



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

04-9
Rox

FEB 10 1992

REPLY TO THE ATTENTION OF:

HSRM-6J

VIA FACSIMILE AND
FIRST CLASS MAIL

Mr. Arthur Kleinrath
U.S. Department of Energy
Dayton Area Office
P.O. Box 66
Miamisburg, Ohio 45343

RE: U.S. DOE Mound Plant Review Comments
Site Scoping Report, Volume 11

Dear Mr. Kleinrath:

The United States Environmental Protection Agency (U.S. EPA) has the following comment on the "Site Scoping Report, Volume 11 - Spills and Response Actions" for the Mound Plant site.

Table II.1 and Table II.3, Pages 2-8 and 2-19, respectively -
Please explain the gap in the records found in Table II.1 from
June 1978 until March 1983 and in Table II.3 from March 1973
until July 1985.

Please provide a response to this comment, and revised pages if
necessary, within forty-five days of your receipt of this letter, or
by March 26, 1992. Please feel free to call me at (312) 353-6287 if
you have any questions.

Sincerely,

Diana Mally
Remedial Project Manager

cc: M. Hatcher, OEPA
~~D. Neff, EG&G Mound~~
T. Farmer, LANL ER-TSO
J. Price, Weston

29-01-01-07-11

9406160005

F-049



6501 AMERICAS PARKWAY, N.E.
ALBUQUERQUE, NM 87110-1517
505-884-5050 • FAX: 505-884-5388

23 March 1993

EG&G Mound Applied Technologies
Attention: Kathy Koehler
Mail Stop OSE-2
P.O. Box 3000
Miamisburg, Ohio 45343-3000

RE: BOA No. 24251
Operable Unit 9, Site Scoping Report

RFW WO# 5376-39-02

Dear Ms. Koehler:

At your request, we are sending to CH2M Hill, under separate cover, one copy each of the following Site Scoping Reports:

Volume 2 - Geologic Log and Well Information and Addendum - Stratigraphic and Lithologic Logs

Volume 7 - Waste Management

Volume 10 - Permits and Enforcement Actions

Volume 11 - Spills and Response Actions

Per instructions from Diana Mally, these volumes are being sent to:

CH2M Hill
Attention: Eldon Fink
310 West Wisconsin Ave.
Suite 700
Milwaukee, Wisconsin 53201-2090

If you have any questions regarding this matter, please do not hesitate to call Bill Criswell (505) 884-5050 or the Alternate Project Manager, John Price, at (513) 825-3440.

Sincerely,

ROY F. WESTON, INC.

John W. Thorsen, P.E.

Project Manager

CWC/gy

29-01-01-07-11
9406160005



pc w/attachment: E. Fink (CH2M Hill)

w/o attachment: C. Friedman (EG&G MAT)
M. Williams (EG&G MAT)
A. Kleinrath (DOE DAO)
D. Mally (EPA)
D. Spencer (EPA)
ER Project File (ABQ)
ER Project File (CIN)



ROY F. WESTON, INC.
6501 AMERICA'S PARKWAY, N.E.
SUITE 800
ALBUQUERQUE, NEW MEXICO 87110
505-884-5050
FAX: 505-884-5388

L. W. W. A. 9
P. G. K.
ACTIONAL
dh
2/25

18 February 1992

University of California
Los Alamos National Laboratory
Attention: Dr. Kenneth Rea
EES-14, ER TSO
P.O. Box 1663, MS K-485
Los Alamos, NM 87545

RE: ER Program, Mound Plant
Operable Unit 9, Site Scoping Report
Change Order Request 18-001

RFW WO# 2744-41-18

Dear Dr. Rea:

Attached is the change order request for the Operable Unit 9, Site Scoping Report. This change order is required to complete Volumes 2, 10 and 11, as discussed below.

Volume 2 - Geologic Log and Well Information Report includes a revision in response to regulatory agency comments and publication of the Final document. An addendum is also required that will include lithologic and stratigraphic data compiled from Mound Plant engineering records. The revised document is due to EPA 17 April 1992.

Volume 10 - Permits and Enforcement Actions requires revision in response to regulatory agency comments. Response to comments and the revised document are due to EPA 21 March 1992.

~~Volume 11~~ - Spills and Response Actions requires response to regulatory agency comments. The response to comments is due to EPA 17 April 1992.

One trip to Miamisburg, Ohio is included to confer with Mound personnel and complete the data-gathering efforts for these reports.

Approval pages will be included with the final copies of Volumes 2, 10 and 11 submitted to EPA on the dates cited above. Four new copies of each of these volumes will be produced with the signed approval pages and submitted to R.A. Neff, EG&G-MAT, for inclusion in the administrative record. Twenty-five copies of the approval pages and Final cover and title sheets will also be reproduced and distributed for insertion into existing documents.

Additional labor and expense charges are included in this change order request for reproduction of the large volume of reference materials used in compilation of Volume 7 - Waste Management Report. Since much of the data compiled for this report was not available through outside sources, the project managers agreed at the December FFA Meeting that one copy of the set of references for each of the agencies will be sufficient. This involves about 40 hours labor at the production technician level. Five copies of these references will be produced and distributed, two copies to EG&G-MAT and one copy each to EPA and OEPA. One copy will be retained in the WESTON project office in Cincinnati, Ohio.

29-01-01-07-11
9406160005



Dr. Kenneth Rea

-2-

18 February 1992

The change order request is in the amount of \$33,295 for 417 hours. The new ceiling of this task is \$88,796.

If you have any questions, please contact Bill Criswell or John Price.

Sincerely,

ROY F. WESTON, INC.

A handwritten signature in cursive script that reads "William M. Little".

Michael P. Mauzy, P.E.
ER Program, TSO Subcontractor
Project Manager

CWC/shm

Attachment

pc w/o att: Dick Neff (EG&G)
pc w/att: T. Farmer (ER TSO)
ER TSO File

scopcor2.001

Environmental Restoration Program

OPERABLE UNIT 9,
SITE SCOPING REPORT:
VOLUME 11 – SPILLS AND
RESPONSE ACTIONS

MOUND PLANT
MIAMISBURG, OHIO

March 1992

FINAL

(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory



ENVIRONMENTAL RESTORATION PROGRAM

**OPERABLE UNIT 9,
SITE SCOPING REPORT**

VOLUME 11 - SPILLS AND RESPONSE ACTIONS

**MOUND PLANT
MIAMISBURG, OHIO**

March 1992

**DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE**

**ENVIRONMENTAL RESTORATION PROGRAM
TECHNICAL SUPPORT OFFICE
LOS ALAMOS NATIONAL LABORATORY**

**FINAL
(Revision 0)**

Signature Page

This report is Volume 11 of a multiple-volume Site Scoping Report providing the background information pertinent to the remedial investigation/feasibility study (RI/FS) of the Mound Plant. Under the terms of the Federal Facility Agreement between DOE and US EPA, this report is submitted to US EPA for approval.

This report is approved by US EPA only for the purposes of scoping the RI/FS, and approval does not imply concurrence with the interpretations presented herein. It is recognized that additional information will be collected during the RI/FS and may supersede information contained in this report.

APPROVED:

Diana Mally
Remedial Project Manager
U.S. Environmental Protection Agency
Region V



CONTENTS

1.	INTRODUCTION	1-1
1.1.	SCOPE OF REPORT	1-2
2.	SUMMARY OF SPILLS AND ENVIRONMENTAL RELEASES	2-1
2.1.	RECORDS OF THE SAFETY OFFICE	2-1
2.2.	CORRELATIONS WITH OTHER RECORDS	2-15
3.	SUMMARY RESPONSE ACTIONS	3-1
3.1.	RESPONSES BY OHIO ENVIRONMENTAL PROTECTION AGENCY	3-1
3.2.	RESPONSES BY U.S. ENVIRONMENTAL PROTECTION AGENCY: DRAFT RCRA FACILITY ASSESSMENT	3-1
3.3.	SUMMARY OF THE DOE COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM (CEARP)	3-8
4.	REFERENCES	4-1

TABLES

II.1.	Summary of Spills and Environmental Releases from Records of the Safety Office	2-2
II.2.	Transcription of "Undocumented" Spills from Appendix B of MRC Investigation Report No. 74-13, "Plutonium Off-Site."	2-13
II.3.	Excerpts from Radiation Incident Records - Health Physics Office	2-16
III.1.	Summary of Response Actions by Ohio Environmental Protection Agency Emergency Response Section	3-2
III.2.	List of Sites Currently in the Mound Plant Environmental Restoration Program by Operable Unit Cross-Referenced to the RCRA Facilities Assessment and CEARP Phase I	3-3

ACRONYMS

AEA	Atomic Energy Act
AEC	Atomic Energy Commission
AL	Albuquerque Operations Office
AOC	area of concern
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
BVA	Buried Valley aquifer
DAO	Dayton Area Office
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EG&G-MAT	EG&G-Mound Applied Technologies
ER	Environmental Restoration
EROS	Emergency Response Online System
ERS	Effluent Removal System
FFA	Federal Facilities Agreement
FOIA	Freedom of Information Act
HEPA	high efficiency particulate air filter
HRS	Hazard Ranking System
L	liter
mL	milliliter
MRC	Monsanto Research Corporation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OEPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
PVC	polyvinyl chloride
PR	preliminary review
RAPCA	Regional Air Pollution Control Authority
RCG	radioactivity concentration guide
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facilities Assessment
RQ	reportable quantity
SNAPP	space nuclear auxiliary power
SSP	Site Survey Project
SWMU	solid waste management unit
VSI	visual site inspection
WTS	Waste Transfer System

ACKNOWLEDGEMENTS

This report was prepared by Roy F. Weston, Inc., Albuquerque, New Mexico, under subcontract 9-XS1-Q7181-1 to the University of California, Los Alamos National Laboratory, Los Alamos, New Mexico.

1. INTRODUCTION

The U.S. Department of Energy (DOE) Mound Plant, Miamisburg, Ohio, was placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List (NPL) on November 21, 1989 (54 Federal Register 48184). Pursuant to its NPL status, the DOE signed a CERCLA Section 120 Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA) that became effective October 11, 1990. A similar agreement is in negotiation between the DOE and the Ohio EPA (OEPA) (December 1991). The terms of the FFA require that the DOE develop and implement remedial investigations and feasibility studies and conduct interim remedial actions in order to ensure that environmental impacts associated with past and present activities at the site are thoroughly investigated and appropriate action is taken to protect the public health and welfare and the environment (EPA 1990).

