and Regulatory Affairs, Environmental Regulation Administration (ERA) was not informed of this event until April 19, 1996. We have now been told that this shell was found inside of a house."

Salient Issue:

Determine methods to ensure that CENAB is immediately contacted when any munitions are found at the OSR FUDS.

Response:

Once the project was completed, the community was notified (by letter) to call 911 in the event of a munition discovery. The 911 call notifies the police who in turn notify DC Office of Emergency Preparedness (DCOEP) and the 149th EOD. Ordnance specialists from the 149th EOD handle the safe removal of the munitions. DCOEP then notifies the CENAB's Emergency Operations Center; who in turn notifies the chain of command within CENAB. It is DCOEP's responsibility to notify other District of Columbia agencies if they deem it appropriate. Appendix D is a copy of the notice to residents directing them to call 911 if the encounter a suspicious object and a flow diagram after a 911 is made.

Reference:

None.

Section 12

SECTION 12

CONCLUSIONS

No.	Location in Document			Statement in Document
	pp	¶	Lines	
41	13	3	1-6	"Because the remediation efforts at American University did not address all of the areas of concern reflected in the historical report, serious questions remain over the adequacy of the search for unexploded ordnance as well as the survey for residual contamination from the toxic substances used in the research."

Salient Issue:

Determine if the RI adequately addressed all the potential environmental problems.

Response:

12.1 OVERALL

12.1.1 The investigation of the OSR FUDS Site was conducted in accordance with DERP, 10 U.S.C. Sec. 2701-2707 and Section 104 of CERCLA, 42 U.S.C. 9601 et seq. The OSR FUDS investigation was properly conducted within the usual sequence of events outlined by the CERCLA process described in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (USEPA, 1988a). Public participation was encouraged through the CENAB public affairs office developed and implemented Public Involvement and Response Plan. All documents were approved by the appropriate parties.

The foundation of the OSR FUDS investigation was to focus initially on POIs identified in the historical record as associated with CWM research, development, testing and evaluation.

12.1.2 The investigation was designed to locate:

- Caches of buried munitions associated with DoD activities at the OSR FUDS, focusing on American University Experiment Station (AUES) activities; and
- Residual surficial soil contamination from CWM or CWM unique breakdown products from static firings or persistence testing of CWM or residual contamination from laboratory contaminants associated with CWM research and development at AUES.

12.1.3 The scientific basis of the investigation was to investigate those areas of highest probability of hazards and expand the area of investigation only if hazards were detected in these high probability areas. These areas, termed Points of Interest (POIs), were identified in the historical record as associated with CWM research, development, testing and evaluation. If unexploded ordnance (UXO) or CWM was not located in those areas of documented use, the likelihood of UXO or CWM in other areas of the OSR FUDS is remote.

12.1.4 The only munition cache was the initial find at 52nd Court which was associated with an identified POI, POI 14. Additionally, after investigating over 1900 anomalies (including pits, trenches, and single items) in 518 properties throughout the OSR FUDS, only four single UXO items were found. Two were suspect "amnesty" rounds (turned in anonymously by local residents). One was found in plain sight by the side of a road and the other was found near the USACE Spring Valley Resident Engineer's Office at the Interim Holding Area. The first was considered a suspect CWM containing munition because it appeared to contain liquid when handled (weight shifted). However, there were no static firing attachments and CWM was not loaded into ballistically fired munitions at AUES. Although it was most likely filled with water or other inert liquid it was sent to Pine Bluff Arsenal, Arkansas, for disposal. The other amnesty round was sent to Letterkenny Army Depot, Pennsylvania. The third round was an unfuzed mortar shell uncovered during the digging of a footer for a basement extension to a house. It was removed from the area by the 57th EOD Unit at Ft. Belvoir, detonated, and determined from detonation to be empty. The fourth was a spent Livens projectile partially filled with smoke agent which was discovered by the OSR FUDS UXO investigation team. It was sent to a RCRA permitted commercial facility in Sauget, Illinois, for incineration.

12.1.5 No CWM or CWM unique breakdown products were detected in over 260 environmental samples. Several naturally occurring metals which could also be associated with CWM, and others which were not associated with CWM, were detected at levels above USEPA Region III Risk Based Concentrations (RBCs) and above background. However, when subjected to a risk assessment performed in accordance with the USEPA Risk Assessment Guidelines for Superfund these were determined to require no further remedial action.

12.1.6 As a result of this current detailed review of the OSR FUDS investigation, the USACE identified the possible presence of single UXO items and buried mustard agent in a polymerized form (asphalt-like consistency) as potential residual hazards. Undisturbed, these potential hazards pose no risk to the public and no further investigation beyond that for POI 24 (See 12.1.7) is warranted. However, to minimize the potential for injury in the event of a chance discovery of a single UXO item or buried polymerized mustard agent, the Army will prepare a

fact sheet describing the UXO items and the characteristics of buried polymerized mustard agent and notification procedures. This fact sheet should be provided to residents and contractors by the District of Columbia Government whenever a digging permit is issued.

12.1.7 POI 24 was incorrectly located during the RI. As a result of the 1997 RI evaluation, aerial and supporting photographs were reviewed by the USACE Topographical Engineering Center (TEC). Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This review also identified this location as a possible mustard agent burial pit (see 8.8). The disposal practice at the time was to place containers in a pit, break the container, spread chlorinated lime over the mustard agent, and backfill the pit. Under these conditions, it is possible mustard agent could exist in a polymerized form. Undisturbed, this potential hazard poses no risk to the public. However, the following alternatives are available to address the long-term impacts of the potential polymerized mustard or CWM related environmental contamination at POI 24.

- No action.
- Notify and coordinate with the public and take no action.
- Notify and coordinate with the public and initiate institutional controls (e.g. notify the property owner, red tag any construction permits for this specific area).
- Notify and coordinate with the public and conduct additional geophysical investigation and soil sampling for polymerized mustard or other CWM related environmental contamination.

12.1.8 Based upon the new photographic interpretation, the Army recommends further investigation of POI 24. This recommendation includes additional geophysical investigation and soil sampling to determine if polymerized mustard or other CWM related environmental contamination exist at POI 24.

12.2 REGULATORY FRAMEWORK

12.2.1 An orderly and usual sequence of events was performed during the OSR FUDS. All applicable regulations were followed and the steps taken to perform this investigation were reviewed by USEPA, DC Government, and affected citizens. The Record of Decision (ROD) documenting "No Further Action Required" for OSR FUDS excluding Operational Unit-2 (OU-2) (Spaulding and Captain Rankin Areas), was signed by the Army and EPA on June 2, 1995.

The draft Site Closure Plan and ROD for OU-2 documenting "No Further Action Required" has been approved by USEPA Region III.

12.3 HISTORICAL FRAMEWORK

12.3.1 The OSR FUDS investigation benefited greatly from an abundant historical record, including a 1918 aerial photograph of the test area. The historical record was thoroughly reviewed and documented in The Historical Summary (USACE, 1994a). This allowed the investigation to focus on those areas most likely to be impacted by the AUES research, development, testing, and evaluation activities.

12.4 INVESTIGATION HYPOTHESIS

12.4.1 As stated above, the foundation of the OSR FUDS investigation was to focus initially on those areas identified in the historical record associated with CWM research, development, testing and evaluation to locate any buried caches of munitions or residual CWM surficial soil contamination from static firings or persistence testing of CWM. If UXO or CWM was not located in those areas of highest probability, the likelihood of UXO or CWM in other areas of the OSR FUDS is remote. This is a scientifically defensible basis for the OSR FUDS investigation.

12.5 POI IDENTIFICATION AND SELECTION PROCESS

12.5.1 POIs associated with CWM research, development, testing and evaluation were identified and located by merging and interpreting 1918, 1927, 1991, and 1993 aerial photographs utilizing various photogrammetric techniques by the USACE Topographic Engineering Center. Additional POIs were identified from the historical record. Those POIs identified as pits or trenches were geophysically investigated for munitions caches. Those POIs associated with either CWM static firing testing or persistence testing were environmentally sampled for CWM and CWM breakdown products.

12.6 UXO INVESTIGATION/REMOVAL PROGRAM

12.6.1 All POIs which were potential munitions burial pits were thoroughly investigated using state-of-the-art instrumentation. One buried munitions cache was discovered, albeit by construction activity prior to the beginning of the OSR FUDS investigation, at POI 14, a pit

associated with the northern test trenches. Based upon the results of the OSR FUDS investigation, the Army determined there are no remaining buried caches of munitions on the OSR FUDS.

12.6.2 Since the initial 141 buried munitions were discovered, over 1900 anomalies were investigated and only four intact munitions have been recovered at the OSR FUDS:

- Unfuzed 75 mm shell found near the original AUES area on the surface by a local citizen. The round was assessed as a suspect chemical round and removed to Pine Bluff Arsenal, Arkansas, for disposal.
- Spent Livens projectile partially filled with smoke agent excavated in Zone 9. It was removed to a commercial RCRA incinerator in Sauget, Illinois, for incineration.
- Unfuzed 3" Stokes mortar round found in the vicinity of the SVRO, a probable amnesty (i.e., discovered by a resident) round which was safed and transported to Letterkenny Army Depot, Pennsylvania, for destruction.
- Unfuzed 3" Stokes mortar round next to a house foundation uncovered during construction activities which was subsequently removed from the area and detonated. The OE item was determined to be empty after it was destroyed.

12.6.3 Due to the extensive geophysical investigation, and the large amount of development in the area, the probability of encountering even single UXO items is small.

12.7 ENVIRONMENTAL SAMPLING PROGRAM

12.7.1 The environmental sampling program focused on CWM and CWM unique breakdown products at documented CWM testing areas. No CWM or CWM unique breakdown products were detected in over 260 environmental samples. Other evidence supporting the lack of remaining CWM or CWM unique breakdown products includes:

- These agents rapidly hydrolyze (degrade in water or moisture).
- There has been extensive development resulting in significant cut and fill of the area.

