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Environmental Restoration Program

OPERABLE UNIT 6, DECONTAMINATION AND DECOMMISSIONING VERIFICATION WORK PLAN

MOUND PLANT
MIAMISBURG, OHIO

VOLUME I
WORK PLAN
HEALTH AND SAFETY PLAN

August 1992

FINAL
(Revision 1)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

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Health + Safety Plan
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ENVIRONMENTAL RESTORATION PROGRAM

OPERABLE UNIT 6, DECONTAMINATION AND DECOMMISSIONING VERIFICATION WORK PLAN

WORK PLAN

MOUND PLANT

MIAMISBURG, OHIO

July 1992

DEPARTMENT OF ENERGY

ALBUQUERQUE FIELD OFFICE

ENVIRONMENTAL RESTORATION PROGRAM

TECHNICAL SUPPORT OFFICE

LOS ALAMOS NATIONAL LABORATORY

FINAL

REVISION 1

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ACRONYMS

AA	atomic absorption
AEA	Atomic Energy Act
AL	Albuquerque Field Office
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
AWQC	Ambient Water Quality Criteria
CAA	Clean Air Act
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DDCA	Decontamination and Decommissioning Cleanup Activities
DOE	U.S. Department of Energy
DQO	data quality objective
DWEL	Drinking Water Equivalent Lifetime
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration (Program)
ERWM	Environmental Restoration Waste Management
FFA	Federal Facility Agreement
FIDLER	field instrument for the detection of low-energy radiation
FR	Federal Register
FS	feasibility study
FUSRAP	Formerly Utilized Sites Remedial Action Program
GC	gas chromatograph
HEA	Health Effects Advisory
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,6-tetrazocine cyclo-tetramethylenetetranitramine
ICP	inductively coupled plasma
LAER	lowest achievable emission rate
MCL	maximum contaminant level
MS	mass spectrometry
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NUREG	Nuclear Regulatory Commission Regulation
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate (explosive)
PP	Plutonium Processing (Building)
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
R	Research (Building)
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-s-triazine cyclotetratmethylene-tetranitramine
RfD	reference dose
RI	remedial investigation

ROD	Record of Decision
SAP	sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SM	Special Metallurgical (Building)
SOP	Standard Operating Procedure
SRDS	storm water retention and discharge system
SW	Semi-Works (Building)
T	Technical (Building)
TAL	Target Analyte List
TBC	to be considered
TCL	Target Compound List
TRU	transuranic
TSCA	Toxic Substances Control Act
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
VOC	volatile organic compound
WD	Waste Disposal (Building)
WQC	water quality criteria
WTS	waste transfer system
XRF	X-ray fluorescence

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EXECUTIVE SUMMARY

INTRODUCTION

The Mound Plant, located in Miamisburg, Ohio, is operated by EG&G Mound Applied Technologies for the U.S. Department of Energy (DOE). As a result of historic disposal practices and contaminant releases to the environment, Mound Plant was placed on the National Priorities List in November 1989. In August 1990, the U.S. Environmental Protection Agency (EPA) and the DOE entered into a Federal Facility Agreement (FFA); the DOE was deemed the lead agency. The terms of the FFA require that the DOE develop and implement a remedial investigation/feasibility study (RI/FS) and conduct interim remedial actions in order to protect the public health, welfare, and the environment. To facilitate this effort, nine operable units were established. The Decontamination and Decommissioning (D&D) Program Areas, Operable Unit 6, is one of these operable units.

Operable Unit 6 addresses 12 areas with radioactively contaminated soils that are part of the Mound Plant D&D Program. These soils contain radioactive contaminants in concentrations greater than the cleanup standards used by the Mound Plant D&D Program. The scope of this operable unit is limited to the verification of cleanup (hazardous and radioactive contaminants) of soils following remedial activities by the Mound Plant D&D Program and, where necessary in support of a risk assessment, obtaining additional data required to characterize residual contaminants following cleanup.