The Albuquerque Operations Office of the DOE established the Environmental Restoration (ER) Program in 1984 to collect and assess environmental data in order to develop a conceptual site model, assess both the nature and extent of contamination, and identify potential exposure pathways and potential human and environmental receptors. These activities have been conducted under DOE policy for all facilities to comply with applicable environmental regulations. In order to provide EPA with sufficient information and data gathered during these previous investigations, a multi-volume scoping report providing background information has been prepared. The Site Scoping Report will provide descriptions and summaries of the current conditions and characteristics of Mound Plant and will consist of at least the following volumes:

1. Groundwater Data: February 1987 - July 1990
2. Geologic Log and Well Information Report
3. Radiologic Survey Report
4. Engineering Map Series
5. Topographic Map Series
6. Photo History Report
7. Waste Management Report
8. Environmental Monitoring Data
9. Annotated Bibliography
10. Permits and Enforcement Actions
11. Spills and Response Actions

1.1. SCOPE OF REPORT

This report provides summaries of past product and hazardous substance spills, including identification of materials spilled, amounts and locations, and response actions conducted. Data for this report were compiled from a review of records and incident reports maintained in the plant safety office. The safety office records are maintained by the plant's operating contractor, currently EG&G - Mound Applied Technologies (EG&G-MAT), formerly Monsanto Research Corporation (MRC), a subsidiary of Monsanto Chemical Company. Limited data were also obtained from health physics reports that allowed some correlation of dates and materials. The record is not entirely complete, as some incidents appear in one record that are not correlated to the other. Safety records from the 1950s and 1960s appear to be incomplete. Records from the 1970s and 1980s increase in regularity and detail, reflecting the increased standards imposed by the Occupational Safety and Health Act (29 CFR 1904) and reporting requirements relating to compliance of federal and state environmental regulations authorized under the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act (RCRA) and CERCLA (DOE 1991b).

Only incidents that resulted in a spill or an environmental release are included in this report. Laboratory and tabletop accidents, releases that were entirely contained within buildings, and personal injuries and radiation or hazardous substance exposures that did not apparently result in an environmental release are beyond the scope of this report. Under the Privacy Act of 1974 (PL 93-579), names of individuals are additionally excluded from this report.

Summaries of response actions conducted by EPA and OEPA were requested under the Freedom of Information Act (FOIA). EPA deferred the FOIA request until early in 1992, so little information from the federal agency is available at this writing. OEPA provided information from the records in the Emergency Response Online System (EROS) database. The Emergency Response Section maintains the EROS database and is the designated reporting point for spills and unauthorized discharges in Ohio.

Summaries are also provided for 1) the visual site inspection conducted by EPA as part of the RCRA Facilities Assessment (RFA) and 2) activities conducted by DOE as part of the Comprehensive Environmental Assessment and Response Program (CEARP), the forerunner of the ER Program. Sites identified by these assessments are cross-referenced to the current potential release sites included in the ER Program.

2. SUMMARY OF SPILLS AND ENVIRONMENTAL RELEASES

2.1. RECORDS OF THE SAFETY OFFICE

As a government-owned, contractor-operated facility, Mound Plant must operate in compliance not only with Executive Orders and Orders of the DOE, formerly the Atomic Energy Commission (AEC), under the Atomic Energy Act (AEA) (42 U.S.C. 2201 et seq.), but with federal and state statutes and regulations, and corporate safety policies. EG&G-MAT has been the operational contractor since 1988, MRC was the operator from 1948 to 1988 (DOE 1991a). Under orders from the AEC and DOE, MRC and EG&G-MAT have conducted accident and incident investigations and maintained records of these investigations.

DOE Order 5484.1 establishes the requirements and procedures for the reporting of information concerning environmental protection, safety, and health protection for all DOE facilities. Three types of investigations are defined by DOE Order 5484.1: 1) Type A board investigations in which a conflict of interest or sensitive issue may permit only DOE personnel to be appointed; 2) Type B board investigations in which all contractor employees or both DOE and contractor employees may be appointed; and 3) Type C non-board investigations conducted by DOE contractor personnel when their operations are involved. Type A investigations typically involve a fatal accident or an incident so severe that an in-depth investigation is justified. At the other end of the spectrum, a "near miss" incident is defined by the operating contractor as one that meets minimum criteria for which an investigation will be conducted. An "unusual occurrence" is defined by DOE Order 5000.3 as an unplanned event that has programmatic significance such that it adversely affects, or potentially affects the performance, reliability or safety of a facility.

Table II.1 is a summary of data compiled by review of accident and incident investigation reports maintained in the plant safety office. Only incidents that apparently resulted in a spill or an environmental release are included in the compilation. By and large, the majority of spills and releases listed in Table II.1 qualified as Type C investigations, unusual occurrences or near misses. Investigation and reporting of the latter was handled by MRC and EG&G-MAT in much the same manner as Type C investigations, although they did not truly qualify as such.

Only one incident in this record was observed to have qualified to trigger a Type A investigation board. This was the tritium release of November 8, 1989, in which over 38,000 curies of tritium were accidentally released to the atmosphere. This incident resulted in a formal DOE review panel, a news release and a public press conference. The incident investigation report was completed January 1990 (Table II.1) A smaller tritium release of 132 curies on March 13, 1973, also resulted in a formal

Table II.1. Summary of Spills and Environmental Releases from Records of the Safety Office

Date	Location	Material	Amount	Incident	Response
02/12/63	South end SW Bldg.	H-3	"Low-level"	Fire of paper covering metal during cutting and drumming for disposal (63-13).	MRC Incident Investigation Report No. 63-13 (2/14/63).
03/04/63	Historic landfill	Misc. chemicals	Unknown	Explosion of incompatible chemicals in deteriorated containers; no radioactivity.	MRC Incident Investigation Report No. 63-19 (2/19/63).
10/27/64	SM Bldg.	Pu-238	Unknown	Methanol vapors inside fumehood exploded; possible air release.	MRC Incident Investigation Final Report 11/23/64 - record incomplete. Use of flammable solvents within gloveboxes prohibited by AEC.
02/26/65	SM Bldg.	Pu-238	Unknown	Ruptured can of trash in Room 26; possible air release; possible water release.	MRC report 3/2/65 - record incomplete.
03/06/65	SM Bldg.	Pu-238	Unknown	Acid release in Room 59; possible air release.	MRC report 3/8/65 - record incomplete.
08/27/65	SM Bldg.	Pu-238	Unknown	Fire in Room 38; possible air release.	MRC report 9/7/65 - record incomplete.
05/20/66	SM Bldg.	H-3	Unknown	Unidentified release of tritium to SW stack.	MRC Incident Investigation Report No. 66-26 (5/27/66). Recommendations to re-evaluate mechanical and engineering conditions of ERS.
09/08/67	WTS west of SM Bldg.	Pu-238	Unknown	Flanges in line found unbolted; low-risk line contaminated, including soil to 15 ft downslope; high-risk line not in use yet.	MRC Incident Investigation Report No. 67-21 (10/10/67). Soil cleanup proposed (no cleanup guideline given) with periodic system inspections.
11/09/67	Wasteline south of SW/R Bldgs.	"Low-level radioactivity"	1,500-2,000 gals	During wasteline repair wastewater spilled across road to storm drains and then to drainage ditch; about 7.65 millicuries released.	MRC Incident Description 11/17/67. 10 on-plant and 7 off-plant water samples collected 5 to 20 minutes after spill; highest air reading 1200 dis/min/mL; highest water reading 216.0 dis/min/mL at culvert exit to drainage ditch.
03/30/68	SM Bldg.	Pu-238	Unknown	Reversal of air flow in SM stack; possible air release.	MRC Incident Investigation Report No. 68-8 (4/10/68).

Table II.1. (page 2 of 10)

Date	Location	Material	Amount	Incident	Response
04/03/68	SM Bldg.	Pu-238	Unknown	Explosion in glovebox in Room 35A; possible air release.	Interim Report 4/18/68 by DAO - record incomplete. New PP Bldg. facility evaluated to ensure similar incident could not occur.
01/23/69	WTS below WD Bldg.	Pu-238	1,000(?) gals	High-risk caustic solution spilled from a leak in the pipeline.	MRC Investigation Report 2/11/69. Line repaired; at least seventy-five 30- and 55-gal drums filled with contaminated soil (as of 1/25/69); report of 2/11/69 noted that four known leaks occurred since May 1968.
10/07/70	R Bldg.	MoF ₆ HF	About 1 pound	Fracture of transfer line and discharge of cylinder to fumehood and R Bldg. stack; included molybdenum hexafluoride, hydrogen fluoride, and molybdenum oxyfluorides, no radioactivity involved.	MRC Incident Investigation Report No. 70-18 (10/19/70).
12/70	T Bldg. Wasteline	Po-210	Unknown	Routine samples at SD influent showed increased alpha activity; source traced to cracked wasteline west of T Bldg.; seepage found to have migrated across to sanitary wasteline in adjacent manhole.	Memo to AL from DAO 5/26/72 - record incomplete. 39 30-gal drums of soils excavated and shipped off-plant for disposal by mid-March 1971; estimated 20 μ Ci removed; leaks repaired.
02/10/71	SM Bldg.	Pu-238	49.9 μ Ci	Fire in Rooms 27 and 35; releases mostly through stack; little or no material tracked by firefighters.	MRC Incident Investigation Report No. 71-5 (2/24/71). Mound and Miamisburg fire departments responded; sampling at stack measured indicating 49.9 μ Ci represented 62.4% of RCG.
05/26/71	SW Bldg.	H-3	1,100 Ci	Condensate liquid sprayed area during drainage; material vented to stack.	MRC Incident Investigation Report No. 71-16 (6/9/71). Cause of pressurization unexplained; gauges installed to monitor.
09/02/71	HH Bldg.	H-3	3,600 Ci	Liquid nitrogen trap ruptured causing tritium contaminated gas and oil to be vented to atmosphere.	MRC Incident Investigation Report No. 71-25 (9/14/71).
11/03/71	PP Bldg.	Pu-238	Unknown	Fire detection sprinkler head failed, causing water to cover floors in filter banks; no significant increase in stack effluent.	MRC Incident Investigation Report No. 71-28 (11/11/71).