12.7.2 Several naturally occurring metals which could also be associated with CWM, and others which were not associated with CWM, were detected at levels above RBCs and

above background. However, when subjected to a risk assessment performed in accordance with the USEPA Risk Assessment Guidelines for Superfund these were determined to require no further remedial action.

12.7.3 Since no CWM or CWM unique breakdown products were detected during the extensive environmental investigation focused on those areas most likely to be contaminated, the likelihood of encountering CWM or CWM unique breakdown products at OSR FUDS is remote.

12.7.4 POI 24 was incorrectly located during the RI. As a result of the current RI evaluation, aerial and supporting photographs were reviewed by the USACE Topographical Engineering Center (TEC). Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This review also identified this location as a possible mustard agent burial pit. Although this does not present an imminent hazard to the public, the Army recommends additional investigation to confirm and mitigate any potential future hazard.

12.8 RISK ASSESSMENT PROCESS

12.8.1 The risk assessment for the OSR FUDS was conducted in accordance with USEPA guidance including the *Risk Assessment Guidance for Superfund Human Health Evaluation Manual* (RAGS) (USEPA, 1989a) and supporting documents. Several naturally occurring metals which could also be associated with CWM, and others which were not associated with CWM, were determined to require no further remedial action by this risk assessment process.

12.9 OTHER REPORTS

12.9.1 DCRA cited other reports and articles and suggested potential problems with the OSR FUDS investigation. These reports and articles were reviewed for this evaluation of the OSR FUDS investigations.

12.9.2 The *Smithsonian* article "The Soldiers Moved On. The War Moved On. The Bombs Stayed." was used as evidence of the hazards associated with UXO and CWM. The OSR FUDS Evaluation Report, Section 10.1, shows that a comparison between a WW I battlefield and a research facility is not practical.

12.9.3 The Apex report was cited to show the OSR FUDS Investigation missed potential arsenic and CWM contamination resulting in the exposure to contractors. However, the Apex report, identified high levels of arsenic present with post AUES contaminants including Silvex herbicide. The contaminant which acutely affected the contractors was most likely Silvex. In a second incident, Apex reported contractors were affected by volatile organics or vehicle emissions. Therefore, neither exposure was a result of AUES activities.

12.9.4 The Naval Security Station report was cited as evidence of widespread arsenic contamination as a result of AUES testing activities. However, there was only one sample with an elevated arsenic level. This was a background sample and does not validate widespread arsenic contamination.

12.9.5 USEPA split sample data was cited as evidence that improper methods where used in analyzing the soil and that potential contaminants were missed. The USACE data was analyzed using USEPA analytical methods by an USACE Missouri River District approved Laboratory. All data underwent rigorous data validation using USEPA validation protocols. Any differences in split sample results is attributed to natural variability in soils, acceptable analysis variability, and common interlaboratory variability. The review also found that the SVOCs and PCBs found in the USEPA split samples were post AUES contaminants.

12.9.6 DCRA reported that lewisite residue was found on glassware. A review of the OSR FUDS investigation found no evidence of lewisite residue found anywhere on the OSR FUDS site.

12.10 AGENCIES AND RESPONSIBILITIES AND PUBLIC INVOLVEMENT

12.10.1 All documents were reviewed internally by appropriate Army agencies and then submitted to various non-Army agencies and personnel for review and comment. Agencies/personnel to whom the documents were forwarded for review and comment included the US Environmental Protection Agency Region III, the District of Columbia Office of Emergency Preparedness (the DC designated point of contact for the OSR FUDS investigation), and concerned Spring Valley residents and businesses (primarily the Zone Captains). Upon receipt and incorporation of all modifications resulting from comments received from these agencies/personnel, the reports were then submitted to USEPA Region III and the District of Columbia Office of Emergency Preparedness for final review.

12.10.2 All OSR FUDS stakeholders and regulatory agencies were kept very well informed regarding the status of all phases of the project and had the opportunity to provide comments.

12.11 POTENTIAL RESIDUAL HAZARDS

12.11.1 Potential Residual Hazards

12.11.1.1 The USACE identified the following potential residual hazards:

12.11.1.2 Single UXO items. The OSR FUDS investigation focused on detecting large caches of buried munitions. It was expanded to include detection of single UXO items on properties in the proximity of POIs, however, single UXO items may remain on site.

12.11.1.3 Buried mustard agent which exists in a polymerized form. During this 1997 RI evaluation, further analysis of circa 1918 photos of AUES concluded 5 gallon (approximately) glass or ceramic containers which could have contained mustard agent may have been buried in a pit near the fenced perimeter of the AUES (see 8.8). The disposal practice at the time was to place containers in a pit, break the container, spread chlorinated lime over the mustard agent, and backfill the pit. Under these conditions, it is possible mustard agent could exist in a polymerized form.

12.11.1.4 POI 24 was incorrectly located during the RI. As a result of this current RI evaluation, aerial and supporting photographs were reviewed by the TEC. Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This review also identified this location as a possible mustard agent burial pit (See 8.8).

12.11.2 Potential Risks

12.11.2.1 Undisturbed, these potential hazards pose no risk to the public. Possible single UXO items will not spontaneously detonate. If polymerized mustard exists, it is not releasing mustard vapors in its current form. To present a hazard it must contact the skin. However, if disturbed through digging such as construction activity, these potential hazards may be a risk to the public as described below:

12.11.2.2 Single UXO items. The probability of the public encountering a single round is remote. During the RI, over 1,900 anomalies were investigated in 518 properties throughout

the OSR FUDS with only four intact UXO single items found. None of the intact UXO single items found were hazardous or posed any danger to the public prior to or upon discovery. All were unfuzed. In addition, with the exception of the cache found at the identified POI 14, there have been minimal UXO items uncovered, although there has been significant land development in the OSR FUDS area since 1918.

12.11.2.3 Buried Polymerized Mustard Agent. The probability of the public coming in contact with buried polymerized mustard agent is also remote. Besides POI 24, which the Army has recommended for additional investigation, polymerized mustard would only be associated with random locations where mustard may have been spilled and subsequently decontaminated. Although mustard can exist in the polymer form for many tens of years, there is an equal probability the agent completely degraded to much less toxic breakdown products. The polymerized form has the consistency of asphalt and minimal vapor pressure. If it exists in the polymer form, it is most likely in a relatively thin layer (from spilling from the broken containers) and must be disturbed to become a hazard. This hazard would be a potential contact hazard causing skin burns, but is not an inhalation hazard. In addition, the hazard would be very localized, affecting only those who came in direct contact with the agent. It is not a splash or vaporization hazard..

12.11.2.4 POI 24. The Army is recommending additional investigation to determine if residual hazards, specifically mustard agent containers or polymerized mustard, exist at this location.

12.11.3 Additional Investigation

12.11.3.1 Single UXO items. No additional investigation for single item UXO is warranted. While the technology exists to locate UXO single items, in the Spring Valley urban environment, the technology does not exist to distinguish a single UXO anomaly from urban anomalies such as construction debris, ferrous rocks, etc. The OSR FUDS investigation focused on those areas most likely to contain UXO caches and was expanded to detect single UXO items within the POIs. Minimal UXO was discovered in these high probability areas. Expanding the investigation to low probability areas is unlikely to uncover additional UXO single items.

12.11.3.2 Buried Polymerized Mustard Agent. With the exception of POI 24, no additional investigation for buried polymerized mustard agent is warranted.

12.11.3.3 POI 24. Based upon the additional photo interpretation and the potential for polymerized mustard to exist at POI 24, the Army evaluated the following alternatives to

address the long-term impacts of the potential polymerized mustard or CWM related environmental contamination at POI 24.

- No action.
- Notify and coordinate with the public and take no action.
- Notify and coordinate with the public and initiate institutional controls (e.g. notify the property owner, red tag any construction permits for this specific area).
- Notify and coordinate with the public and conduct additional geophysical investigation and soil sampling for polymerized mustard or other CWM related environmental contamination.

12.11.4 Recommendations.

12.11.4.1 The Army recommends further investigation of POI 24. This recommendation includes additional geophysical investigation and soil sampling to determine if polymerized mustard or other CWM related environmental contamination exist at POI 24. The Army will develop and implement a public involvement and response plan to address the issues at POI 24.

12.11.4.2 With the possible exception of POI 24 where there is photographic evidence mustard agent may have been disposed in a pit, the possibility of public contact with single UXO items or buried polymerized mustard agent is extremely remote and will be associated with digging activities. To minimize the potential for injury in the event of a chance discovery of a single UXO item or buried polymerized mustard agent, the existing emergency response procedures (911) should be reinforced and expanded. The Army will prepare a fact sheet describing the UXO items (e.g., pictures of common AUES rounds) and the characteristics of buried polymerized mustard agent (e.g., would be found in conjunction with ceramic or glass fragments, has a garlic odor) and notification procedures. The fact sheet should be provided by the D.C. government to:

12.11.4.2.1 Spring Valley OSR FUDS area residents and contractors whenever a digging permit is issued.

12.11.4.2.2 Emergency response personnel.

12.11.4.2.3 All new Spring Valley OSR FUDS area residents at time of title transfer.

12.11.4.2.4 All Spring Valley OSR FUDS area residents through an annual mailing.

12.11.4.2.5 Other citizens as determined appropriate by the DC Government.

12.12 CONCLUSIONS

12.12.1 The OSR FUDS investigation was properly conducted in accordance with CERCLA and DERP. It focused on those areas with the highest probability for imminent hazards or environmental contamination. The investigation found no imminent health or safety hazards or environmental contamination associated with AUES ordnance testing or CWM or CWM unique breakdown products. The Remedial Investigation Report, Site Closure Plan, and Record of Decision were reviewed and approved by the public and appropriate government agencies. The Record of Decision was signed June 2, 1995.

12.12.2 POI 24 was incorrectly located during the RI. As a result of the current RI evaluation, aerial and supporting photographs were reviewed by the TEC. Based upon this review, the revised POI 24 location is on the grounds of 4801 Glenbrook Drive instead of the American University property. This review also identified this location as a possible mustard agent burial pit (see 8.8). Although this does not present an imminent hazard to the public, the Army recommends additional investigation to confirm and mitigate any potential future hazard. All the other POI were accurately located in the OSR FUDS RI Report and appropriately investigated.