Operable Unit 5 addresses areas with known or suspected radioactive contamination below the current Mound Plant D&D Program cleanup levels. The scope of Operable Unit 5 includes identifying potential hazardous contaminants and, where necessary, obtaining additional data necessary to fully characterize the radioactive contaminants to support a risk assessment and an FS. Operable Unit 5 will also characterize the hydrogeology and groundwater on the Special Metallurgical (SM)/Plutonium Processing (PP) Hill.

It is anticipated that all radioactively contaminated soils at the Mound Plant, including the currently defined Operable Unit 5, Radioactively Contaminated Soils, and Operable Unit 6, D&D Program Areas, will eventually be consolidated into a single operable unit for the purposes of completing the remedial action and a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD). Following appropriate remedial measures, both operable units would include soils with contaminant levels below accepted cleanup standards.

BACKGROUND

Leaks and spills related to plant processes, storage of radioactive materials, and radioactive materials carried through waste lines, constitute the principal known sources within Operable Unit 6. The potential release mechanisms related to these sources include leaks, spills, and leaching due to the primary sources. Releases from primary sources resulted in a secondary source of contaminated soil. It is necessary to understand potential contaminant transport pathways in order to establish a conceptual site model and establish cleanup criteria and priorities for the various Operable Unit 6 D&D Program Areas. The D&D Program at Mound Plant is ongoing and predates the enactment of CERCLA. Currently, the D&D Program scope of activities addresses the following 12 areas:

- Area 1, formerly a thorium storage and redrumming area;
- Area 4, the area surrounding the Waste Disposal (WD) Building where influent tanks containing polonium-210 and cobalt-60 overflowed;
- Area 4a, the old sewage disposal plant that was contaminated by polonium-210 and cobalt-60 as the result of a waste line break;
- Area 11, formerly a storage area for plutonium-238-contaminated wastes from the SM Building;
- Area 14, location of the 1969 waste transfer line break (plutonium-238);
- Area 16, consisting of a sanitary sewage septic tank and septic leach field formerly for the SM Building (plutonium-238);
- Area 17, the area under and surrounding the SM Building, contaminated with plutonium-238 from plutonium processing and from the use of several tanks just outside the building;
- Area 19, underground waste transfer lines (plutonium-238);
- Area D, formerly an acid leach field for the PP Building (Building 38);
- The old sanitary wastewater treatment plant, located immediately west of the WD Building;
- Contaminated soil box area; and
- Underground radioactive waste lines.

GEOLOGY AND HYDROLOGY

The Mound Plant is situated on top of a river bluff overlooking the Great Miami River and the city of Miamisburg. Elevations on the plant site range from approximately 700 to 900 ft above mean sea level. The dominant features on the plant site are two adjacent hills (Main Hill and SM/PP Hill). These

consist of relatively flat lying bedrock of calcareous shales and interbedded limestones. These materials are an important control on groundwater flow in these areas. Pleistocene-age glacial deposits overlie the bedrock in the Mound Plant Area. These consist of unsorted, unstratified till or well-sorted sand and gravel outwash deposits in horizontal layers and cross beds. The outwash deposits are interstratified with glacial till in the Mound Plant valley and in the Great Miami River Valley.

Surface water flow at the Mound Plant is drained by five subwatersheds. Many natural surface flow patterns have been altered by the plant drainage ditch and by the construction activities at the plant. The hydrogeologic regime at the plant consists of two geologic environments: flow through the bedrock beneath the topographic elevated areas, and flow within the glacial deposits and alluvium associated with the Buried Valley aquifer in the Great Miami River Valley. In the bedrock system, the flow is dominated by fracture flow. In the Buried Valley aquifer, there is porous flow with the gravel lenses providing the major sources of water.

The soils at the site fall into several mapping units, are typically reasonably well drained, and usually show an increase in pH with depth.

D&D ACTIVITIES

Decontamination and decommissioning activities at Mound Plant started in 1955, eight years after the plant began operation. The list of facilities that have undergone partial or complete D&D includes

- Semi-Works (SW) Building,
- SM Building,
- Technical (T) Building,
- PP Building,
- Research (R) Building, and
- Waste Transfer System (WTS).