Table II.1. (page 3 of 10)

Date	Location	Material	Amount	Incident	Response
11/03/71	SD System/Outfall #1 Sampling Station	Pu-238		Increase in gross alpha concentration in standard 24-hour sample; activity increased from 0.5 (normal) to 205 dis/min/mL; dropped to 15 dis/min/mL by 11/12/71.	MRC memo to file 11/9/71 - record incomplete. Source traced to termination activities in SM Bldg. where sanitary drains left uncapped; pipes plugged.
11/05/71	Outfall #1 Sampling Station	H-3	3.75 Ci	Increase in tritium concentration in standard 24-hour sample; about 160,000 gals water with 6.2 μ Ci/l tritium discharged through pipeline to river.	MRC Incident Investigation Report No. 71-29 (11/12/71). Source tentatively identified as SW Bldg.; quantity of tritium released estimated to be half that released in a "normal" month and about double that released from SD system in "normal" month.
12/09/71	SW Bldg.	H-3	270 Ci	Seal on vacuum pump ruptured, releasing oil and water vapors to atmosphere.	MRC Incident Investigation Report No. 71-35 (12/27/71). Recommendations to check and modify all vacuum pumps.
01/17/72	SM Bldg.	Pu-238	Unknown	Frozen water lines in filter banks burst, releasing water to building and outside areas, plant drainage ditch.	MRC Incident Investigation Report No. 72-4 (2/17/72). Release caused exceedance of annual goal for plutonium in January alone, no concentration data given; new asphalt laid on the old pavement behind SM Bldg.; formal Type B investigation committee report 5/17/72.
03/09/72	HH Bldg.	H-3	150 \pm 75 Ci	Repair of raw gas system cut by maintenance personnel causing about 56 liters of 0.1% tritium to be released to the atmosphere.	MRC Incident Investigation Report No. 72-7 (3/16/72). Continuous sampling stations both on- and off-plant remained below 1% of RCG.
04/26/72	PP Bldg.	Pu-238	100 gals	Contaminated water (12,000 dis/min/mL) from process chill system ran to ground south of PP Bldg.	MRC Incident Investigation Report No. 72-12 (5/4/72). Twenty 55-gal drums (1/2 full) of contaminated soil removed from area; decontamination level not reported.
05/25/72	WD Bldg.	Pu-238	About 4,000 gals	Overflow of low risk tanks to storm sewer and plant drainage ditch.	MRC Incident Investigation Report No. 72-16 (6/15/72). Contamination level 523 dis/m/mL below hazard reportable to AEC, but above allowable discharge; safety alarm system modified.

Table II.1. (page 4 of 10)

Date	Location	Material	Amount	Incident	Response
07/23/72	SW Bldg.	H-3	Unknown	Repair of pipe to a drip tank in the Effluent Recovery System released tritium to the stack.	MRC Incident Investigation Report No. 72-20 (7/27/72).
07/28/72	SW Bldg.	H-3	Unknown	Replacement of a drying tower drainline resulted in release of tritium to stack.	MRC Incident Investigation Report No. 72-21; (8/3/72).
08/25/72	PP Bldg.	Pu-238	Unknown	Repair of glovebox by carpenter resulted in some contamination tracked around area.	MRC memo 9/6/72 - record incomplete. Work violated several standard operating procedures.
09/08/72	SW Bldg.	H-3	Unknown	Repair on 3/8 inch copper line of Effluent Removal System resulted in about 20 mL to be leaked to floor and vapors to be emitted through the stack.	MRC Incident Investigation Report No. 72-26 (9/15/72).
09/08/72	SM Bldg. Storm Sewer	Pu-238	Unknown	Low-risk wastewater tank overflowed onto ground and into storm sewer.	MRC Incident Investigation Report No. 72-27 (9/18/72). Elevated levels of plutonium (420 dis/m/mL) measured in storm sewer outflow to drainage ditch; water sample taken in drainage ditch 9/9/72 showed no elevated activity - actual activity level not noted.
10/27/72	Firefighter Training Pits	Stoddard solvent	About 50 gals	Solvent released from open drain to plant drainage ditch from one pit while other pit used for fire training.	MRC Incident Investigation Report No. 72-29 (11/2/72). Downstream sample indicated only a trace of solvent; no data values reported.
03/13/73	SW Bldg.	H-3	132 Ci	Repair of ball valve on Effluent Recovery System resulted in release of liquid to prepared container and subsequent atmospheric release.	MRC Incident Investigation Report No. 73-08 (3/23/73). Diffusion calculations indicated 2.8 times the RCG at the plant boundary as averaged over a 24-hour period; formal investigation committee was formed 3/14/73; a news release was issued 3/15/73 and a press conference was held 3/16/73.

Table II.1. (page 5 of 10)

Date	Location	Material	Amount	Incident	Response
06/06/73	Powerhouse	Fuel oil	50-100 gals	Overflow of storage tanks during filling.	MRC Incident Investigation Report No. 73-16 (6/15/73). Earthen dike at outfall of storm sewer prevented some material from entering stream; water sample downstream showed a high of 172.5 mg/L oil and grease on 6/6/73; 8.2 mg/L on 6/7/73; and no detect on 6/8/73.
07/12/73	SM Bldg.	Pu-238	7.8 μ Ci	Installation of new HEPA filters - blowers not shut down, release noted in stack monitors and blowers immediately turned off.	MRC Incident Investigation Report No. 73-20 (7/19/73). Release of 7.8 μ Ci calculated from stack data; 2.6% of RCG at the fence line and 88.6% of RCG at Library Park, Miamisburg.
07/18/73	SW Bldg.	H-3	865 Ci	Rupture of welded joint in thermal diffusion column ion chamber; uncombined gaseous state tritium released to atmosphere.	MRC Incident Investigation Report No. 73-21 (8/3/73). Routine and special tritium air samples at the fence line only slightly higher than normal; no data values reported.
08/30/73	Sewer north of WD Bldg.	"Radioactivity"	Unknown	Stones tossed out of process waste sewer contaminated surrounding soil.	MRC Incident Investigation Report No. 73-23 (9/10/73). Debris bagged and placed in area involved covered about 48 square feet; one 30-gal drum for disposal.
12/26/73	Plant Drainage Ditch	Oil slick	Unknown (> 100 gal?)	Oil slick observed on water in plant drainage ditch.	MRC Incident Investigation Report No. 73-33 (1/15/74). Inspection for source of spill into drainage ditch above Bldg. 51 waste incinerator; thought not to be fuel oil or waste oil from Bldg. 51 tank (although no inventory records for the tank); volume greater than 6/6/73 incident; possible source at powerhouse but no source confirmed; water samples taken, highest "oil" content 84, 247 mg/L at junction of Miami-Erie Canal on 12/16/73.

Table II.1. (page 6 of 10)

Date	Location	Material	Amount	Incident	Response
02/02/74	Miami-Erie Canal	Pu-238	Unknown	Reinvestigation of offsite plutonium contamination in north and south canal, city ponds and plant drainage ditch.	MRC Incident Investigation Report No. 74-13 (9/16/74). Accident investigation committee formed May 1974 to find cause for plutonium in Miami-Erie Canal and city ponds; report details sequence of events surrounding 1/23/69 spill; release estimated at 400 Ci (uncertainty suggests 200-800 Ci), with 158 Ci drummed in 1969, 22 Ci left on hillside and 220 Ci left in pipe break hole; additional cleanup at hillside initiated and 2,700 cu. ft. of soil removed (Black 1974); subsequent detailed study of Miami-Erie Canal (Rogers 1975).
07/18/74	WTS below WD Bldg.	Pu-238	Unknown	Leak at joint in transfer line discovered.	"Report of Property Damage or Loss" (Form No. AEC 283) 7/24/74 - records incomplete. Thirty-four drums of contaminated soil excavated for disposal; elimination of WTS pipeline recommended.
08/23/74	West of WD Bldg.	Pu-238	1 liter (7 mCi)	Leak in steel drum containing high-risk acid waste found about 40 ft west of WD Bldg. dock area.	MRC Incident Investigation Report No. 74-14 (8/30/74). Removal of silt, dirt, and asphalt to level of 0.03 nCi/g; 120 drums and 14 boxes removed by 8/27/74.
01/21/75	R Bldg.	"Radioactive dust"	Unknown	Removal of contaminated copperline and sheet metal duct work; possible air release.	MRC Incident Investigation Report No. 75-02 (1/30/75).
11/12/75	WD Bldg	Pu-238	Unknown	Flow of air from high-risk filter bank to low-risk bank resulted in possible air release.	MRC Incident Investigation Report No. 75-10 (11/20/75).
01/01/77	SW Bldg.	H-3	123 Ci	Sprinkler line froze and burst causing a short in glovebox control system and release of tritium to atmosphere.	"Report of Property Damage or Loss" (Form No. AEC-283) 3/31/77 - records incomplete.
12/11/77	WD Bldg.	"Alpha"	10,000 gals	Pipe failure in sprinkler system; spread of water controlled by temporary dike containment barrier.	"Report of Property Damage or Loss" (Form No. AEC-283) 12/13/77 - records incomplete.

Table II.1. (page 7 of 10)

Date	Location	Material	Amount	Incident	Response
03/28/78	SW Bldg.	H-3	Unknown	Apparent atmospheric release from vane pump failure.	Informal Committee Report 5/3/78 - records incomplete.
06/15/78	SW Bldg.	H-3	805 Ci	Release occurred while connections were being made between a secondary storage container to proper containment.	MRC memo to file 6/16/78 of unusual occurrence. Total amount of tritium released was calculated to be 805 Ci with 99% of this as elemental tritium.
03/24/83	M Bldg.	Copper cyanide	8 gals	About half of tank of bath solution (800 gms copper cyanide in water $Cu(CN)_2$) lost into floor drains to dilution tank; no visible evidence of dilution drainage.	MRC Incident Investigation Report No. 83-5 (4/13/83). No measurable impact to Sanitary Treatment Facility; the dilution tank observed to be losing water somewhere other than the exit drain; trace of copper found at sanitary waste treatment plant; no data values reported.
04/13/83	M Bldg.	Silver cyanide	4.2 gals (2 lbs cyanide)	Unused plating solution released by accident to floor drains and sanitary sewer.	MRC Incident Investigation Report No. 83-5A (5/5/83). No measurable impact to Sanitary Treatment Facility; no data values reported.
08/18/83	Powerhouse	No. 2 Fuel Oil	10 gals	Leak from oil pump drained to trench in floor and to storm sewer, the plant drainage ditch, and the Great Miami River.	MRC Incident Investigation Report No. 83-15 (8/23/83). OEPA inspected spill site.
05/31/84	Bldg. 19	Cobalt-60 Cesium-137	Unknown	About 20 linear ft of steel and iron pipes removed from sump in Room 16 of T Bldg. spread contamination to truck and pavement at Bldg. 19 during salvage operations.	MRC Incident Investigation Report No. 84-11 (6/15/84). About one-half pound of dirt removed from floors of T Bldg.; small section of asphalt removed at Bldg. 19 and some of the bed of the truck used was removed and boxed for disposal.
04/17/85	SW Bldg.	Zinc chromate Brine solution	300 gals	During turning on new pipeline, drain plug left off; brine ran onto floor and out onto driveway on west side of bldg.	MRC Incident Investigation Report No. 85-10 (4/29/85). Below EPA reportable volume; investigation report recommended replacing zinc chromate, a suspected carcinogen, with another substance.
04/11/85	Powerhouse	Refrigerant	1,000 lbs	Loss of refrigerant occurred over period of time; released to atmosphere.	MRC Incident Investigation Report No. 85-11 (5/1/85). No environmental impact noted.