12.12.3 There is a possibility that UXO single items or buried polymerized mustard agent remain on the site; however, there is no risk to the public if these remain undisturbed. The possibility of public contact with single UXO items or buried polymerized mustard agent is extremely remote and will be associated with digging activities. Additional investigation to locate any potentially remaining UXO single items or buried polymerized mustard agent, with the exception of POI 24, is not warranted. The risk to the public is remote and the investigation is not technically feasible.

12.12.4 To minimize the potential for injury in the event of a chance discovery of a single UXO item or buried polymerized mustard agent, the existing emergency response procedures should be reinforced and expanded. The Army will prepare a fact sheet describing the UXO items, the characteristics of buried polymerized mustard agent, and notification procedures. This information should be provided by the D.C. Government to residents and contractors whenever a digging permit is issued, to new Spring Valley area residents, annually

to Spring Valley area residents, to emergency response personnel, and to other citizens as determined appropriate by the DC Government.

12.12.5 Consistent with its obligations under CERCLA and DERP, the Army remains responsible for any additional response actions necessary in relation to buried munitions and environmental contamination associated with prior Department of Defense (DoD) activities at the OSR FUDS.

Section 13

SECTION 13

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Appendix A

APPENDIX A
DCRA COMMENT RESPONSE AND
USACE RESPONSE INDEX

APPENDIX A
DCRA COMMENT RESPONSE AND USACE RESPONSE INDEX
OSR FUDS

No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
1	1	2	1-6	".... this urgency did not permit the orderly and usual sequence of operations for remediation of formerly used military sites. The Draft Proposed Military Range Rule (hereinafter, Range Rule), 32 CFR 339 4/15/96 stresses the need to examine the entire range after a range assessment/accelerated response (RA/AR) is completed."	3.1, 3.2
2	1	3	1-2	"To our knowledge a total comprehensive environmental study was not done at the American University site."	8.1
3	1	3	6-8	".... the Army lacked experience as well, because it was the first time the Army had conducted an ordnance and chemical warfare removal operation in a residential area."	7.4, 8.2
4	1	3	8-14	"Although the American University site was identified by the Federal government in 1985, stakeholders were not informed until the buried munitions story emerged in the press in 1993. Indeed, it was not until 1994 that the Department of Defense recognized the need to refine its community involvement policy."	3.3, 11.2
5	2	1	2-4	"In addition to the large variety of substances, large quantities [of dangerous substances] also existed."	4.1
6	2	1	7-10	"Many of these experiments involved releasing great quantities of these toxic substances into the air and on the soil to see the effects on animals placed at various distances from the release point."	6.3.1
7	2	2	3-7	"Only a few of these chemicals have been tested for at the site, and then only at isolated locations. No random grid sampling of soil and groundwater was done. No survey has been conducted to determine if there are any adverse health effects to the residents of the area."	8.4.1
7a	2	2	3-7	"Only a few of these chemicals have been tested for at the site, and then only at isolated locations. No random grid sampling of soil and groundwater was done.	8.5, 8.6.2
7b	2	2	3-7	No survey has been conducted to determine if there are any adverse health effects to the residents of the area."	9.1
8	2	3	1-7	".... the final 1995 report on the American University site indicates that only 53 points of interest there were scanned with metal detectors in an effort to locate other buried munitions. During this limited scanning 2,000 anomalies were found ... Of these anomalies, approximately 87 were excavated."	5.2, 7.5
9	2	3	8-10	"This failure to fully investigate all buried metal is magnified by the inadequacy of current detection equipment."	7.3
10	2	4	1-7	".... since live chemical weapon munitions (CWM), as well as high explosive shells, were found buried at the American University site, and many toxic substances were released into the environment, we felt that a substantial research project was necessary in order to determine the potential for residual contamination and munitions on the site."	5.2, 8.1

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
11	3	1	1-3	".... we became convinced of an immediate threat to the health and safety of residents at the site."	7.5
12	3	2	1-6	"Subsequently, on April 2, 1996, another live munition (incendiary white phosphorous?) was found. The District of Columbia Department of Consumer and Regulatory Affairs, Environmental Regulation Administration (ERA) was not informed of this event until April 19, 1996. We have now been told that this shell was found inside of a house."	7.1, 11.3
13	3	3	1-7	"Additionally, on June 10, 1996, we were informed that a full glass chemical bottle with glass stopper had been unearthed along with the remains of several more, at the American University site. While we are awaiting a laboratory analysis, soil samples contained arsenic levels as high as 1200 parts per million, as well as other pollutants. To date, 40 cubic yards of contaminated soil have been removed."	10.2.1
13a	3	3	1-7	"Additionally, on June 10, 1996, we were informed that a full glass chemical bottle with glass stopper had been unearthed along with the remains of several more, at the American University site	10.2.1
13b	3	3	1-7	While we are awaiting a laboratory analysis, soil samples contained arsenic levels as high as 1200 parts per million, as well as other pollutants. To date, 40 cubic yards of contaminated soil have been removed."	10.2.1
14	3	3	7-12	"We were also informed that, 5 years ago, several workers were overcome during excavation procedures at the same site and hospitalized for respiratory problems. We feel strongly that these workers may have been exposed to poison gas from these broken bottles or a leaking munition disturbed during the excavation process."	10.2.1
15	3	4	1-5	"It is our opinion that the remediation efforts did not address all of the areas of concern reflected in the Historical Report and Range Rule, and our own study, both with respect to the potential for contamination and the likelihood of more unexploded munitions on the site."	7.1, 8.1
16	3	5	1-4	".... the threat posed at the American University site requires that every part of the 600 acre site be surveyed with magnetometers and ground penetrating radar to a depth of 10 feet, with all anomalies intrusively investigated and cleared."	5.2, 7.2, 7.3, 7.5
17	3	6	1-4	"The entire site should have the soil at various depths sampled, as well as the groundwater sampled for the toxic substances listed below. This should be a random grid sampling comparing the results to off-site background levels."	5.1, 8.3, 8.5, 8.6.2, 9.3

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
18	3	7	1-3	".... a health survey of the residents should be conducted to determine if there is any elevated incidence of any disease processes, related to the hazardous substances listed."	9.1
19	4	1	1-5	"In our opinion, the immense quantity of gas there, the lack of information indicating that any CWM were moved, the buried CWM already found, the numerous trenches providing convenient burial, compel the conclusion that more CWM still exist on the site."	4.1, 4.2, 5.2, 6.3.2
20	4	3	3	"There is mounting evidence that the American University Site encompassed a massive production facility for poison gas in addition to its development and experimentation functions."	4.1
21	5	1	1	"Specific Quantities and Types of Toxic Substances"	8.5
22	7	3	2-4	"Lewisite was found on glassware apparatus recovered during the removal operations which also testifies to its long term viability."	10.5.1
23	7	3	4-6	"The process for making large quantities of Lewisite was perfected at American University."	4.1.2
24	9	2	1-8	"Altogether, there were about 164 structures and earthworks identified by the District and the Corps of Engineers. However, only 53 Points of Interest have been intrusively investigated. Although some of these points encompassed more than one structure, many clearly have been omitted. Indeed, many of these structures have not been located on any known maps, supporting our recommendation that the entire 600 acres needs to be examined (Appendix I)."	6.1
25	9	4	1-5	".... there were 153 structures by war's end. Spills, dumping or burial of small quantities of toxic substances could have occurred at any of these structures, necessitating extensive soil and groundwater testing."	8.4.1, 8.6.2
26	9	5	3-5	".... the second largest expenditure for a cylinder storage building, indicating a very large structure. This could have been an extensive burial site."	4.2
27	9	6	1-5	"Numerous documents detail tests of chemical shells at the American University site. Some shells were attached to the top of poles or placed in the ground and fired electrically. Others were fired from mortars, designed to detonate on impact."	4.1.3
28	10	1	1-4	"We found trench maps and test reports from American University indicating that many Livens projectiles as well as smaller 75-millimeter artillery shells were tested with poison gas (Appendices E, F, and G)."	4.1.3
29	10	1	10-12	"Unfortunately, the arsenic soil test data we have available is for areas away from many of the probable test sites."	10.3

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
30	10	1	12-16	"Arsenic soil test data from the Naval Security Station, leeward from American University, reveals an elevated arsenic level approximately 1 foot underground, which could be compatible with a 75 year old deposition. Soil above and below this narrow bank shows very little arsenic (Appendix L)."	10.3
31	10	2	2-7	"Tremendous amounts of gas could be stored in even small cylinders. Some of the shells experimented with at American University were also very large. For example, a 12 inch Naval chemical shell was developed. The 8 inch Livens projectile was another large shell, developed primarily to carry poison gas."	4.1.3
32	10	3	1-3	".... one Point of Interest identified previously was the Old Mustard Field, a 500 foot diameter area covered repeatedly with mustard gas."	6.2
33	10	4	1-4	"Some of the munitions previously found contain liquefied poison gas which is designed to vaporize when the shell ruptures on impact and likewise will vaporize if it rusts through."	9.2
34	11	1	1-6	"This raises the level of potential devastation where old explosive shells are buried together with chemical shells, as was the case at American University, because a hypersensitive explosive filler could detonate rupturing many adjacent corroded chemical munitions, greatly increasing the amount of agent released."	5.2, 7.2
35	11	2	1-4	"Experience with the leftover gas shells found on the WWI European battlefields conclusively demonstrates that the gas in these shells remains viable, and that the shells will corrode through releasing the gas."	10.1
36	11	2	4-8	"A very definitive article on the hazards of remaining WWI gas munitions is titled, 'The Soldiers Moved On. The War Moved On. The Bombs Stayed' by Donovan Webster, from the Smithsonian Magazine, February, 1994."	10.1
37	12	1	3-6	"There are two potential sources for gas exposure at American University: (1) individual unexploded ordnance resulting from the dispersion testing; and (2) gas shells and cylinders, intentionally buried, when the operation ended."	4.1.3, 6.3.2
38	12	3	1-2	"There were many shells fired during the dispersion testing which must have left many isolated dud or UXO rounds."	4.1.3
39	13	0	1-2	"In all probability, there are numerous isolated dud rounds which must be located and cleared."	4.2
40	13	1	1-3	"A very significant risk at the American University site is the likelihood that many chemical munitions and cylinders were buried when the project was abandoned at war's end."	4.2