The current areas assigned to undergo D&D include

- Area 1, thorium storage and redrumming;
- Area 4, WD Building influent tank overflow;
- Area 4A, sludge drying pits;

- Area 11, contamination from the SM Building operations;
- Area 14, radioactive waste line break;
- Area 16, sanitary sewage septic tank and leach basin for the SM Building;
- Area 17, the area under the SM Building;
- Area 19, underground waste transfer line;
- Area D, acid leach field;
- The old sanitary wastewater treatment plant;
- Contaminated soil box area; and
- Underground radioactive waste lines.

These areas are usually subdivided for the purpose of cleanup; the subareas undergo D&D individually; and cleanup is certified individually. In some cases, the impetus for the cleanup has been the need for reuse of the land or facility.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Verification sampling involves the sampling of soils following Mound Plant D&D Program remedial activities in order to determine whether or not an area has been sufficiently remediated. In making this determination, analytical results obtained from the verification sampling are compared to cleanup standards. For many of the analytes, these standards will take the form of applicable or relevant and appropriate requirements (ARARs). For the remaining analytes, proposed standards will be developed through a risk assessment. Potential ARARs that may be employed in determining if an area has been sufficiently remediated are identified in Section 4, Requirements and Data Quality Objectives.

Because of the likelihood of transfer of areas from one operable unit to another, ARARs must be coordinated between operable units expected to be involved in area transfers. For this reason, there is similarity between those identified for Operable Unit 6 and those of Operable Unit 5.

DATA NEEDS AND DATA QUALITY OBJECTIVES

Data needs and data quality objectives (DQOs) for Operable Unit 6 activities are consistent with those for other operable units so that data and other information can be interchanged between the units. Data needs for Operable Unit 6 activities fall into the following two categories:

- after D&D, verifying cleanup of radionuclides and chemicals to a given level and determining the significance of any hazardous contaminants, if present, to potential ARARs; and

- ensuring that data are of sufficient quality to support a risk assessment based on all radioactive and nonradioactive contaminants remaining following D&D actions.

D&D VERIFICATION REPORTS

Formal verification of the cleanup is provided through a process that includes the development of the sampling and analysis planning document, the sampling, laboratory analysis, data validation, and preparation of the verification report.

The format for the sampling and analysis plan includes

1. Introduction
2. Sampling Objectives
3. Sampling Locations, Sample Frequency, and the Justification for Decisions
4. Sample Designations
5. Sampling Equipment and Procedures
6. Sample Handling and Analysis
7. Data Evaluation Methods
8. References

When the samples have been collected, analyzed, and the data have been validated, the verification report is written. The format for the verification report includes

1. Purpose of the Report
2. Scope of the Verification
3. Background Material (including the area description and the history of the activity)
4. Sampling Activity Summary
5. Summary of the DQOs
6. Description of the deviations from the activities as planned (including the reasons for deliberate changes and any deficiencies identified during quality assurance activities)

7. Summary of the Analytical Work

8. Summary of the Data Validation

9. Data Analysis (to demonstrate that the cleanup criteria have been attained). This includes the data interpretation and statistical analysis.

10. Conclusions. This includes recommendations for further work if the area or a part of the area has not met the cleanup criteria.

The purpose of the verification report is to provide a defensible record for the activity.

1. INTRODUCTION

This Verification Work Plan describes environmental sampling and analysis protocols to be implemented at the U.S. Department of Energy (DOE) Mound Plant Decontamination and Decommissioning (D&D) Program sites, Operable Unit 6. Based on these protocols, area-specific sampling and analysis plans (SAPs) will be prepared and will specify sampling and analysis sufficient to verify that the D&D is complete. The description of sampling and analysis protocols has been done in a work plan format in order to integrate ongoing environmental cleanup by the D&D Program with ongoing environmental characterization under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The Atomic Energy Act of 1954 (AEA) (42 United States Code [U.S.C.] 2011) is the legal authority by which the DOE conducts its operations. The DOE must also comply with other laws and regulations, including, but not limited to, the Resource Conservation and Recovery Act (RCRA), CERCLA, and the Clean Water Act (CWA). Routine DOE nuclear operations involve the use and management, including related waste management, of special nuclear material or other radionuclides, and the operations are either specifically or implicitly exempted from most environmental regulations. However, CERCLA is applicable to DOE nuclear operations when operations result in contamination that presents a substantial threat to public health, welfare, or the environment.