Table II.1. (page 8 of 10)

Date	Location	Material	Amount	Incident	Response
08/28/85	SW Bldg.	H-3	50 Ci	Unplanned transfer between holding tank and effluent removal system; tritium released through SW stack.	MRC Incident Investigation Report No. 85-22 (9/11/85). Two separate incidents recorded.
08/28/85	SW Bldg.	H-3	Unknown	Leak in piping at condensate tank.	MRC Incident Investigation Report No. 85-22 (9/11/85). Contribution to 50 Ci released through stack unknown.
01/09/86	A Bldg.	Cooling brine (zinc chromate, calcium chloride)	600 gals	During maintenance, a ventline was fractured that released chilled water brine (18% by volume calcium chloride and 1,600 ppm zinc chromate) into basement of A Bldg.; some unknown quantity reached drainage ditch and was diverted to overflow pond.	MRC informal investigation report 1/15/86. Since zinc chromate was not listed, the incident was not reportable; 300 gals recovered in A Bldg. basement, 360 gals (diluted) recovered in drainage ditch below Bldg. 29; about 100 gals lost downstream.
04/24/87	SW Bldg.	Cooling brine (calcium chloride, zinc chromate)	2,100 gals	Leak in cooling pipes on roof of SW Bldg. discharged to storm sewer and plant drainage ditch; remainder of spill of brine solution (162 ppm chromium VI) controlled by diversion into 55-gal drums.	MRC Incident Investigation Report No. 87-11 (5/1/87). Spill exceeded concentration and reportable quantities and the National Response Center, OEPA, and City of Miamisburg notified; data from the composite sampler on the NPDES outfall 001 pipeline indicated that nearly all the brine was discharged to the Great Miami River.
05/04/87	Bldg. 57	Chlorine gas	< 150 lbs	Improper removal of regulator from bottle of compressed gas resulted in atmospheric release of chlorine gas.	MRC Incident Investigation Report No. 87-10 (5/8/87). No environmental impact noted.
07/06/87	Powerhouse	Cooling brine (calcium chloride, zinc chromate)	475 gals	Leak in water makeup line resulted in discharge to storm sewer and plant drainage ditch to the overflow pond where it was contained; water contained 134 ppm chromium VI (0.54 lbs).	MRC Incident Investigation Report No. 87-13 (7/14/87). Spill did not exceed reportable quantities, no regulatory agencies notified.
08/17/87	M Bldg.	Beryllium	Unknown	Suspected air pollution problem - none positively identified; some Be found in cooling water (516 µg/L) probably splashed during machining operations.	MRC Incident Investigation Report No. 87-18 (9/30/87). RAPCA notified; no actual environmental release was documented.
09/17/87	M Bldg.	Oil (low odor 410 resaturant)	Unknown	Rainfall washed oil applied during roof repair down drains and into plant drainage ditch and the overflow pond.	OEPA notified by letter from MRC 9/17/87. No incident report found.

Table II.1. (page 9 of 10)

Date	Location	Material	Amount	Incident	Response
09/17/87	WD Bldg.	Calcium carbonate	30,000 gals	High pH (11.7-11.8) wastewater released from WD Bldg. (87-21).	MRC Incident Investigation Report No. 87-21 (10/8/87). OEPA notified 9/17/87.
12/15/87	Bldg. 2	Cooling water (ethylene glycol)	22,000 gals	Leak in chilled water system resulted in discharge of solution of 30% by volume ethylene glycol to plant drainage ditch and overflow pond (87-13).	MRC Incident Investigation Report No. 87-31 (1/5/88). Did not involve hazardous substance as defined by EPA; dilution of glycol with water in overflow pond prevented discharge of concentrated glycol to Great Miami River.
01/06/88	Powerhouse	#2 Fuel oil	200 gals	Overflow of storage tank to surrounding soil; flow contained before it reached the plant drainage ditch.	MRC Incident Investigation Report No. 88-1 (1/26/88). Spill did not reach overflow pond or Great Miami River; not reported as environmental problem.
05/26/88	M Bldg.	Waste oil (Cimperial 1011) Freon	55 gals	Drum ruptured violently expelling contents on walls and driveway surfaces and grassy area west of M Bldg.	MRC Incident Investigation Report No. 88-13 (6/14/88). Near-miss accident; "floor dry" used to absorb ponded liquid; drum moved.
05/27/88	OS West Bldg.	Cooling water (ethylene glycol)	2,250 gals	Valve failure on new installed air conditioning units resulted in loss of chilled water solution (30% by volume ethylene glycol) to sanitary sewer and waste treatment plant.	MRC Incident Investigation Report No. 88-15 (6/7/88). Liquids contained in sanitary system and not released to environment; 200,000 gal glycol-contaminated sewage was stored; other half of waste treatment plant continued unimpeded.
09/01/88	SW Bldg.	H-3	300 ± 50 Ci	Erroneous use of pure hydrogen compressed gas in tritium aqueous waste recovery system resulted in release of elemental tritium to stack.	MRC memo from Tritium Environment and Safety Overview Committee (9/15/88). Below DOE and other regulatory reportable quantity (RQ) limits; calculated radiation dose to off-plant individual was 0.00001 mrem, well below RQ of 25 mrem by 40 CFR 61.
07/20/89	Powerhouse	Fuel oil	10-15 gals	During the moving of a 500-gal tank, the drain plug was broken, releasing fuel oil to the soil on the southside of the powerplant.	EG&G-MAT Incident Investigation Report No. 89-21 (8/1/89).

Table II.1. (page 10 of 10)

Date	Location	Material	Amount	Incident	Response
11/08/89	SW Bldg.	H-3	38,268 Ci	During unloading of a container, tritium was released into a fumehood and then exhausted to the stack and to the atmosphere.	DOE Type A Investigation Board Report January 1990; Ohio Emergency Management Agency, Miami Valley Emergency Management Authority, City of Miamisburg and EPA/Southwest Ohio District Officer were notified; some delay was incurred by DOE HQ's lengthy approval process; press release and press conference were held the evening of the incident; final calculated off-plant maximum individual exposure was 0.004 mrem; analysis of water, grass, and milk samples indicated no significant impact.
12/21/89	SW Bldg.	H-3	27 Ci	Leak occurred during removal of corroded section of condensate line resulting in tritium diffused to stack and atmosphere; initial estimate was 54 Ci.	EG&G-MAT Unusual Occurrence Report No. 89-14 (12/21/89).
04/27/90	Powerhouse	PCB oils	2-3 qts.	Apparently seal on spare transformer failed causing leak; lab results indicated 64,500 ppm - PCB.	EG&G-MAT Unusual Occurrence Report No. 90-8 (5/9/90). Leak reported to EPA although the RQ is 1 lb or greater (the release involved less than one-half lb); subsequent sampling by ER Program resulted in Removal Action (DOE 1991d).

AEC - Atomic Energy Commission
 WTS - Waste Transfer System
 RCG - radioactivity concentration guide
 HEPA - high efficiency particulate air filter
 EPA - U.S. Environmental Protection Agency
 OEPA - Ohio Environmental Protection Agency
 NPDES - National Pollutant Discharge Elimination System
 RAPCA - Regional Air Pollution Control Authority
 RQ - reportable quantity
 SD - Sewage Disposal
 dis/min/mL - disintegrations per minute per milliliter (equals $4.505 \times 10^{-7} \mu\text{Ci per mL}$)

investigation committee, a news release and a press conference, which was held at Mound Plant on March 16, 1973. No evidence was found, however, that the latter was truly a Type A investigation involving only, at the time, AEC personnel.

The only formal Type B investigation was a "possible Type B occurrence" on January 17, 1972. A frozen water line burst in the penthouse of the SM Building, where the filter banks were located. Reports relating to this incident indicate elevated levels of plutonium-238 in the surface water in the plant drainage, but no data as to the actual concentrations were found in any of the documents. The levels were reportedly "very high."

Two incidents involving explosions in glovebox operations are inferred to have triggered Type B investigations, because references were made in the incident reports of joint MRC-AEC committee findings. These incidents occurred on October 27, 1964, and April 3, 1968, and both involved plutonium-238 operations. Neither of these events resulted in a proven environmental release; the atmospheric releases are inferred from the incident descriptions (Table II.1).

Informal committees were formed in the mid-1970s to investigate the presence of plutonium in the Miami-Erie Canal. The plutonium was discovered during routine environmental sampling and confirmed by core sampling in 1974. In February 1974, an investigative committee was formed to "find cause" for the off-plant deposit (Table II.1). No single event was identified as the sole cause, although effluent discharges from SM and WD Building operations, contaminated soil erosion, and the January 1969 wasteline break were highlighted. A public announcement of the off-plant plutonium deposit was made May 15, 1974. The incident investigation committee report (MRC Incident Investigation No. 74-13; Table II.1) contained a "historical picture" generated from record searches from available materials and personnel interviews. Two tables were included entitled "Documented" and "Undocumented." All of the incidents in the documented table are corroborated in Table II.1. The undocumented information has not been confirmed by this investigation nor by the 1974 investigation committee, but the entire table is retyped in Table II.2.

A second committee was formed in August 1974 to assess the impact of the wasteline break on soil contamination and the erosion of contaminated soil to the plant drainage ditch (DOE 1974). In October 1974, briefings were held for federal, state and local health agencies and congressional representatives. In January 1975, the manager of the Albuquerque Operations Office of the AEC appointed an additional investigative committee, referred to as the "Ad Hoc committee" to evaluate the health and safety aspects of the plutonium-238 in the environment of Mound Plant, then known as Mound Laboratory (DOE 1976). The results of a detailed sampling campaign in the Miami-Erie Canal were published shortly thereafter (Rogers 1975).

Table II.2. Transcription of "Undocumented" Spills from Appendix B of MRC Investigation Report No. 74-13, "Plutonium Off-Site."