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
41	13	3	1-6	"Because the remediation efforts at American University did not address all of the areas of concern reflected in the historical report, serious questions remain over the adequacy of the search for unexploded ordnance as well as the survey for residual contamination from the toxic substances used in the research."	4.2, 5.2, 7.2, 12
42	13	3	6-13	"There are five areas of research findings which bear on the issue of whether of not a potential for more buried CW munitions exists: (1) burial occurred at other sites; (2) gases and shells were produced in extremely large quantities; (3) the entire site was shut down quickly at wars end; (4) there were rumors of large scale burial operations; and (5) there is a lack of evidence that the leftover munitions were turned over to other departments or moved elsewhere."	4.2
43	14	1	1-3	"Second, as we have seen above, the production of chemical warfare agents was very large. The operation had 1200 chemists and engineers, and 700 support personnel."	4.1
44	14	3	1-3	"Thus twelve hundred shells may have been sent to American University, shortly before its closing. From test reports and the shells recovered, we are only able to account for 107 of these, leaving 1093 unaccounted for gas shells in just the 75mm size (Appendix T). We were unable to locate any information on the number of Livens, Stokes or other gas shells sent to American University."	4.2
45	15	1	1-10	"A letter dated November 8, 1918, in response to concerns raised by the Commissioners of the District of Columbia, stated, ... supports the concept that shells ordered earlier may not have been completely used up."	4.2
46	16	2	1-7	"The use of the word 'dispose' for supplies means burial to us. Whereas, 'salvage' for property means to sell or keep. Since there did not appear to be much interest in surplus poison gas after the war, a reason cited by chemical companies for declining the offer of production contracts, it does not seem that existing stockpiles could be sold, leaving only the alternative of disposal."	4.2
47	16	4	1-8	"Fourth, there were rumors of large scale burial of munitions at the site. In the Historical Report it states, The USATHAMA (US Army Toxic and Hazardous Materials Agency) study incorporated materials from American University and concluded that there was no evidence to confirm rumored large-scale burials of munitions. But it did highlight two sites that would be likely candidate locations if burial had occurred."	6.3.2
48	16	5	1-2	"Fifth, the munitions apparently could not and were not turned over to the Ordnance Department."	4.2

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
49	17	2	1-5	"Not only is there no evidence that the 'enormous quantities' of toxic substances and munitions known to have been there, were moved, but these two memoranda seem to indicate that the chemical and explosive munitions were not moved to the ordnance department facilities at Aberdeen."	4.2, 6.3.2
50	17	3	3-5	".... unexploded and buried chemical and high explosive ordnance is certain to remain at the American University site."	7.5
51	17	3	8-12	"Our view on the need for a complete site investigation with a study of environmental contamination, health impacts, and a search of the entire area for individual UXO and buried stockpiles is also confirmed by the proposed Range Rule."	3.1
52	1	1	5-7	Letter to USEPA from DCRA "It is the conclusion of the report that the initial investigation and remedial action performed by the U.S. Army Corps of Engineers was not adequately completed and the substantial additional action is required to protect the health and safety of residents in the area."	8.1
53	1	4	1-7	Letter to USEPA from DCRA "....a large amount of chemical ordnance was manufactured at, or sent to, the site shortly before the site was rapidly decommissioned at the end of World War I. Documents suggest that leftover supplies were buried. However, the buried chemical ordnance recovered to date by the U.S. Army Corps of Engineers appears to be less than 5% of what we believed to be present at the end of the war. With the lack of any hard evidence that this material was disposed of properly, we are concerned that there are still large amounts of buried ordnance at the site."	4.2
54	1	5	2-7	Letter to USEPA from DCRA Recently, a hot spot of 1200 ppm arsenic (background level is approximately 3 ppm) was found at a private residence adjacent to American University (report enclosed). We have learned that in 1992 five (5) construction workers required medical treatment after being overcome while digging the foundation for this residence. The residence is in close proximity to the site of an arsenic laboratory which was in operation during World War I."	10.2.1
55	2	1	1-6, 8-11	Letter to USEPA from DCRA "....we have also learned that EPA performed their own analysis of samples taken by the Army from locations at the Spring Valley site. The analysis results indicated contamination greater than the EPA recommended Risk-Based Concentration level for arsenic and other hazardous substances. Both surface and above ground level air burst testing of experimental chemical agents, many containing arsenic, were performed at the site..... Sample results may not indicate the presence of arsenic if they were not within the downwind contamination areas of these air burst test sites, however. We are therefore concerned that arsenic and other toxic materials may be present in high concentrations throughout Spring Valley and adjacent areas at rather shallow depths.	6.1, 10.4

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No.	Location in DCRA Document			Statement in Document	Locations in OSR FUDS RI Evaluation Report
	Page	¶	Lines		Section
56	2	2	3-7	Letter to USEPA from DCRA "....neither a magnetometer (metal detector) sweep nor a grid soil sampling of the entire 600 acre site has been completed. Where magnetometer sweeps were done, only a small portion of the anomalies (indications of metallic debris) were excavated. The Army's own research states that magnetometer sweeps for the identification of suspected anomalies without excavation is only 60% reliable."	7.5
57	2	3	1-2	Letter to USEPA from DCRA "Many of the recommended procedures in the DoD's Proposed Range Rule, 32 CFR 178, including a Site Specific Response Evaluation, were not completed.	3.1
58	2	3	2-3	Letter to USEPA from DCRA "Neither a CERCLA Preliminary Assessment nor a RCRA Facility Assessment was completed"	3.2
59	2	4	1-5	Letter to USEPA from DCRA Finally, new technology, such as microgravity analysis, soil gas surveys with color contour maps, and Pulsed Fast Neutron (PINS) Analysis are now available. The Proposed Range Rule allows for reopening of a range when new technology would be helpful in clearance activities. Also, a deep seeking magnetometer with a data recording system and global positioning system (GPS), designed specifically for locating deep burial areas, could be used."	3.1, 7.3

Appendix B

APPENDIX B
OSR FUDS RECORD OF DECISION AND
OU-2 APPROVAL LETTER

RECORD OF DECISION

FOR THE

OPERATION SAFE REMOVAL FORMERLY USED DEFENSE SITE

1.0 DECLARATION

1.1 Site Name and Location

Site Name: Operation Safe Removal Formerly Used Defense Site
Site Location: Washington, D.C.

1.2 Statement of Basis and Purpose

1.2.1 This decision document presents a determination that no further action will be taken at the Operation Safe Removal Formerly Used Defense Site (OSR FUDS) in Washington, D.C. This decision document excludes the Captain Rankin Area of the OSR FUDS, as it is still under investigation. This determination was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), 42 USC Section 9601 *et seq.*, and the National Contingency Plan (NCP) 40 CFR Part 300. This no further action decision is supported by documents contained in the administrative record. The District of Columbia has concurred on the no further action determination.

1.3 Declaration Statement

1.3.1 This no further action decision is based on the baseline risk assessment conducted for the OSR FUDS, which concluded that conditions at the OSR FUDS do not pose unacceptable risks to human health and the environment. Therefore, no further remedial action is necessary at the OSR FUDS, excluding the Captain Rankin Area, to protect human health and the environment.

Lewis D. Walker — 6/2/95

Lewis D. Walker
Deputy for Environment, Safety, and Occupational Health,
Occupational Health Office of the Assistant Secretary of the Army,
U.S. Department of the Army

Date

2.0 DECISION SUMMARY

2.1 Site Name, Location, and Description

2.1.1 The OSR FUDS is located in Northwest Washington, D.C., inclusive of the campus of American University. The OSR FUDS is an urban, residential area consisting of approximately 616 acres. The area is bounded by Dalecarlia Parkway from Westmoreland Circle to Mill Creek to a 400 to 800 foot strip of land west of Dalecarlia Parkway to Loughboro Road to Nebraska Avenue to Van Ness Street to 43rd Street to Warren Street to 45th Street to Van Ness Street to Massachusetts Avenue to Westmoreland Circle. This area was divided into nine zones to aid in the investigation effort. The OSR FUDS and the nine zones are shown in Figure 1.

2.1.2 The Captain Rankin Area of the OSR FUDS is comprised of the shell pits located in Points of Interest (POIs) 21 and 23. The final results of the investigation of the Captain Rankin Area were not available for inclusion into the Final Remedial Investigation (RI) Report; therefore, the Captain Rankin Area has been excluded from this ROD. The Captain Rankin Area will be addressed under a separate ROD upon completion of the investigation.