When DOE facilities or assets (e.g., buildings) are declared surplus or are no longer needed, the D&D Program will manage the decontamination of radiological and chemical contamination associated with routine operations. This includes D&D of contaminated soil associated with a building or process, and it extends to the D&D of underground tanks and piping involved in nuclear operations. This Verification Work Plan is intended to integrate the obligations of the DOE under the AEA for decommissioning of nuclear operations with its obligations under CERCLA for remedial response to releases of hazardous substances.

1.1. PURPOSE

The goal of this Verification Work Plan is ultimately to assist the Mound Plant D&D Program in demonstrating that current and future D&D actions achieve CERCLA cleanup standards for both radioactive and hazardous chemicals. The Work Plan is intended to fulfill the same purpose as any CERCLA remedial investigation/feasibility study (RI/FS) work plan; i.e., to provide a documented, logical approach to remedial activities. By doing so, it is intended that the verification of cleanup at D&D Program areas will meet the data quality objectives (DQOs) consistent with CERCLA requirements. These data provide input for risk assessment activities presently planned as part of Operable Unit 9.

It is the purpose of this Verification Work Plan to address two potential problems associated with the fact that the D&D Program cleans up multiple sites over a period of several years and associated with the fact that multiple SAPs are prepared over a period of years: first, the preparation of multiple plans for similar sampling creates the possibility of presenting some information redundantly in the various SAPs; and second, this creates the possibility of inconsistency among the various SAPs. This work plan is intended to address the problem of redundancy by presenting material of general applicability that can be referenced by succeeding SAPs and to address the problem of consistency by laying a programmatic foundation for those SAPs.

1.2. SCOPE

This work plan encompasses those actions following D&D that provide the verification including sampling, analysis, and documentation, and that are done under CERCLA guidance. It encompasses protocols of general application for verification of both radioactive and hazardous chemicals following D&D of radioactively contaminated soil areas. The scope of this document includes the verification of contaminated soil associated with such features as buildings, tanks, and piping. However, it excludes the verification of cleanup of the structural elements of those features. This work plan provides a framework for the preparation of a SAP for each contaminated soil area. Because of site-specific factors, an individual SAP must be prepared to describe the detailed sampling and analysis for each of those areas. The procedures called out for use in this document and SAPs are those written for CERCLA activities.

1.3. ENVIRONMENTAL RESTORATION (ER) PROGRAM DESCRIPTION

Mound Plant, located in Miamisburg, Ohio, is operated by EG&G Mound Applied Technologies for the DOE. Location maps are shown in Figures 1.1 and 1.2. Mound Plant is one of seven DOE Albuquerque Field Office (AL) installations currently being evaluated by the DOE Environmental Restoration (ER) Program. The ER Program, formerly known as the Comprehensive Environmental Assessment and Response Program (CEARP), was initiated by DOE AL in 1984 to identify, assess, and remediate environmental contamination associated with release sites that resulted from spills or inadequate management of hazardous substances. The ER Program fulfills DOE's obligations under the environmental laws.

As a result of historic disposal practices and contaminant releases to the environment, Mound Plant was placed on the National Priorities List (NPL) in November 1989 (54 Federal Register 48184) (FR 1989). Pursuant to sections 120 and 105 of CERCLA, the DOE and the U.S. Environmental Protection Agency (EPA) entered into a Federal Facility Agreement (FFA) (EPA Administrative Docket No. VW-'90-