1963 or 1964	Leaking drums R&R (Feed Material) Storage and behind SM Building and Building 33 (no known contamination).
1963	Pipe break (dry) SM 20/21 during December. Airborne contamination.
1963 or 1965	Washed off truck behind R-Building decontaminated. H ₂ O went to storm sewer.
1963 to 1965	Hot solution possibly poured down drain (cold) SM-Building, Room #3, during 1963 to 1965 time frame.
1964	Tracking problem outside SM Building. Washed area down with fire hose - run-off water went over the hill to storm sewer systems.
1964 or 1965	Someone remembered high counts on SM Hill; i.e., on rocks, tree roots, etc.
1965	Someone remembered a liquid leak in Room 34 of SM. Could not remember if contamination got outside building or size of leak.
1965 to 1974	In area between SM-PP Buildings, high and low-risk manhole contained hot dirt (drummed up). This manhole for access only; not connected to any sewer system.
1965 to 1968	SM #57 storage vault H ₂ O; where was it pumped to? Think to hot drain.
1965 to 1968	SM 28 and 60 cooling H ₂ O to plasma torch; where did leaking H ₂ O go? Someone thinks to storm sewer.
1966	Pipe break in lower levee near river; low contamination located west of Rt. 25.
1966	Contaminated H ₂ O SM #39 area hot and cold sides contaminated (glovebox filled with water).
1966 to 1967	SM Building, Room 38, resin fire in glovebox, contained in same.
1966 to 1973	PP-Building acid room drains, drained to where? Appears to back field.
1967 to 1971	WDA effluent after treatment routed to storm drain.
1967 or 1968	Leaking drum R&R Building. Storage tanks overflowed at same time. No known contamination.
1967 to 1968	SM, Room 10, waste raised contamination level of WDA effluent tanks.
1967 to 1969	Repaving of SM contaminated. Bad weather (rain) run-off H ₂ O to storm sewers.

M9SSD02.22 01/07/92

Table II.2. (page 2 of 2)

1967	Near HH Building, line breakage, February 22, 1967. (No contamination as a result of incident was remembered.)
1967	May 16 - high, low risk lines installed. Hot influent received at WD August 15, 1967.
1968 or 1969	Hot pavement behind SM Building to Building 30. Pavement dug up and drummed out.
1967 to 1971	Duct work changed top SM Building. Gravel contaminated, drummed up and removed. Rain washed H ₂ O to storm sewer.
1969 or 1970	Scrub tower corrosive vapor system PP-Building. Room 13 overflowed.
1969	March - Building 41 overflow.
1969	April - WD charged line broken fluorinator. No known contamination.
1969	April - Leaking tank enclosure R&R (SM-PP area) (high, low risk).
1972	Overflow Building 41, H ₂ O from SM termination.
1971	S.D. connection from SM not plugged. Contaminated H ₂ O to SD plant.
1972	Sept. 18 - overflow to SM Building, H ₂ O from SM termination 72-27. (very low counts)
1963 to 1964	Someone remembered a 30-gal. water leak to storm sewer (SM #1), 50,000 counts/min.

M8SSD02.22 01/07/92

2.2. CORRELATIONS WITH OTHER RECORDS

Table II.3 presents an independent summary of radiation incidents at Mound Plant. This table was compiled by a health physics worker at Mound Plant from records and field logs in the Health Physics Office. ~~These records are maintained to document worker exposures to radioactive materials, a task~~ well beyond the scope of CERCLA and this report. The Privacy Act protects these data from public scrutiny; however, during the review for this report, data on documented and possible spills and environmental releases were noted in these records and are included in Table II.3. In addition to dates and locations of accidents and radiation incidents, Table II.3 provides valuable information on dates of use of isotopes, project dates and other data that proved helpful in compiling the Site Scoping Report: Volume 7 - Waste Management (DOE 1991c). The table is transcribed exactly as provided, and some original errors are noted. For example, uranium-233 was entered for January 1961, but the isotope was undoubtedly uranium-238.

Most of the incidents listed in Table II.1 have been correlated with listings in Table II.3. However, several incidents are not common to both and are known only by a single entry, and some facts remain unclear. One such example is the erroneous citation in the RCRA Facilities Assessment (RFA) (EPA 1988) concerning an "incident in October of 1971, a spontaneous fire of solvents and plutonium (resulting from improper storage of materials) released 49.9 μ Ci of plutonium...". Table II.1 shows that the incident that released 49.9 μ Ci of plutonium occurred in February 1971 (2/10/71, not 10/71) and was a major event in which the Miamisburg Fire Department responded. However, no such date is listed in Table II.3. Table II.3, however, lists an entry for October 12, 1971, but only personnel exposure data not included in the Table II.3 tabulation were recorded. Both Tables II.1 and II.3 include entries on March 13, 1973, for an incident that released 132 curies of tritium to the atmosphere. The RFA correctly listed the date of the latter, but stated that 163 curies were released (EPA 1988).

Table II.3. Excerpts From Radiation Incident Records - Health Physics Office

Date	Building	Rooms	Isotope	Description of Incident
2/0/49	HH		Po-210	Hot operations began.
3/29/49	T		Po-210	Contamination spread during ventilation shutdown.
6/10/49	R	122	Ra-226	Cooling jacket for volatilization condensor water in hood #6 leaked through hot waste outlet to floor, main corridor, and into 158 & 159; area unoccupied; check hot corridor drains to waste disposal plant?
5/4/50	R	142	Ra-226 Po-210	Explosion in hood #1, fire; 0.75 Ci Po-210 in capillary intact; beaker with 100 μ Ci radium spilled in hood opposite; floor & hood contaminated.
1/22/52	T		Po-210	Joint wind speed, direction, stability table for Mound produced.
7/22/52	R	114	Ac-227	Actinium perchlorate solution leaked in safe, contaminated lab.
4/3/54	T			Fire in neutron source paraffin; fast n = 300/cm ² /s 6 ft; gamma = 2 mR.
3/8/55			Th-230 Po-210	Mention of thorium program; proposed WD handling of GP SW Building raffinate and diuranate; moving I work to T will require 5 urine/wk for Th, 3 river samples Th, 40 urines/wk Po, 10 veg/2 wks Po, 8 river water + 4 muds/wk Po.
4/12/55			Th	Memo: will tank truck shipping Th to Fernald have decon problems?
5/24/55	M	20		LiOH fire in Livermore Project drybox.
12/2/55			Th-230	Ionium program; Mallinckrodt will ship raffinate from uranium refinery.
12/5/55	R		Th, Pu	New ionium and plutonium work in R bldg.
1/1/56			Th, Ra	Problems in R Building with thorium daughters commingling with daughters from radium-actinium program. Solved when Th program cancelled; 630 drums of Th decantate discharged to river; Pa separation set up HH.
3/22/56	R	149	Pa-231	Microcurie quantities being handled.
3/22/56	SW	G1B	Pa-231	Columns set up for purification, due to start 3/26/56.
3/22/56	R	133	Th-230	Ionium program due to begin 3/26/56.
3/22/56	R	116	Pu-239	Neutron source production scheduled to begin 6/6/56.
8/6/56				Health Procedures Manual, MLM-208, prepared by J.E. Bradley.

Table II.3. (page 2 of 4)

Date	Building	Rooms	Isotope	Description of Incident
11/27/56	T	277	Po-210	Po emitted as vapor from T-279, room filters nearly plugged.
1/16/60	R		Pu-238	Special metal separation and purification project.
3/24/60				Fire in garbage truck, may be caused by uranium salts.
5/15/60	SW	8	H-3	Manostat flow regulator and bellows pump located in thermal diffusion columns failed, Hg spilled, much of SW and R buildings hot.
5/26/60	T	254	Po-210	Carbonyl reacted with oxygen, flask exploded, cracked window; little or no radioactivity escaped room.
7/21/60	SW	8	H-3	Hot mercury spilled from gauge; tracked in SW and R; special investigation.
10/3/60	R	108	H-3	Interior of 12 L vessel cleaned with tri and tetrachloroethylene, which was spilled on floor and tracked around a wide area.
1/10/61	M	Dumpster	U-233?	Fire in dumpster caused by uranium chips from uranium lathe.
6/7/61	SW	8	H-3	Gas escaped from 100 L tank when cover removed under exhaust fan at base of West stack; replaced by type 1A tanks; planned release.
2/1/62	R	116	Pu-239	Exposures to nickel carbonyl gas due to containment failure; could be Pu contamination as well.
11/9/62	R	1208	Pu-238	Fire in primary HEPA filter while cutting walk-in box with torch.
12/18/62	SM	1	Pu-238	High level waste PVC pipe broke.
1/16/63	R	149	Pu-238	Overpressure in argon system popped glove off drybox 3 in SNAP line.
4/26/63	SM	10	Pu-238	Spill during transfer.
9/24/63	SM	21	Pu-238	Pu waste for calorimetry melted bag, setting off air monitor.
6/11/64	T	275-27	Po-210	Material spilled from South concentration cell passbox onto floor; tracked throughout low risk side and stairwell 13, platform floors and acid storage area.
10/27/64	SM	35	Pu-238	Explosion.
10/30/64	T	267	Po	Fire in glove box 5, line 1; 50 mR/hr gamma, indicates 500 Ci Po. E-41 exhaust = 1029 cpm/11.43 m ³ (normal = 100).
2/26/65	SM	10	Pu-238	Incident in facility.
2/26/65	SM			Opened hot waste drum without asking.

Table II.3. (page 3 of 4)

Date	Building	Rooms	Isotope	Description of Incident
8/26/65	R	145	Pu-238	Organic and acid wastes were mixed; polyethylene bottle in hood exploded, flooding floor of hood; activity contained to hood with no personnel exposure; solution contained HNO ₃ , sulfamic acid, ferrous ammonium sulfate, NaF, trioctylphosphine oxide, cyclohexane, ethanol, triethanolamine, 1-(2-pyridylazo)-2 naphthal, Pu-238, 239, U-234.
7/19/67	T	267	Po-210	Minimal release, explosion in hood, acetone addition to leach solution.
8/17/67	SM	10	Pu-238	Dissolver/evaporator pot exploded; floor in vicinity of box 10-65 in 1-2M range; filters clogged, + differential. Condenser in hood 2 exploded; positive differential: floor up to 600k cpm; other air samples in 40-50k cpm range.
9/8/67	SM	WTS	Pu-238	Flanges on both low and high risk transfer lines to WD found unbolted; about 15 feet west of road at SW corner of SM fence line; considerable contamination of pipes, soil and pipe trench sand and gravel downhill; several yards soil removed to below 2000 dpm direct.
11/9/67	environment		Pu-238	2000 gallons low-level rad waste spilled during waste line tie in; total release estimated at 7.65 mCi; 10 onsite, 7 offsite water samples; maximum activity 1200 dpm/ml.
4/30/68	SM	35A	Pu-238	Explosion in glove box blew fronts off several boxes.
4/30/68	T	270	Po-210	Fire in trash box behind alpha box 8 in P&E line 4.
8/22/68	SM		Pu-238	Release occurred in uncontrolled area; 80 gallon drum opened outdoors.
8/22/68	T	260	Po-210	Glove ripped in glove box 10, resulting in airborne contamination.
1/8/69	PP		Pu-238	Valve left open, tank exchange, escape of gas.
12/9/69	R	127	Pu-238	Fire in glove box 2, some floor contamination from water.
10/7/70	R	168	none	MoF ₆ gas released in hood, out stack when line broke.
1/17/72	SM	lot		Sprinkler froze, thawed, ran out through hoods onto floor and out of building into parking lot. Survey; pads north and west are hot; sealer applied 1/18; resurfaced with 2 inches new asphalt 2/17/72.
5/26/72	WDA	Tanks	Pu-238	Low risk waste tank overflowed to environment; source valve left on at SM decon operations; remaining water 523 dpm/ml.