2.1.3 The OSR FUDS has been developed as a residential neighborhood with some commercial and retail centers located primarily on Massachusetts Avenue. The OSR FUDS had a total population of 13,203 in 1990. The site topography indicates that surface water runoff is channeled into two intermittent streams (Mill Creek and East Creek). These streams are not used as sources of potable water. Man-made storm sewers also channel runoff over large portions of the site. Eventually all runoff at the site flows into the Potomac River. The discharge points of both Mill Creek and East Creek are approximately 1-mile downstream

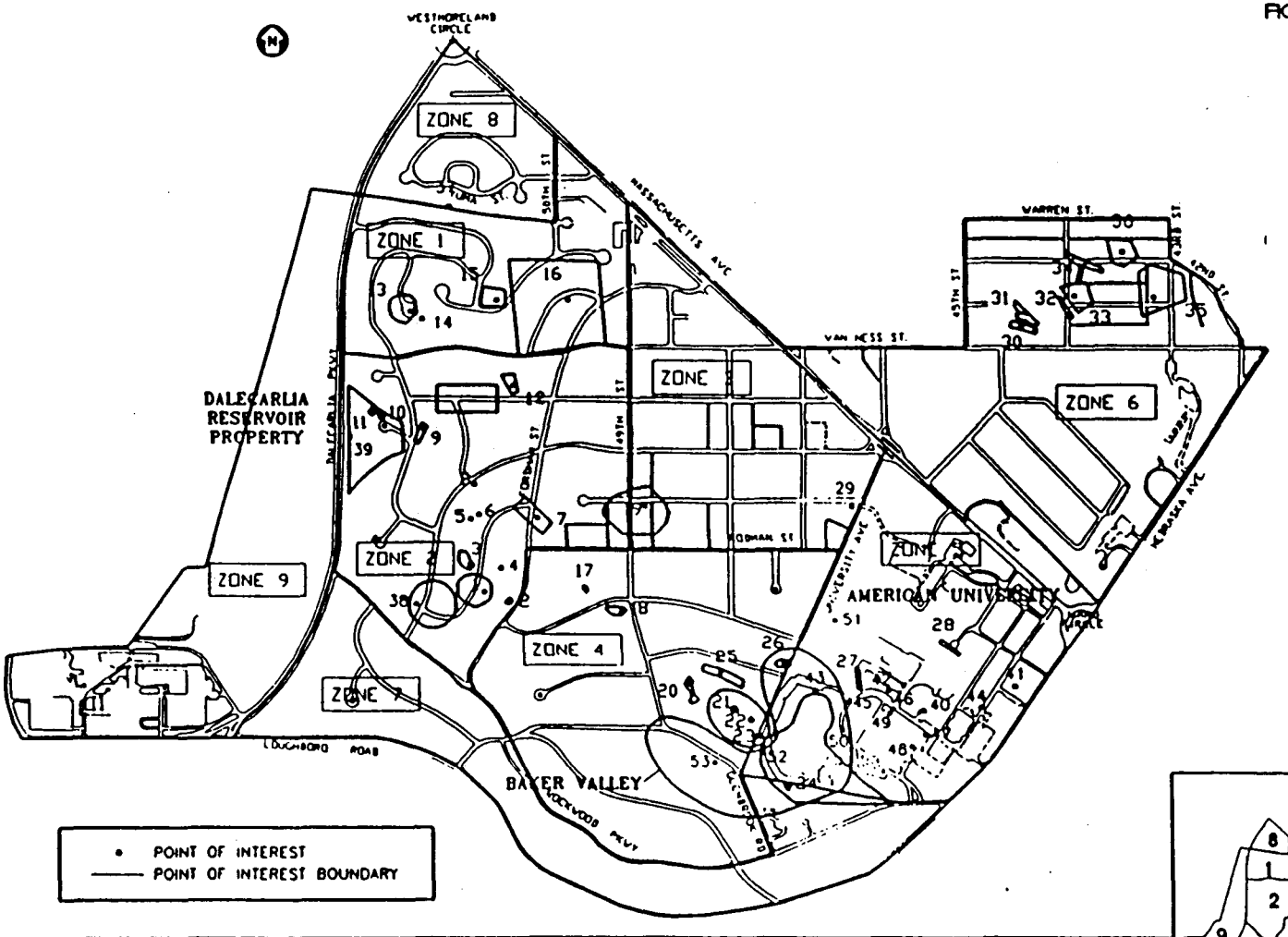
FIGURE 1

NUMBER POINTS OF INTEREST

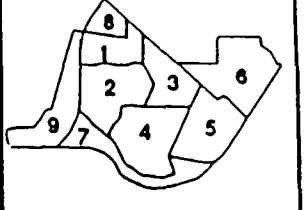
1. Circular Trenches
2. Possible Pit
3. Small Crater Scars
4. Possible Pit
5. Possible Pit
6. Possible Target or Test Site
7. Possible Test Area
8. Possible Target or Test Site
9. Possible Firing or Observation Stalls
10. Possible Target or Test Site
11. Scattered Ground Scars
12. Possible Graded Area
13. Circular Trenches
14. Pit
15. Ground Scar
16. Chemical Persistency Test Area
17. Possible Pit
18. Small Crater Scars
19. Old Mustard Field
20. Ground Scar
21. Shell Pit
22. Shell Pit
23. Shell Pit
24. Probable Pit
25. Possible Trenches
26. Small Crater Scars
27. Probable Trench or Ditch
28. Probable Trench or Ditch
29. Ground Scar
30. Training Trenches
31. Training Trenches
32. Training Trenches
33. Training Trenches
34. Training Trenches
35. Training Trenches
36. Training Trenches
37. Mill Creek
38. Bradley Field/Major Tolman's Field
39. Static Test Fire Area
40. Ohio Hall
41. History Building
42. Physiological Laboratory
43. Gun Pit
44. Chemical Research Laboratory
45. Explosives Laboratory
46. Cannister Laboratory
47. Bacteriological Laboratory
48. Disperoid Laboratory
49. Pharmacological Laboratory
50. Gun Pit
51. Fire and Flame Laboratory
52. Electrolytic Laboratory
53. Baker Valley

NAMED POINTS OF INTEREST

American University



ZONE MAP



This map was prepared for use of the U.S. Army Corps of Engineers for illustrative purposes only. This map was created using data prepared from various sources. It does not represent survey of the site. The scale, accuracy, and completeness of the data is not guaranteed. No liability is assumed as to the sufficiency or accuracy of the data collected hereon.

SOURCE

USDA 1976

PARSONS ENGINEERING SCIENCE, INC.

APPROXIMATE SCALE

0 400 800

FEET

POINT OF INTEREST

OSR FUDS RI

OPERATION SAFE REMOVAL

JOB NUMBER

DOCUMENT NO.

DAS SHEET

US Army Corps of Engineers

P03-8a 3/1/93

of the intake for the District of Columbia water system at Little Falls Dam. Water is supplied to residents in the OSR FUDS area through the District of Columbia water supply.

2.1.4 Groundwater flow in the piedmont rocks and saprolite of the OSR FUDS is anticipated to follow the topographic gradient toward the southwest and the Potomac River. Groundwater is not used for public water supply at the OSR FUDS. No private, domestic, or commercial wells have been observed at the site during field activities.

2.1.5 A Record of Environmental Consideration for Remedial Investigations at Spring Valley was completed on January 27, 1993.

2.2 Site History and Enforcement Actions

2.2.1 The American University Experiment Station (AUES) was used by the U.S. Army and Navy during World War I to investigate the production of noxious gases, antidotes, and protective masks. Initially operated by the Bureau of Mines, the AUES was transferred to the U.S. Army and was operated by the U.S. Army until 1918, when the experiment station was closed. The land around the former AUES was subsequently developed into an urban residential neighborhood located in Northwest Washington, D.C. In January 1993, a contractor digging a utility trench uncovered buried ordnance. The U.S. Army responded with Operation Safe Removal.

2.2.2 Operation Safe Removal consisted of two phases. Phase I was the immediate emergency response after the discovery of buried ordnance in January 1993. Phase I of Operation Safe Removal began on January 5, 1993 and ended on February 2, 1993. The ordnance items included 141 intact munitions, assorted ordnance-related debris, and laboratory material. The buried ordnance items were removed by the U.S. Army. Forty-three of the

intact munitions recovered were deemed suspect chemical munitions and subjected to further on-site qualitative analysis. This analysis confirmed that the items were chemical munitions. Nine of the suspect chemical ordnance items were subjected to quantitative off-site analyses. The results of these analyses revealed that one munition contained mustard agent, five contained aqueous salt solutions, two contained fuming sulfuric acid, and one contained gun cotton. Soil, surface water, and groundwater samples were collected during the removal of the ordnance items. The analysis of the soil samples collected from the excavated area and soil, surface water, and groundwater samples collected from the vicinity of the excavated area indicated that no residual contamination was present as a result of buried munitions.

2.2.3 On January 21, 1993, the Findings and Determination of Eligibility was approved establishing the OSR FUDS. This study determined that 509 acres were eligible, with an additional 107 acres subsequently added as an addendum, as part of the OSR FUDS. An inventory project report conducted by the U.S. Army concluded that Chemical Warfare Material (CWM) hazards could potentially be present at the site. Consequently, the Army determined that it was necessary to conduct a remedial investigation (RI) to determine if Ordnance and Explosive Waste (OEW) or CWM were actually present at the site and posed potential adverse health risks. The RI was performed during Phase II of Operation Safe Removal.

2.2.4 Phase II of the RI began immediately after Phase I on 3 February 1993. Phase II included the historical records search, geophysical survey, intrusive studies, non-time critical and time critical removal actions, environmental sampling, and risk assessment necessary to determine the existence and extent of any OEW and/or OEW- or CWM-related environmental contamination within the OSR FUDS as a result of Department of Defense (DoD) activities during World War I. These activities and findings, excluding the

Captain Rankin Area, which is still under investigation, are summarized in the RI Report.

2.3 Highlights of Community Participation

2.3.1 The RI Report was released to the public on 21 March 1995. This document was made available to the public in both the administrative record and in information repositories maintained at the following locations:

- Spring Valley Resident Office;
- Washington, D.C. Public Library - Tenley Branch; and
- Washington, D.C. Public Library - Palisades Branch.

The notice of the availability of this document was published in the Washington Post and Washington Times on 21 March 1995.

2.3.2 To provide the community with reasonable opportunity to submit written and oral comments on the results of the RI for the OSR FUDS, the Army established a public comment period from 21 March 1995 through 30 April 1995. A public meeting was held on 23 March 1995 to present the results of the RI and to answer questions and receive comments. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision (ROD). This decision document presents the determination that no further remedial action is necessary for the OSR FUDS in Washington, D.C., is consistent with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record.

2.4 Scope and Role of OSR FUDS Response Action

2.4.1 The RI of the OSR FUDS investigated the site for the presence of OEW and CWM at the site. This ROD is the final action for addressing the potential presence of OEW and CWM at the OSR FUDS, excluding the Captain Rankin Area. The U.S. Army has concluded that there are no OEW or CWM hazards remaining at the OSR FUDS that warrant further remedial action. Therefore, no further action is required for the OSR FUDS. This ROD serves to document this no further action decision.