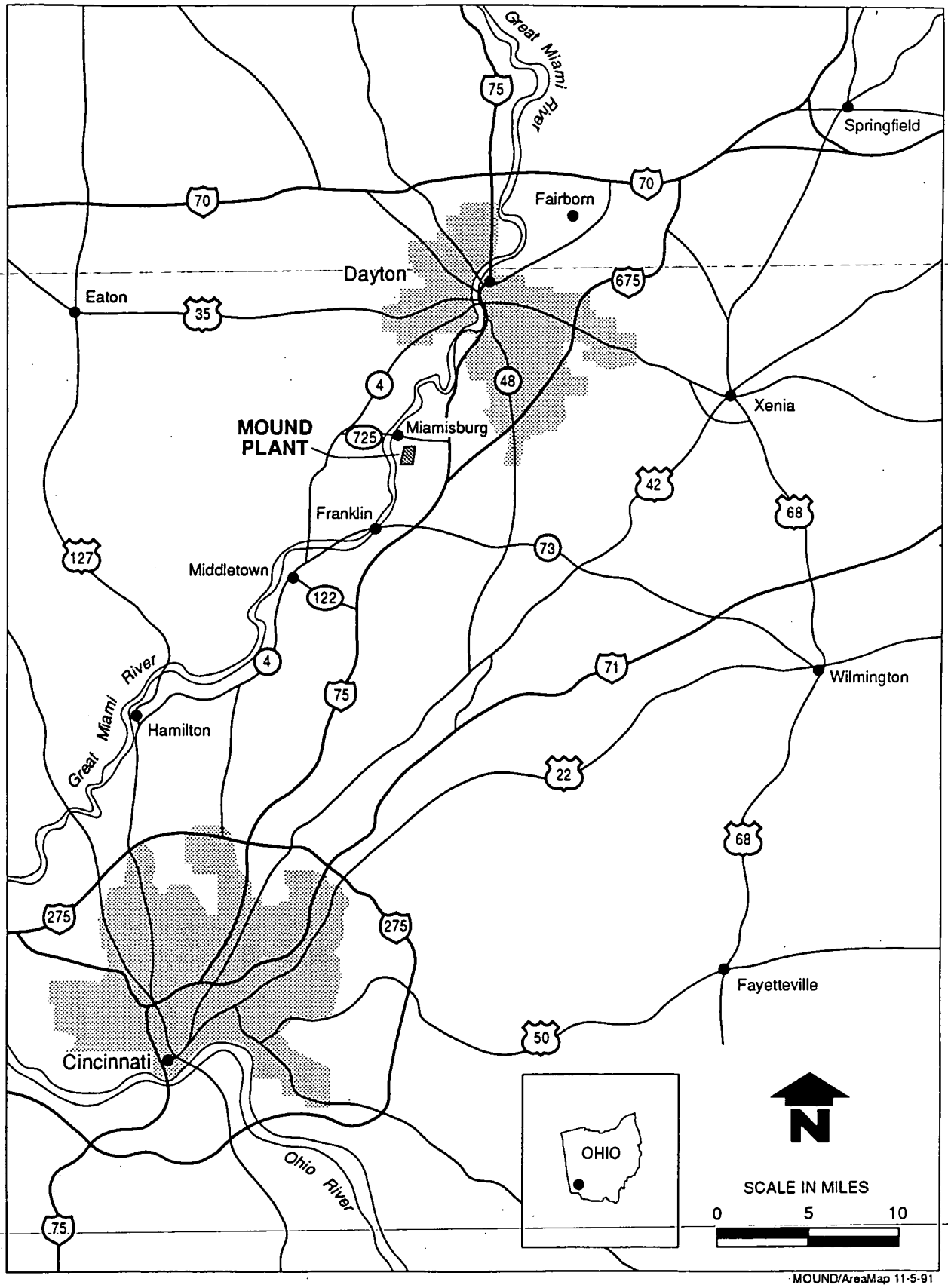