Table II.3. (page 4 of 4)

Date	Building	Rooms	Isotope	Description of Incident
72	WDA		Pu	Overflow of untreated low risk waste.
7/28/72	SW	231	H-3	Rad incident report 72-21; repair on leaking drying tower drain line.
3/13/73	SW	8	H-3	132 Ci stacked; calculated 2.8 x RCG at fence/24 hrs.
7/12/85	WD			"Loss of Control" unusual event on WTS near WD.
8/28/85	SW	13	H-3	Accidental transfer to ERS; ERS leaks 50 Ci to room, stack (Rpt 85-22).
2/3/87	PP	corridor	10	Contamination spread by cutting insulation during airline removal.

WD - WD Building (waste disposal)

GP - General Purpose building (later known as SW Building)

HEPA - high efficiency particulate air filter

PVC - polyvinyl chloride

SNAP - space nuclear auxiliary power

WTS - waste transfer system

ERS - Effluent Removal System

dpm - disintegration per minute

3. SUMMARY RESPONSE ACTIONS

The general response actions conducted for each spill or environmental release were summarized in Table II.1. By and large, the majority of incidents in Table II.1 include only responses by the DOE operating contractor, a standard practice in compliance with orders from DOE and AEC. These responses included investigations of the causes of the incident, as well as recommendations for cleanup and prevention of a recurrence. Available data concerning the amount of soil or materials excavated or removed have been included in Table II.1 where noted in the references.

3.1. RESPONSES BY OHIO ENVIRONMENTAL PROTECTION AGENCY

To augment the data compiled from Mound Plant records, inquiries for this report were made to federal and state agencies. Summaries of response actions conducted by OEPA and EPA were requested under the FOIA. OEPA provided information from the records in the EROS database. The Emergency Response Section maintains the EROS database and is the designated reporting point for spills and unauthorized discharges in Ohio. Table III.1 summarizes the data supplied by the OEPA (OEPA 1991). None of the response actions listed in Table III.1 resulted in an enforcement action.

Two incidents listed in Table III.1 cannot be correlated with the data obtained from Mound Plant. References to the plutonium-contaminated liquid reported in October 1982 and the radioactive dirt reported in January 1986 cannot be reconciled in Tables II.1 and II.3. Except for the dates of the incidents, there is no information by which to trace these incidents through the records at the plant. The other entries, including cooling water, fuel oil and tritium releases, are all cross-referenced in Table III.2.

3.2. RESPONSES BY U.S. ENVIRONMENTAL PROTECTION AGENCY: DRAFT RCRA FACILITY ASSESSMENT

The only information currently available on federal agency response is contained in the draft RFA (EPA 1988). The Preliminary Review (PR) and Visual Site Inspection (VSI) were conducted by EPA in May 1988 as part of the RFA for the plant. This inspection included review of files and materials from OEPA, data evaluations and interviews to evaluate the potential for releases of hazardous constituents from solid waste management units (SWMU) and other areas of concern (AOC) identified during the review. This inspection resulted in the identification of 86 SWMUs and 38 AOCs. Release of hazardous substances was reported for 11 sites from file materials and the VSI. The list of 124 sites identified by the RFA is included in Table III.2. A draft PR/VSI report (EPA 1988) was prepared by A.T. Kearney, Inc. under contract to EPA, Region V, but was never finalized. All of the 124 sites originally

**Table III.1. Summary of Response Actions by Ohio Environmental Protection Agency
Emergency Response Section (OEPA 1991)**

Date Reported	Material	Amount	Spill Size	Response Priority	Areas Affected
10/15/82	Plutonium contaminated liquid	2 gal	S	3	None
08/18/83	Fuel oil	40 gal	S	3	Surface Water
01/3/86	Radioactive dirt	Unknown	L	3	Land
04/27/87	Calcium chloride Zinc chromate	2,100 gal 10 lbs	M	2	Surface water
11/8/89	Tritium	4 grams	S	3	Other

Note:

S - small

M - medium

L - large

2 - next working day

3 - whenever possible

Table III.2. List of Sites Currently in the Mound Plant Environmental Restoration Program by Operable Unit Cross-Referenced to the RCRA Facilities Assessment and CEARP Phase I

ER Program Sites	RCRA Facility Assessment (SWMU's and Other Areas of Concern)	CEARP Phase I (Category-Site)
		1-Area A, soil fill 1-Area E, oil spill 3-Tritium in BVA 3-Monsanto Unit I 3-Monsanto Unit II 3-Monsanto Unit III 3-Monsanto Unit IV 3-Monsanto warehouse 3-Monsanto - Marion
Area B Groundwater, Operable Unit 1:		
Site Sanitary Landfill	LF-1 lined landfill	
Area 18, Landfill Cover		3-Area 18
Contaminated Soil and Pond Area	LF-2 past landfill	1-Area B
Main Hill Seeps Operable Unit 2:		
Seeps	D North slope springs G Hillside hole	
Area 15, Old SW Cave		3-Area 15
Area 6, WD Building Filter Waste	DD Main Hill-6	3-Area 6
Area F Chromium Trench	MI-7 Chromium trench	3-Area F
Cooling Tower Basins	MI-8 Cooling tower basins CS-16 Cooling tower storage	
Building E Solvent Storage Shed	CS-2 Bldg E solvent storage	
Building G Garage Area	P Bldg G spills	2-Bldg G
Monitoring Well 34-1	MI-13 Monitoring well 34-1	
Miscellaneous Sites, Operable Unit 3:		
Farm Trash Area	LF-5 South property dump	
Underground Sewage Lines	SD-10 Underground sewer lines	
Paint Shop Area	N Paint shop spills	2-Paint shop
Powerhouse Area	O Powerhouse spills	2-Powerhouse
Area C, Waste Storage Area	MI-6 Lithium carbonate disposal	1-Area C
Building 61, Former Equipment Area	Q Bldg 61 spills	2-Bldg 61
Oil Burn Structure	MI-3 Oil burn structure	
Fire-Fighting Training Facility Pit	MI-5 Fire fighter training	
Area I, Buildings 1, 27 Leach Pits	SI-4 Bldg 1 leach pit SI-5 Bldg 27 leach pit	1-Area I
Building 27 Sump Area	SU-3 Bldg 27 leach pit	
Building 27 Concrete Flume	MI-14 Bldg 27 flume	

Table III.2. (page 2 of 5)

ER Program Sites	RCRA Facility Assessment (SWMU's and Other Areas of Concern)	CEARP Phase I (Category-Site)
Building 27 Solvent Storage Area	CS-12 Bldg 27 solvent storage	
Glass Melter Room Sump	SU-1 Glass melter room sump	
WD Building Drum Staging Area	CS-18 WD Bldg drum area	
Area H, Pyrotechnic Waste Disposal	OB-8 Pyrotechnic waste disposal	1-Area-H
Pyrotechnic Waste Shed	OB-5 Pyrotechnic waste shed	
Thermal Treatment Unit Area	OB-2 Thermal treatment unit	
Trash Burner Area	OB-1 Trash burner	
Waste Oil Drumfield Area	CS-6 Waste oil drumfield	
Old Firing Range Drum Storage Site	CS-10 Old firing range storage	
Building 34 Aviation Fuel Tank	UT-2 Aviation fuel tank	
Building 51 Waste Solvent Tank	UT-1 Waste solvent tank IN-3 Waste solvent incinerator AP-10 Waste solvent incinerator scrubber	
Miami-Erie Canal, Operable Unit 4:		
(All parts comprise 1 site)	B Runoff hollow I North canal J South canal K North pond L South pond	3-Plutonium in M-E Canal
Radioactively Contaminated Soils, Operable Unit 5:		
Area 2, Crushed empty thorium drums	CC Valley-3	3-Area 2
Area 3, Thorium drum storage	T Valley-1	3-Area 3
Sewage Disposal Building area	SD-1 Grit chamber SD-2 Grit conveyor SD-3 Comminutor SD-4 Equalizer basins SD-5 Aeration basins SD-6 Clarifier SD-7 Sand filters SD-8 Chlorine chambers	
Sludge Drying Beds	SD-9 Sludge drying beds	
Dredge Spoil Drying Beds	MI-15 Dredge spoil beds	
Building 72 Storage Area	CS-13 Outdoor hazardous waste storage CS-14 Empty drum storage	
Area 5, Radioactive Waste Line Break	Z Main Hill-3	3-Area 5
Area 7, Empty Thorium Drums	KK Valley-6	3-Area 7
Area 8, Contaminated Soils from Area 1	EE SM/PP Hill-4	3-Area 8
Area 9, Former Thorium Storage	W SM/PP Hill-2	3-Area 9

Table III.2. (page 3 of 5)