2.5 Site Characteristics

2.5.1 The RI of the OSR FUDS focused on areas most likely to contain OEW or to be contaminated by OEW, CWM, or their breakdown products. The RI was aided by the historical record of World War I chemical agent research, development, and testing activities of AUES, including a 1918 aerial photograph of AUES. Geophysical surveys of areas of interest four times greater than the size of points of interest (POIs) along with 10 percent of the remaining area, and follow up intrusive investigations of suspect anomalies, were conducted to find any buried ordnance remaining at the OSR FUDS from the activities at AUES. The soil investigation focused on sampling for chemical agents, associated breakdown products, and OEW residue results most likely to be present at points of interest throughout the OSR FUDS. The following subsections summarize the findings of the RI Report.

2.5.1 Ordnance

2.5.1.1 Since the initial discovery of 141 buried munitions, three intact munitions have been recovered at the OSR FUDS. One was a 75 millimeter (mm) shell found in October 1993 near the original AUES area on the surface. This round was assessed as a suspect chemical round. The second was a Livens projectile partially filled with smoke agent which was excavated under a Time

Critical Removal Action in May 1994. The third was an unfuzed 3-inch Stokes Mortar found near the Spring Valley Resident Office (SVRO) in November 1994, which was apparently an amnesty find left by an unknown individual.

2.5.1.2 Spent OEW discovered within the OSR FUDS included ten 75 mm expended projectiles and numerous fragments within POIs 10/11 and 39 and Zone 9; fuzes, fuze components, and shell fragments in the area of POIs 21/22/23 and 25; and the empty nose cone of a World War I incendiary drop bomb in the American University soccer field (Figure 1).

2.5.2 Environmental Samples

2.5.2.1 No chemical agents, CWM-unique breakdown products, explosives, or explosives breakdown products were found in soil, groundwater, surface water, or sediment samples collected from the OSR FUDS. However, several metals were detected in samples collected from all of these environmental matrices. These analytical results were initially compared to U.S. Environmental Protection Agency (USEPA) Region III risk based concentrations (RBCs) for the protection of human health. Chemicals present at concentrations exceeding screening RBCs were then statistically compared to background, i.e., naturally-occurring concentrations. If the concentration of a chemical exceeded both RBCs and background, the chemical was considered a chemical of potential concern. All chemicals of potential concern were subsequently included in a quantitative risk assessment performed for the OSR FUDS.

2.5.2.2 Results of soil sampling at four POIs in Zones 4 and 5 indicated the presence of metals at concentrations that exceeded RBCs and background concentrations (Table 1). These metals were considered chemicals of potential concern and were evaluated using a quantitative risk assessment in accordance with USEPA's Risk

Assessment Guidance for Superfund. This risk assessment indicated that no health hazard exists due to the presence of these metals.

2.5.2.3 Section 1.8 of the RI Report notes that the results of the investigation of the Captain Rankin Area were not available at the time of the final RI Report. Therefore, the Captain Rankin Area has been excluded from this ROD. The Captain Rankin Area will be addressed under a separate ROD upon completion of the investigation.

TABLE 1

METALS SUBJECTED TO QUANTITATIVE RISK ASSESSMENT
OSR FUDS ROD

POI	Metal
21/22/23	aluminum, beryllium, manganese, nickel, thallium, and vanadium
25	aluminum, selenium, thallium, and vanadium
American University	aluminum, beryllium, cadmium, nickel, and vanadium
Livens Excavation, in Zone 9	beryllium, cadmium, and zinc

2.6 Summary of Site Risks

2.6.1 Methodology and Assumptions

2.6.1.1 Detected chemicals were screened in the risk assessment with respect to background metal concentrations, the presence of essential nutrients, and USEPA Region III RBCs. Chemicals having concentrations that exceeded RBCs and that could not be conclusively attributed to background or other sources were retained as chemicals of potential concern.

2.6.1.2 Residents and construction workers were evaluated for exposure to chemicals in soil. Exposure pathways for the residential scenario included:

- Ingestion of surface soil;
- Dermal contact with surface soil while gardening; and
- Ingestion of homegrown vegetables.

Risks from ingestion of surface soil were addressed quantitatively, while risks from ingestion of homegrown vegetables and dermal contact were addressed qualitatively. Exposure pathways evaluated for the construction worker scenario included:

- Ingestion of surface and subsurface soil;
- Dermal contact with surface and subsurface soil; and
- Particulate inhalation.

Risks from particulate inhalation and ingestion of surface and subsurface soil were addressed quantitatively. Dermal contact and ingestion of homegrown vegetables were addressed qualitatively.

2.6.1.3 Chemical intake was combined with toxicity information to calculate risks. USEPA-generated slope factors and reference doses were used to evaluate carcinogens and noncarcinogens, respectively. For carcinogens, risks were estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. The USEPA-acceptable risk range is from one in ten thousand (10^{-4}) to one in one million (10^{-6}). For noncarcinogens, potential health threats are evaluated by comparing an estimated exposure level over a given period to a reference level (the RfD) below which it is unlikely that even sensitive individuals will experience adverse health effects. This ratio is expressed as a hazard index; if the calculated hazard index is below one, than adverse effects are not expected.

2.6.2 Soil Sampling Results

2.6.2.1 Chemicals of potential concern were identified at POIs 21/22/23 and POI 25 in Zone 4; at American University in Zone 5; and at the LTC Bancroft Area in Zone 9. In Zone 4, the following chemicals of potential concern were identified and evaluated: aluminum, beryllium, manganese, nickel, selenium, thallium, and vanadium. Results of the risk assessment for Zone 4 indicated that no further remedial actions are necessary due to the presence of these metals. In Zone 5, the following chemicals of potential concern were identified and evaluated: aluminum, beryllium, cadmium, nickel, and vanadium. Results of the risk assessment for Zone 5 indicated that no further remedial actions are necessary due to the presence of these metals. In Zone 9, the following chemicals of potential concern were identified and evaluated: beryllium, cadmium, and zinc. Results of the risk assessment for Zone 9 indicated that no further remedial actions are necessary due to the presence of these metals.

2.7 Conclusion

2.7.1 Based on the RI, there are no risks posed by hazardous substances that exceed acceptable risk levels for human health or the environment. Consequently, no further action is needed at the OSR FUDS.

2.8 Explanation of Significant Changes

2.8.1 The RI Report for the OSR FUDS site was released for public comment on 21 March 1995. The RI Report identified no further action as the remedy for the OSR FUDS. The U.S. Army reviewed all written and verbal comments submitted during the public comment period. Upon review of the these comments, it was determined that no significant changes to the no further action determination proposed in the RI Report, were necessary.

3.0 RESPONSIVENESS SUMMARY

3.1 Community Preferences

3.1.1 At the time of the public comment period, the Army proposed that "no further action" was necessary for the OSR FUDS in Washington, D.C. Based on the comments received during the public comment period, the public supports this "no further action" proposal for the OSR FUDS.

3.2 Background on Community Involvement

3.2.1 Community interest in the OSR FUDS began when buried ordnance was disccvered in January 1993 at 52nd Court, N.W. Upon definition of the boundaries of the OSR FUDS, the Army divided the FUDS into nine zones to aid subsequent investigative efforts. Because of the large number of people potentially impacted by the site, the Army then solicited members of the local community to become "Zone Captains" to facilitate communication between the Army and the residents of each of the nine zones. Briefings on the progress of the investigation was provided at weekly Zone Captain meetings held at the SVRO. Zone Captains in turn conveyed the information obtained during these meetings to the residents of their respective zones.

3.3 Integration of Comments

3.3.1 Comments raised during the OSR FUDS public comment period on the Remedial Investigation Report are summarized briefly below. Only significant comments are reccunted below; other comments pertaining to minor inaccuracies or verbiage changes are not included. The comment period was held from March 21, 1995 to April 30, 1995.

1. W.C. and A.N. Miller Companies stated support for the selection of the no further action strategy for the OSR FUDS, however, they felt that language throughout the report should be amended to more strongly reflect the rationale for the Army's conclusion that no further action is required in the OSR FUDS.

   Army Response: It is stated throughout the risk assessment that the calculated risks are within USEPA's acceptable risk range. Thus, the statement that the results of the risk assessment do not support a need for further remedial action at the OSR FUDS is both accurate and appropriate.

2. W.C. and A.N. Miller Companies expressed concern that several assumptions made in the risk assessment were unduly conservative and resulted in an overstatement of actual risk. However, W.C. and A.N. Miller Companies concluded by stating that since the Army has concluded that no further action is required, it is pointless to revise the risk assessment using less conservative assumptions because the ultimate conclusion would be the same. Finally, W.C. and A.N. Miller Companies stated that, in other regards, the risk assessment is fully supported by sound science.

Army Response: The risk assessment for the OSR FUDS was conducted in accordance with USEPA's Risk Assessment Guidance for Superfund (RAGS). The conservative assumptions that were made were in accordance with RAGS and with specific guidance received from USEPA Region III.

3. W.C. and A.N. Miller Companies states that the summary in paragraph 3.2.3.2 of the RI report of the three documents that comprise the 1986 Army report "understates the conclusions therein that other munitions could be buried in the area." W.C. and A.N. Miller Companies continue by contending that "It is disingenuous, if not deliberately misleading, to state that 'None of the documents point conclusively to any large scale ordnance burials' and that 'the possibility of buried ordnance was not completely discounted.' Moreover, the RI does not explain that the 1986 report was never disclosed to the public prior to the discovery of munitions on 52nd Court in January of 1993."

Army Response: The statements made in the RI report and called out by W.C. and A.N. Miller Companies are an accurate summary of the 1986 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) report. In his 29 October 1986 Memorandum for Record summarizing the Camp

American University historical search, Mr. J.W. Williams, USATHAMA Historian, makes the following statements:

- "The sole source that says munitions were buried is historically suspect because of when written, the contexts in which statements appear, the nature of the source, and inferences from comparisons with other sources."
- "If any materials were buried, they were probably small quantities of laboratory or experimental materials. All sources we found were inconsistent with the notion of substantial quantities of any munitions or the components for munitions existing at [American University]".
- "We could not disprove the burial of some materials on or near Camp American University, and subsurface ordnance could still exist from military uses of [American University]".