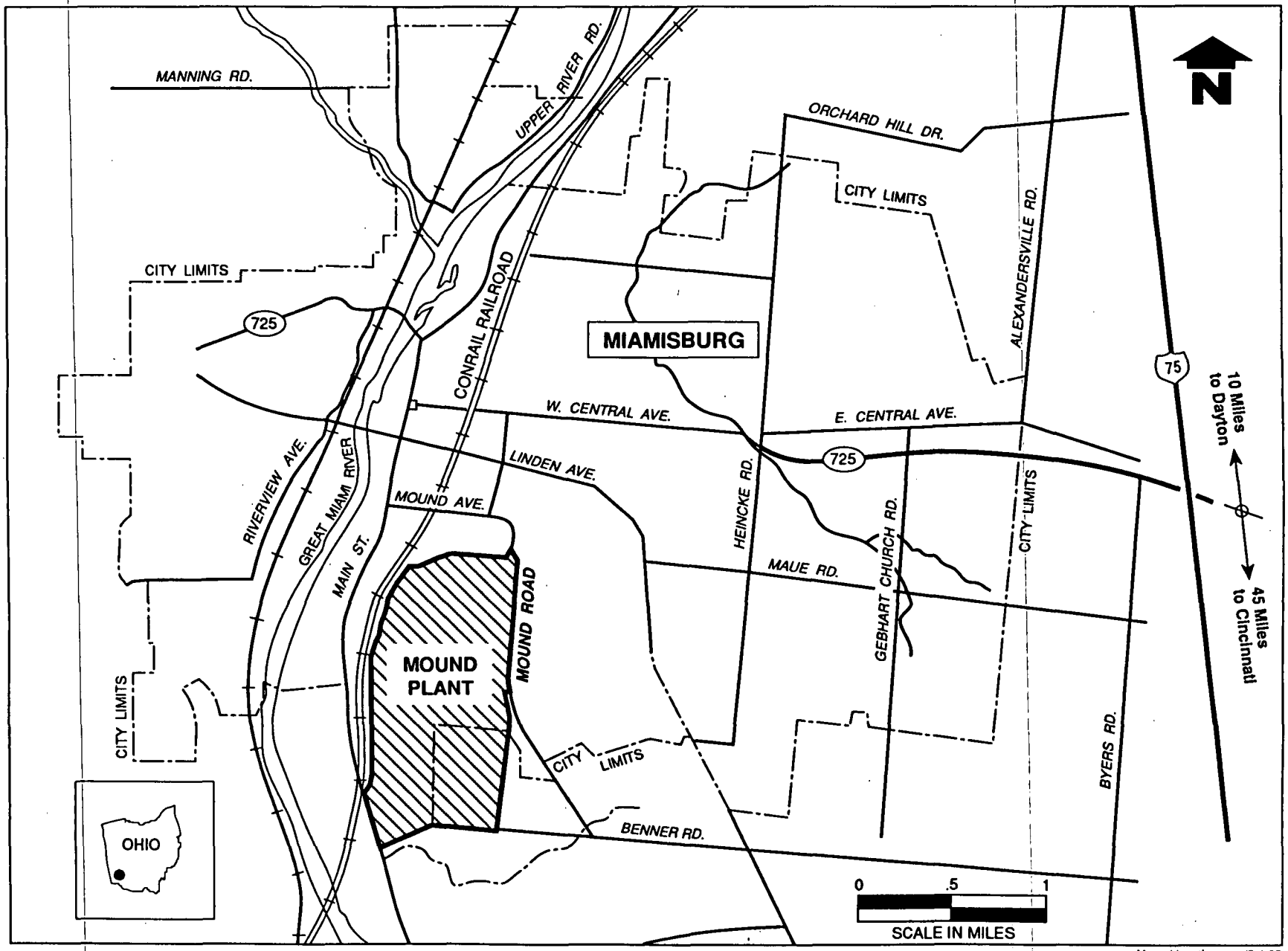