ER Program Sites	RCRA Facility Assessment (SWMU's and Other Areas of Concern)	CEARP Phase I (Category-Site)
Area 10, Concrete from Dayton units	FF SM/PP Hill-5	3-Area 10
Area 12, Contaminated Soil from Area 1 and SM Building Operations	GG SM/PP Hill-6	3-Area 12 3-Area 13
Area 13, Polonium-contaminated wood	HH-Valley-4	
Area 20, Radioactive waste line break	BB Main Hill-5 R HH Bldg contamination	
Area 21, Old Bunker	LL SM/PP Hill-10	
Area 22, Orphan soil	II SM/PP Hill-7	
Area J, Hillside catch basin	SI-6 Hillside catch basin LF-4 Dredged material disposal	1-Area J
Spoils Disposal Area	LF-3 Spoils disposal	
D&D Sites, Operable Unit 6:		
Area 1, Bulk transfer of thorium drums	A Thorium drum storage S SM/PP-1	3-Area 1
Area 4, WD Building Influent Tanks	U Main Hill-1	3-Area 4
Area 4A, Overflow Area	V Main Hill-2	3-Area 4a 3-Area G
Area 11, Contamination from SM Building	JJ SM/PP Hill-8	3-Area 11
Area 14, Radioactive Waste Line Break	Y Valley-2 AA Main Hill-4	3-Area 14
Area 16, Sanitary Sewage Septic Tank and Leach Basin for SM Building	F SM/PP-9 C Septic tank and leach field	3-Area 16
Area 17, Area under the SM Building	X SM/PP Hill-3	3-Area 17
Area 19, Underground Waste Line	MI-2 Waste disposal pipeline E Waste disposal pipeline	3-Area 19
Area D, Acid Leach Field	MI-11 Acid leach field	1-Area D
Contaminated Soil Box Area	M Contaminated soil box area	
Old Sanitary Treatment Plant	SD-11 Old treatment plant	
Radioactive Waste lines		
Limited Action Sites, Operable Unit 7:		
Scintillation Vial Storage Area	CS-1 Scintillation vial storage	
Building 28 Solvent Storage Area	CS-3 Bldg 28 solvent storage	
DS Building Solvent Storage Shed	CS-4 DS Bldg solvent storage	
Building B Solvent Storage Shed	CS-5 Bldg B solvent storage	
Hazardous Waste Storage Area	CS-7 Hazardous waste storage	

Table III.2. (page 4 of 5)

ER Program Sites	RCRA Facility Assessment (SWMU's and Other Areas of Concern)	CEARP Phase I (Category-Site)
Past Hazardous Waste Storage Area	CS-8 Past hazardous waste storage	
Radioactive/Mixed Waste Storage Area	CS-9 Mixed waste storage	
Drilling Mud Storage Area	CS-11 Drilling mud storage	
Building B Temporary Drum Storage	CS-15 Bldg B temporary storage	
Test Firing Residual Storage Area	CS-17 Test fire residual storage	
Retort	OB-3 Retort	
Building 90 Blockhouse	OB-4 Bldg 90 blockhouse	
Biodegradation Unit	OB-6 Biodegradation unit	
Explosive Waste Storage Bunker	OB-7 Explosive waste storage	
Building 1 Sump	SU-2 Bldg 1 sump	
Waste Transport Vehicles	MI-4 Waste transport vehicle	
Glass Melter Feed Drum	MI-9 Glass melter feed drum	
Trash Dumpsters	MI-10 Trash dumpsters	
Vapor Degreaser	MI-12 Vapor degreaser	
SW Building Drum Staging Area	CS-19 SW Bldg staging area	
Glass Melter Furnace	IN-1 Glass melter furnace	
Off-Gas Treatment System (9 sites)		
Deluge tank	AP-1 Deluge tank	
Venturi scrubber	AP-2 Venturi scrubber	
Cyclone demister	AP-3 Cyclone demister	
HEPA filter	AP-4 HEPA filter	
WD filter bank	AP-5 WD filter bank	
Recycle tank	AP-6 Recycle tank	
Leaf solution filter	AP-7 Leaf solution filter	
Strainer	AP-8 Strainer	
Iodine absorption filter	AP-9 Iodine absorption filter	
Ventilation Hoods	AP-11 Ventilation hoods	
Epoxy Resin Disposal	H Epoxy resin disposal	
Alpha Wastewater Treatment	WD-2 Alpha wastewater	
Beta Wastewater Treatment	WD-3 Beta wastewater	
Cyclone Incinerator	IN-2 Cyclone incinerator	
Inactive Underground Storage Tanks, Operable Unit 8:		
SD Building (3 tanks comprise 3 sites) WD Building Annex (3 tanks comprise 3 sites)	WD-1 Alpha influent tanks	2-WD Bldg

Table III.2. (page 5 of 5)

ER Program Sites	RCRA Facility Assessment (SWMU's and Other Areas of Concern)	CEARP Phase I (Category-Site)
Site-Wide, Operable Unit 9:		
Plant Drainage Ditch	MI-1 Plant drainage ditch	
Retention Basins	SI-1 Retention basins	
Overflow Pond	SI-2 Overflow pond	
Asphalt-Lined Pond	SI-3 Asphalt-lined pond	
109 Sites	124 Sites	43 Sites

ER - Environmental Restoration

RCRA - Resource Conservation and Recovery Act

SWMU - solid waste management unit

CEARP - Comprehensive Environmental Assessment and Response Program

identified by the RFA were included in the ER Program at the time the FFA became effective (see below). During the scoping process, however, the 124 sites have been recombined to produce 109 potential release sites. Table III.2 depicts the cross-reference of these sites in both programs. Some apparent errors in the RFA have been noted. For example, the Area 14, radioactive waste line break (Table III.2) was found to be referred to twice under two different categories in the RFA: the "Y-site, Valley-2" and the "AA-site, Main Hill-4." Area 19, the underground wasteline was similarly found to be referred to as "MI-2, Waste disposal pipeline" and "E Waste disposal pipeline." Other errors in the draft RFA report are noted in subsection 2.2 above.

3.3. SUMMARY OF THE DOE COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM (CEARP)

In mid-1984 the DOE Albuquerque Operations Office (AL) initiated the Comprehensive Environmental Assessment and Response Program (CEARP) to help fulfill the DOE policy that all facilities comply with applicable environmental regulations while conducting their missions. CEARP was intended to fulfill DOE obligations under the EPA CERCLA Program. It utilized the same basic approach as the EPA guidance to federal facilities (Federal Facility Program Manual for Implementating CERCLA Responsibilities of Federal Agencies, Final Draft) and was authorized by DOE Order 5480.14. CEARP was administered by Los Alamos National Laboratory under contract to AL. As the operating contractor, MRC was responsible to the Dayton Area Office (DAO) for plant operations. CEARP was implemented in five phases:

- Phase I - Installation Assessment
- Phase II - Confirmation
- Phase III - Technology Assessment
- Phase IV - Remedial Action
- Phase V - Compliance and Verification

A CEARP Phase I Assessment Report was compiled for Mound Plant in 1986 (DOE 1986) with the intent of determining the extent of compliance with environmental laws, to ascertain the magnitude of potential CERCLA sites. Tasks performed under Phase I include record searches and literature surveys, employee interviews, waste management evaluation, tentative identification of contaminated areas, evaluation of compliance with environmental regulations, preliminary physical survey, a pathway evaluation and a Hazard Ranking System (HRS) scoring. The Phase I Assessment Report was submitted to EPA and OEPA for review and informational purposes.

The CEARP Phase I assessment results included the identification of 43 sites and their grouping into three categories: (1) areas that have potentially received oils or hazardous substances; (2) areas that because of past activities had potential for leaks and spills; and (3) previously identified areas of radioactive contamination. The 43 sites are listed in Table III.2 by category and are cross-referenced to the present ER Program sites. Category 1 sites were recommended for further investigation and included Areas B, C and I, which were sampled during CEARP Phase II. Two Category 1 sites, Areas A and E, were areas of minor concern and significantly small volumes of waste. Category 2 sites were considered to require no additional investigation but have, nonetheless, been carried forward in the ER Program. The CEARP Phase I Installation Assessment Report (DOE 1986) contains full descriptions and discussions of the sites.

Category 3 sites included two sites off the plant property and 20 areas recommended for further radiological investigation by the Mound Plant Site Survey Program (SSP). Data collected during the SSP (Stought et al. 1988) are reported in the Site Scoping Report: Volume III - Radiological Survey Report (DOE 1991c). The sites off the plant property comprise the Miami-Erie Canal and tritium in the Buried Valley aquifer (BVA). Six category 3 sites were former Monsanto facilities (DOE 1991a) that pre-dated Mound Plant, were not included in the NPL and hence have not been carried forward in the ER Program.

A CEARP Phase II plan (DOE 1987a) was implemented with three objectives: (1) obtain the additional information identified in Phase I; (2) complete an environmental evaluation to confirm the presence or absence of potential environmental concerns of Phase I; and (3) conduct measurements and sampling programs as required to understand potential contaminant sources and environmental pathways. A work plan consisting of a Synopsis, Sampling Plan, Health and Safety Plan, Quality Assurance/Quality Control Plan, and Technical Data Management Plan was submitted to EPA and OEPA for review. EPA Comments were received and incorporated into the revised work plan that served to guide the field work, although the work plans were never officially approved.

The Phase II work plan (DOE 1987a) provided for three stages of investigation using an iterative process whereby additional sampling stages would be guided by data from the previous stage. Stage 1 proposed an ambitious project that addressed the hydrogeochemical characterization of Mound Plant, Area B, Tritium in the Buried Valley Aquifer, and reconnaissance sampling of Areas C, I and the WD Building. The Stage 1 investigations included; (1) location survey and installation of datum markers for all existing monitoring wells, springs and seeps; (2) development of springs and seeps to facilitate sampling and measurement; (3) semi-monthly water level measurements at existing monitoring wells and springs and seeps to determine temporal fluctuations; (4) sampling and analysis of existing monitoring and production wells, springs and seeps for organic compounds; (5) soil gas sampling of

tritium sources; (6) sampling National Pollutant Discharge Elimination System (NPDES) outfalls for organic constituents; (7) sampling and analysis of monitoring wells, springs and seeps for stable isotopes and radioisotopes, including tritium; (8) hydrologic testing of existing monitoring wells; (9) exploratory drilling for tritiated water; and (10) soil sampling in Areas C, I and the WD Building. Not all of these investigations were completed or successful.

Results of the Stage 1 investigations were highlighted in the Stage 2 Supplement Plan (DOE 1987b), but a comprehensive interpretive report was never completed. Results were summarized according to tritium studies, organics in Area B, and reconnaissance sampling of soils.

Investigations of tritium in groundwater focused on the Main Hill under the direction of the Mound Tritium Groundwater Assessment Program and resulted in refinement of the conceptual model of the bedrock groundwater system. Results of the investigations included

- refinement of bedrock stratigraphy by trenching and visual logging, which suggested that some layers may act as aquitards to redirect water laterally;
- tritium concentration monitoring at the seeps, which suggested some temporal correlation with precipitation;
- measurement of flow rates, temperature, pH and conductivity of the largest onsite seep;
- installation of perforated pipe and casing both horizontally and vertically to facilitate water level and tritium concentration measurements;
- installation of drains, access manholes, and collection pumps to aid tritium monitoring and disposal of tritiated water (water with tritium levels above the standard was diverted to the WD Building for processing and water below the standard was discharged through the plant discharge ditch);
- determination that common ions and stable isotopes could act as tracers in monitoring the hydrogeologic system, but that the usefulness of uranium and plutonium as tracers was questionable; and
- elimination of a proposed soil gas sampling for tritium sources as a viable sampling technique.