Therefore, based on the above information, the statements cited by W.C. and A.N. Miller Companies in paragraph 3.2.3.2 of the RI report are deemed by the Army to be neither "disingenuous" nor "deliberately misleading", but instead to be an accurate summary of the major conclusions of the USATHAMA report. Finally, the RI Report has been amended to state that the 1986 USATHAMA report was not disclosed to the public until discovery of the buried munitions in 1993.

4. W.C. and A.N. Miller Companies concluded their comments by stating that it "supports the Army's conclusion that no risk to human health, safety or the environment exists in the OSR FUDS, and that no further action is therefore warranted.'

Army Response: No response required.

3.4 Remaining Concerns

There were no issues raised during that public comment period that have not been addressed by the Army.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107-4431

REPLY TO ATTENTION OF:

Federal Facilities Branch (3HA50)

VIA ELECTRONIC MAIL
FEDERAL EXPRESS

June 2, 1997

U.S. Army Corps of Engineers
Baltimore District
Programs & Project Management Division
10 S. Howard Street
Baltimore, MD 21203-1715

Attn: Gerry Pollis, Chief (CENAB-PP-E)
Environmental Management Branch

Re: Final Remedial Investigation ("RI") Report
Spaulding and Captain Rankin Areas
American University Experiment Station
Formerly Used Defense Site ("Spring Valley")
Washington, D.C.

Dear Mr. Pollis:

Please reference separate correspondence from the U.S. Environmental Protection Agency Region III ("EPA Region III" or "Agency") to the U.S. Army Corps of Engineers ("COE") Baltimore District dated February 12, 1996, May 24, 1996 and August 15, 1996 regarding the draft RI report for the Spaulding and Captain Rankin Areas portion of the Spring Valley Site, which is otherwise designated as Operable Unit Two ("OU-2"). Also reference February 10, 1997 correspondence from Parsons Engineering Science, Inc. ("Parsons ES") to EPA Region III that transmitted the final RI report (Volume I and Volume II), dated June 1996, as well as the responses to comments on the draft RI report, for OU-2 as attachments. This correspondence also transmitted the draft Site Closure Plan and draft Record of Decision ("ROD") for OU-2. EPA Region III received the Parsons ES correspondence via federal express on February 12, 1997. The Agency notes that we had previously received the draft Site Closure Plan and draft ROD for OU-2 as an enclosure to December 13, 1996 correspondence from COE Baltimore District.

As promised during the May 23, 1997 meeting at COE Baltimore District Offices, EPA Region III is providing comments on the final RI report for OU-2. By way of this letter, EPA Region III informs you that, with one very minor exception, COE has satisfactorily addressed all substantive written and verbal comments on the draft RI report for OU-2. As stated in EPA Region III's August 15, 1996 correspondence to COE Baltimore District, the Agency discovered certain minor typographical errors in the original data validation report prepared by our Central Regional Laboratory with respect to an analytical data summary generated on behalf of Parsons ES by Battelle (i.e., incorrect site name on the data summary form). A revised Quality Assurance Review Memorandum, dated June 17, 1996, was included as an attachment to the August 15th correspondence. A review of the final RI report, Volume II, Appendix C-4 indicates that the original data summary form has not been replaced. Although this omission does <u>not</u> affect EPA Region III's conclusions regarding data usability, it is suggested that COE Baltimore District instruct Parsons ES to insert the revised data summary form, which been provided as an attachment to this letter.

In terms of COE-generated data used in the quantitative risk assessment, EPA Region III concurs with the recommendation in the final RI that no further action is necessary at OU-2. EPA Region III offers no substantive comments regarding the draft Site Closure Plan and draft ROD for OU-2 except to note that close-out of the entire Spring Valley site should properly be deferred until satisfactory resolution of environmental concerns recently raised by the District of Columbia.

On a related matter, this letter also serves to document EPA Region III's receipt of graphics file that the Agency understands contains a detailed plan view map showing properties/lots at the Spring Valley site (i.e., denoted as "Plate A" and entitled "Lots and Properties, OSR FUDS RI, Operation Safe Removal" and included in Appendix C to the final RI report for OU-1, dated June 1, 1995). Consistent with discussions during the May 23rd meeting, it is suggested that this information be used to create plan view map overlays, thereby allowing us to more clearly show the spatial relationship among properties/lots, identified points of interest, areas of chemical contamination and other areas of potential environmental concern. This approach should enable both EPA Region III and COE Baltimore District to better respond to the District of Columbia's environmental concerns.

As you know, I will be on vacation from June 3, 1997 to June 23, 1997, inclusive, and will be unavailable until my return to the office on June 24, 1997. In my absence, you may direct any questions to my supervisor, Henry Sokolowski, who may be reached at (215) 566-3348. Please be assured that your continued cooperation is greatly appreciated.

Sincerely,

Drew Lausch
Remedial Project Manager

Attachment

cc w/o attachment:

Hank Sokolowski (EPA)
Linda Watson (EPA)
Brian Nishitani (EPA)
Bill Hudson (EPA)
Tom Stukas (ATSDR)
Jim Sweeney (District of Columbia)

Appendix C

APPENDIX C

CITED LOCATION CROSS REFERENCE

APPENDIX C

CITED LOCATION CROSS REFERENCE

ZONE	POI	POI NAME	IDENTIFIED PROPERTY	COMMENTS
1	13	Circular Trenches	52d Court	Identified in EPIC Report
	14	Pit	52d Court	Phase I initial find
	15	Ground Scar		
	16	Chemical Persistency Test Area		
2			5010 Sedgewick Street	April 2, 1996 UXO find
	1	Circular Trenches		
	2	Possible Pit		
	3	Small Crater Scars		
	4	Possible Pit		
	5	Possible Pit		
	6	Possible Target or Test Site		
	7	Possible Test Area		
	8	Possible Target or Test Area		
	9	Possible Firing or Observation Stalls		
	10	Possible Target or Test Site		
	11	Scattered Ground Scars		
	12	Possible Graded Area		
	38	Bradley Field/Maj Tolman's		
	39	Static Test Fire Area		
	Possible Linear Depression			
3	19	Old Mustard Field		
	29	Ground Scar		

APPENDIX C
CITED LOCATION CROSS REFERENCE
(Continued)

ZONE	POI	POI NAME	IDENTIFIED PROPERTY	COMMENTS
4	East Creek			
	17	Possible Pit		
	18	Small Crater Scars		
	20	Ground Scar		
	21	Shell Pit (Concrete Bunker)		NTCRA
	22	Shell Pit (Concrete Bunker)		
	23	Shell Pit (Concrete Bunker)		NTCRA
	25	Possible Trenches		
	26	Small Crater Scars		
	53	Baker Valley		Accidental CWA release
	East Creek			
5	American University			Laboratory Locations
	27	Probable Trench or Ditch		
	28	Probable Trench or Ditch		
	40	Ohio Hall		
	41	History Building		
	42	Physiological Laboratory		
	43	Gun Pit		
	44	Chemical Research Laboratory		
	45	Explosives Laboratory		
	46	Canister Laboratory		
	47	Bacteriological Laboratory		
	48	Dispersoid Laboratory		

ZONE	POI	POI NAME	IDENTIFIED PROPERTY	COMMENTS
	49	Pharmacological Laboratory		
	50	Gun Pit		
	51	Fire and Flame Laboratory		
	52	Electrolytic Laboratory		
	53	Baker Valley		Accidental CWA release
6			Camp Leach	
	30	Training Trenches		
	31	Training Trenches		
	32	Training Trenches		
	33	Training Trenches		
	34	Training Trenches		
	35	Training Trenches		
	36	Training Trenches		
7			4835 Glenbrook	AU President's Residence
	24	Probable Pit	4801 Glenbrook	
	53	Baker Valley		
8				
	Mill Creek			
9	No POI			UXO Recovered

Appendix D

APPENDIX D

CORPS' PUBLIC INVOLVEMENT/COMMUNITY RELATIONS INITIATIVE FOR OPERATION SAFE REMOVAL, NOTICE TO RESIDENTS LETTER, AND NOTIFICATION FLOW CHART

Corps' Public Involvement/Community Relations initiative for Operation Safe Removal

During the initial days of the crisis, the Public Affairs staff talked one-on-one with many residents—identifying their concerns, assuring them of the continuing commitment to "safety first" and correcting misconceptions and rumors about the possible buried munitions in the 660 acre study area.

Our plan (from the beginning) was to establish and maintain community confidence by communicating the facts early and accurately, providing a physical presence in the community, and creating forums for community input. Our research indicated that the community was affluent, high educated, politically astute, and included senators, congressional representatives, ambassadors, the Secretaries of the Army and Navy, presidential appointees and local and national media correspondents.

Our strategies involved:
initiating a series of town meetings and forming a community advisory board that committed the residents to project discussions and decisions;
opening a public affairs office in the community to help solve problems and address residents concerns;
allowing the access for the media by issuing regular new releases and arranging interviews, media days, photo and video opportunities; and
creating an effective print program that provided timely publications.

We developed the Spring Valley Public Involvement and Response Plan. Fact sheets detailing the historical research of the study area and other pertinent information were produced for the residents at the first town meeting.

Recognizing that this project would involve an intense community relations commitment, we made plans the first few days of the crisis to augment the District public affairs staff of four with an additional temporary employee.

Town meetings became the forum for communicating the Corps' plans and operations to the community. At every important milestone public meetings were conducted. Over the life cycle of the project more than 100 public meetings were conducted in the community.

The first meeting was held on Feb 4, 1993 at a local church (Westmoreland Presbyterian Church) and with a few volunteers, hand delivered notices to more than 1,300 households in the study area. At the meeting the Baltimore District Engineer presented the community with an extensive overview of the history of the area, the work plan, and how the project would impact the lives of the residents.