The investigations of organic compounds in the groundwater targeted Area B. Stage 1 resulted in two important findings. First, the existing monitoring well network was deemed deficient in that (1) wells were found to be unsecured (i.e., unlocked, posing a potential for vandalism); (2) inappropriate drilling and well development techniques may have been used, as the wells did not perform according to calculations of the aquifer and pump test; (3) well design was locally inappropriate (e.g., wide screening intervals for determining the vertical extent of contamination); and (4) the distribution of

wells downgradient of Area B was insufficient for the Remedial Investigation activities. These deficiencies hindered the completion of Stage 1, however the combined findings were used to develop a Stage 2 sampling plan that greatly expanded and improved the monitoring well network. Second, a soil gas survey around Area B indicated that there may be two or more potential sources of volatile organic compounds in the groundwater and the areas upgradient of Area B (e.g., Area C) should be examined more carefully.

The Stage 1 reconnaissance soil sampling of Areas I, C and the WD Building were attempted by hand auger with little success. The Area 1 leach pits were sampled to depths of 1 to 1.5 ft and analyzed for volatile organic compounds, base-neutral-acid extractables and the explosives RDX, HMX, and PETN. All constituents were reported to be below the method detection limit with the exception of one sample with 6.85 µg per gram of RDX and several "tentatively identified compounds" that were suspected to be decomposing vegetation associated with the leach pit. Area C was also sampled with a hand auger. The analyses indicated no contamination, but ambiguity remained when the positive evidence from the soil gas survey was considered. Further investigations of Area C were recommended, including a geophysical survey to define the depth of fill and to determine the possible presence of buried drums. Sampling was also attempted at the WD Building without success. Further groundwater sampling was recommended as budget constraints limited the amount of sampling that could be done in the future.

The Stage 2 supplementary plan (DOE 1987b) proposed to: (1) expand and upgrade the monitoring well network in response to the soil gas survey and reconnaissance evaluation of the older well network; (2) use the new well network to verify the extent or absence of volatile organic compound contamination in the groundwater in Areas B, C and I; (3) refine the sources of tritium in the groundwater; (4) quantify the hydraulic characteristics and the boundaries of the BVA; (5) investigate tritium pathways in groundwater; and (6) determine the presence or absence of contaminants adjacent to the WD Building.

In 1988, CEARP changed its structure to the current ER Program, although the program was briefly referred to as the Comprehensive ER Program. This change resulted from the increased DOE awareness of the importance and impact that the Resource Conservation and Recovery Act (RCRA) as modified by the Hazardous and Solid Waste Amendments of 1984, would have on the DOE's environmental programs nationwide.

While the changes in program management were occurring, the results of the Stage 2 investigations were being compiled and were reported in the ER Program Stage 3 plan (DOE 1989). A comprehensive interpretive report was never completed. The most important results of Stage 2 included:

- Completion of 29 new soil borings, 22 in the unconsolidated deposits, six in the Main Hill bedrock and one in the bedrock on the SM/PP Hill just east of the Plant boundary. Twenty-eight new monitoring wells were installed in the borings. Well location and construction details are presented in the Site Scoping Report: Volume I - Geologic Log and Well Information Report. Core recovery in the bedrock was generally poor, ranging from 9 percent to 93 percent;
- Although minor differences and some correlations between seep discharge and seasonal fluctuations in common ions and stable isotope chemistry were noted, the differences were considered slight enough to warrant only occasional sampling. Quarterly sampling would continue only for contaminant species;
- Volatile organic chemicals were found to be present in the new monitoring wells at levels similar to the old monitoring wells and the soil gas survey. The recurring contaminants included trichloroethane, tetrachloroethane and 1,2-trans-dichloroethene (data from the Stage 2 sampling and analysis are reported in the Site Scoping Report: Volume 1 - Groundwater Data);
- Other contaminants were present in new wells, but below regulatory levels;
- No contaminants, other than suspected laboratory contaminants, were reported in wells off plant property;
- Nitrate/nitrite was reported in three Main Hill seeps above the regulatory level; and
- Two aquifer pump tests and eight well slug tests were conducted with inconclusive results.

The Stage 3 Remedial Investigation Plan (DOE 1989) focused on installation groundwater and identified groundwater as the primary contaminant transport pathway. Organic chemical contamination in Area B and tritium contamination of bedrock seeps on the Main Hill were targeted. Remedial investigation of other known sites was considered, but was postponed for budgetary reasons. Based on the results of Stages 1 and 2, improved conceptual models of the hydrogeochemical setting and contaminant migration were outlined. Important concepts of the models included

- groundwater contamination in the BVA was limited to a few organic chemicals in the vicinity of Area B;
- concentrations of organic chemicals were highest, although still low, adjacent to Area B and diminished to below drinking water standards away from Area B;
- groundwater contamination in Area B consisted primarily of three chlorinated solvents; trichloroethene, tetrachloroethene and 1,2-trans-dichloroethene and some associated breakdown products;
- some correlation between the soil gas survey results and groundwater contamination was apparent, although some of the newer wells did not contain some of the compounds (toluene, benzene, ethylbenzene and chloroform) reported in either the older wells or the soil gas survey;

- sources of organic chemicals other than Area B could exist, but Area B was considered to be the primary source of groundwater contamination;
- nitrate/nitrite could be a problem on the Main Hill but was considered to be of lesser importance than Area B; and
- the hydrogeology of the bedrock will be extremely difficult to characterize because the density of buildings and utilities on the Main Hill made access difficult and utility trenches have added local permeable zones to the system.

The Stage 3 plan was compiled and submitted to EPA and OEPA in early 1989, during which time DOE was actively pursuing a FFA with EPA and the State of Ohio in anticipation of the impending listing of Mound Plant on the NPL. Both agencies responded with written comments to the plan; a revised plan incorporated the comments, but the plan never officially received regulatory approval. DOE considered the groundwater pathway and Area B to be the most pressing environmental problems at Mound Plant and implemented the Stage 3 plan. Based on the need to characterize the transport pathway and evaluate the possible remedial alternatives, Stage 3 also proposed to

- install new monitoring wells in the BVA to assess contaminant migration into the deeper parts of the aquifer;
- model details of groundwater flow in the unconsolidated deposits to support the evaluation of remedial alternatives, which is still in progress;
- conduct a seismic refraction survey to define the lateral extent and continuity of the BVA;
- perform additional aquifer tests to define the hydraulic parameters and aquifer boundaries; and
- perform a risk assessment of the tritium contaminated seeps.

During the period of implementation of Stage 3, Mound Plant was among 27 Federal Facilities placed on the NPL. This listing (54 Federal Register 48184; November 21, 1989) elevated the FFA negotiations and authorized EPA to enforce the requirements of CERCLA. The agreement would require that a full Remedial Investigation/Feasibility Study (RI/FS) be conducted for the plant. Under CEARP, AL had always intended to utilize CERCLA procedures, but had lacked the regulatory recognition of CERCLA authority, and the lack of the proper forum for document comment and response had hindered true regulatory oversight.

In pursuance of the agreement, DOE subdivided the investigation into nine operable units that contained most of the known sites previously identified by the CEARP Phase 1 Assessment Report (DOE 1986) and the draft RFA Report (EPA 1988). At the time the agreement became effective (October 11, 1990) there were 109 sites in the Mound Plant ER Program (Table III.2).

4. REFERENCES

- Black, H. A. 1974. "WD Soil Removal Project." Monsanto Research Corporation. November 1974.
- DOE. 1974. "Reinvestigation of the January 1969 Plutonium-238 Waste Transfer Line Break." Report prepared by Monsanto Research Corporation. September 16, 1974.
- DOE. 1976. "Report of the Ad Hoc Committee to Evaluate the Health and Safety Aspects of ²³⁸Pu in the Environment Adjacent to Mound Laboratory." Report to the Manager, Albuquerque Operations Office, Energy Research and Development Commission, Albuquerque, New Mexico. February 1976.
- DOE. 1986. "Phase I: Installation Assessment Mound [DRAFT]." Comprehensive Environmental Assessment and Response Program. U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. April 1986.
- DOE. 1987a. "Phase 2: Mound Installation Generic Monitoring Plan/Site Specific Monitoring Plan [DRAFT]." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. January 1987.
- DOE. 1987b. "Phase 2: Installation Generic Monitoring Plan/Remedial Investigation Plan - Stage 2 Supplement Mound [DRAFT]." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. September 1987.
- DOE. 1989. "Remedial Investigation Mound Plant, Task AL-MD-1, Groundwater Stage 3 Supplement [DRAFT]." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. September 1989.
- DOE. 1991a. "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Revision 3)." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. October 1991.
- DOE. 1991b. "Site Scoping Report: Volume 8 - Environmental Monitoring Data." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. May 1991.
- DOE. 1991c. "Site Scoping Report: Volume 7 - Waste Management." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. November 1991.
- DOE. 1991d. "Main Hill Seeps, Operable Unit 2, On-Scene Coordinator Report for CERCLA Section 104 Removal Action, West Powerhouse PCB Site." U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico. July 1991.
- EPA. 1988. Preliminary Review/Visual Site Inspection for RCRA Facility Assessment of Mound Plant conducted by A. T. Kearney, May 1988. U.S. Environmental Protection Agency, Region V, EPA Contract Number 68-01-7374, Chicago, Illinois. July 1988.
- EPA. 1990. "Federal Facility Agreement Under CERCLA, Section 120." U.S. Environmental Protection Agency, Region V. Executed August 7, 1990.
- OEPA. 1991. "Reply to request for records in the Emergency Response Online System Database." Letter report from Y. Williams, Records Management Officer, State of Ohio Environmental Protection Agency, Columbus, Ohio, to C. W. Criswell, Roy F. Weston, Inc., Albuquerque, New Mexico. August 14, 1991.

Rogers, D. R. 1975. "Mound Laboratory Environmental Plutonium Study, 1974." Monsanto Research Corporation report for the U.S. Department of Energy. September 1975.

Stought, R. L., D. A. Edling, and D. G. Draper. 1988 "The Mound Site Survey Project for the Characterization of Radioactive Materials in Site Soils." Monsanto Research Corporation for the U.S. Department of Energy. Miamisburg, Ohio. May 1988.