By the second week in February, we had opened a temporary resident office on federal property near the study site, and staffed it with employees from the District office in Baltimore. Two public affairs specialists, on-site for the two-year project, provided the community with a resource center for printed materials about the project and a place to call for answers to their questions and concerns.

The Corps divided the entire study area into nine work areas, (or zones) for ease in completing the work. To give the residents opportunity for more one-on-one communication with Corps officials, zone meetings were set up during the first weeks in February. The District Engineer again briefed the residents about the project and to further enhance the community participation in the future, asked for volunteers to serve as "zone captains" and represent their zones at weekly

meetings. This "Zone Captains' Board" quickly established itself as the working liaison between the residents and the Corps.

Media coverage for the project was fair and balanced because of the decision to provide the media access to the project from the outset. The media were invited to attend town meetings, but because residents had requested no media interruptions during the meetings, interview opportunities with Corps officials were permitted after the meetings. We responded to regular media inquiries and accommodated all types of coverage to include live remotes for morning news shows, TV cable coverage, live radio spots and print media interviews. To further cement relations with the media, we conducted media days, provided photo and video opportunities. Faxed media releases on the status of the project generated news updates that appeared regularly on local broadcasts. Footage from the project was used on CNN's Science and Technology and several articles appeared in external professional journals, the Corps' Engineer Update and the District's internal publication, Constellation.

We prepared a bimonthly newsletter which was mailed to all residents. We also prepared fact sheets on the project technology, equipment, history of the site, personnel profiles and significant issues, and made them available at the resident office. To respond to critical issues, a 24-hour toll-free hotline was installed first at the Baltimore District office, and then transferred to the on-site public affairs office. New residents and visiting dignitaries could visit the office for a project briefing, and view the modular exhibit for a pictorial overview of the project's history and scope of work. We visited several individuals at their homes for special one-on-one briefings about the project. In addition, residents could review project information papers and documents at three repositories set up at two local libraries and the on-site office.

Summary

- 2-year intense Public Involvement/Community Relations program.
- On-site Public Affairs Office open to the public and staffed with two full-time public affairs specialists.
- Toll Free 24-hour Information Line updated daily.
- Monthly newsletter mailed to entire Spring Valley Homeowners Association.
- Weekly Zone Captains Meeting (more than 100 meetings)
- Public Meetings that started on Feb. 4, 1993 and ended March 1995. (More than 100 meetings.)
- Public repositories containing project documents and reports maintained in two local libraries (Tenley/Palisades Libraries)
- News Releases issued (35) and media days held (12)
- Fact Sheets produced (more than 15)
- Letters to Community (approximately 15-20 letters addressing various project issues to include evacuations, work schedules and rights of entries.)
- Numerous briefings for congressional interests, community members, public officials representing local, state and federal agencies and the Miller Company.

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MD 21203-1715

June 22, 1995

REPLY TO
ATTENTION OF

Public Affairs Office

Dear Spring Valley Resident:

"Operation Safe Removal" is the investigation and remediation by the U.S. Army Corps of Engineers of the formerly used defense site known as Camp American University Experiment Station/Camp Leach in Washington, D.C. Phase I began on January 5, 1993, as an emergency response to the discovery of buried ordnance in the 52nd Court area of Spring Valley. Phase I concluded on February 2, 1993.

Phase II, the Baltimore District's investigation to determine the existence of any further ordnance and explosive waste, began immediately after Phase I. The Phase II investigation of the formerly used defense site concluded on March 21, 1995, with the issuance of the project's Remedial Investigation report and Record of Decision document determining that no further action was required at the site, excluding the Captain Rankin Area. We recently concluded a 30-day public comment period on both documents.

The Phase II investigation included an historical records search, geophysical surveys, intrusive excavations and soil sampling. At the beginning of Phase II, we divided the formerly used defense site into zones. To facilitate reporting the status of the investigation in each zone, the Corps prepared a series of zone reports. These reports detail the status of the investigation in each zone. The Remedial Investigation incorporated the zone report's conclusions for the entire site.

The Phase II investigation is comprehensive and thorough. Using geophysical equipment, we surveyed over 490 properties throughout the area and conducted 11 excavations to expose suspect anomalies. During the course of the project, we discovered and safely removed three ordnance items from the site. In addition, we conducted soil sampling at 59 locations at specific points of interest. We analyzed soil samples and found no chemical warfare material, breakdown products or soil contamination that required further action within the site covered by the Record of Decision. The Environmental Protection Agency, Region III, reviewed safety and soil plans and concur with the Remedial Investigation report's conclusion that no further action is warranted or necessary to protect human health or the environment within the formerly used defense site, excluding the Captain Rankin Area.

The final Remedial Investigation report and signed Record of Decision document have been placed in the project's two library repositories. The repositories are located at the Tenley Branch Library at Wisconsin Avenue and Albermarle Street, and at the Palisades Branch Library at 49th and V Streets.

Although the Record of Decision document presents a determination that no further action will be taken at the Spring Valley formerly used defense site, the Captain Rankin Area of the former defense site remains under investigation. The final results of this investigation will be addressed under a separate Record of Decision document and added to the library repositories.

The Environmental Protection Agency, Region III, has agreed to provide upon request a letter to residents within the formerly used defense site verifying the results of the Corps' Remedial Investigation and Record of Decision. For further information regarding such a letter, please contact the Public Affairs Specialist/Community Relations Office, EPA, Region III, at (215) 597-3221.

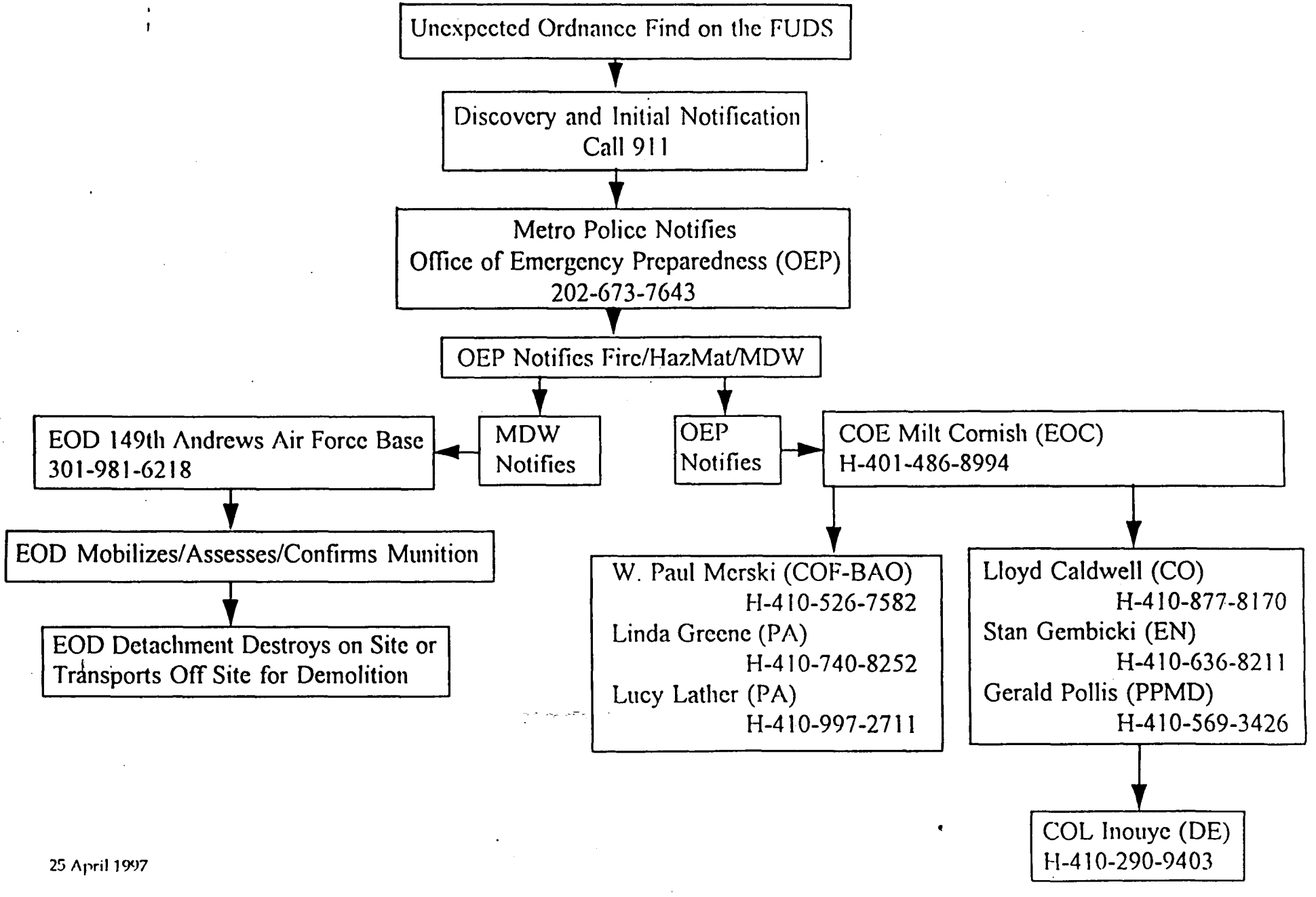
In the future, we ask those residents who may have questions or concerns regarding any suspicious or unidentified metal objects on or near their properties to contact the District of Columbia Metropolitan Police Department at (202) 282-0070 or dial 911. The Metropolitan Police Department will investigate your concern and make the appropriate decision based on the identity of the object in question.

The U.S. Army Corps of Engineers is proud to have had an opportunity to serve your community during the past two years. We thank you for your patience and cooperation throughout the resolution of this complex project. We especially thank your friends and neighbors who dedicated their time to serve as voluntary zone captains. Without the support and understanding of the Spring Valley community, this unique and challenging effort could not have succeeded.

Sincerely,

Neal T. Wright
LTC, Corps of Engineers
Acting District Engineer

Unexplained Ordnance Finds at Spring Valley FormerlyUsed Defense Site



25 April 1997