Figure 1.1. Regional location of Mound Plant.



Mound location map/5-4-92

Figure 1.2. Location of Mound Plant, Miamisburg, Ohio.

C-075) (EPA 1990a) in August 1990; the DOE was deemed the lead agency. The agreement became effective in October 1990. Interactions between the CERCLA, the National Environmental Policy Act (NEPA), and the FFA activities are discussed and diagramed in Appendix A.

The terms of the FFA require that the DOE develop and implement an RI/FS 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 that appropriate action is taken to protect the public health, welfare, and the environment. Because of the number of potential release areas (over 100) and the overall complexity of the RI/FS at Mound Plant, the RI/FS has been divided into nine operable units to facilitate the management of the program. These nine operable units and their current objectives are as follows:

- Area B, Operable Unit 1, includes a historical waste disposal area (landfill) from which there has been a known release of volatile organic compounds (VOCs) to the Buried Valley aquifer. Two stages of the RI have been performed for Area B, and a third is under way.

- Main Hill Seeps, Operable Unit 2, addresses potential release sites on the Mound Plant Main Hill, including some peripheral groundwater seeps. Its scope includes characterization of the indurated bedrock and unconsolidated overburden on the Main Hill, associated soils, and groundwater.

- Miscellaneous Sites, Operable Unit 3, includes those potential release sites for which little or no data are currently available and for which the collection of site-specific data in a limited field investigation will enhance the scoping effort. At the conclusion of the field work and data validation, a decision point is scheduled. At this decision point, a recommendation will be made whether to proceed with a full RI/FS within Operable Unit 3, to reassign the sites to other operable units, or whether any of the sites require no further action. Since many of the sites undergoing limited field investigation are within the plant valley, it is conceivable that Operable Unit 3 may assume geographic responsibility of the plant valley for full characterization.

- Miami-Erie Canal, Operable Unit 4, addresses an abandoned segment of the Miami-Erie Canal, west of Mound Plant, which contains plutonium-contaminated sediments from a 1969 waste line break and tritium-contaminated soils. Although a mile long, it is considered to be one potential release area.

- Radioactively Contaminated Soils, Operable Unit 5, includes soils with known or suspected radioactive contamination. The sites within Operable Unit 5 are not currently scheduled for D&D under the D&D Program at Mound. It is anticipated that as sites obtain funding under the D&D Program, they may be moved from Operable Unit 5 to Operable Unit 6, described below. Since many of the known radioactively contaminated sites are located on the Special Metallurgical (SM)/Plutonium Processing (PP) Hill, Operable Unit 5 has the geographic responsibility for the SM/PP Hill. As with the Main Hill, investigations of the potential source terms on the SM/PP Hill may require characterization of the bedrock and unconsolidated overburden.

- D&D Program Areas, Operable Unit 6, includes potential release areas with radioactively contaminated soil that are undergoing removal or that are scheduled for removal in the

near future. Because it is already known that the contaminated soil will be removed and because the D&D Program is an ongoing activity that reduces potential impacts to human health and the environment, the scope of the RI/FS for these areas is to verify cleanup after the soil is removed and to provide data to allow determination of the risk posed by residual contamination. Groundwater, if encountered during D&D excavation, will be handled by the Mound Plant D&D Program as appropriate.

- Limited Action Sites, Operable Unit 7, includes potential release sites that are believed to have no contamination based on a review of site histories and an August 1990 joint visual site inspection by the DOE, the EPA, and the Ohio EPA. The Operable Unit 9 work plan stipulates that no further action is required, and no further documentation will be produced.

- Inactive Underground Storage Tanks, Operable Unit 8, includes underground storage tanks primarily in the vicinity of the Waste Disposal (WD) Building. Its scope will also include an early review to determine the regulatory status of all underground tanks at Mound Plant and will result in a distribution of responsibility for the tanks between the ER Program and a Mound Plant underground tank compliance program under RCRA Subtitle I, to be administered by the state of Ohio.

- Site-Wide RI/FS, Operable Unit 9, includes off-plant migration of contaminants in groundwater, soils, surface water and sediments, airborne contamination, and ecology. The Site-wide RI/FS will additionally ensure that a comprehensive investigation is performed by compiling all data from individual operable unit investigations into a comprehensive report. Data reports from specific Site-wide investigations conducted under the Operable Unit 9 work plan will be initially reported in interim reports or technical memorandums to ensure that the off-plant and regional data are available early.

1.4. DECONTAMINATION AND DECOMMISSIONING PROGRAM

The Mound Plant D&D Program is an ongoing program that provides a coordinated system for funding and scheduling the D&D of inactive radioactively contaminated areas at Mound Plant (MRC 1987). The program originated before 1955 and has been a distinct entity since 1972. The current program started in 1978 after the processing operations of unencapsulated plutonium-238 ceased at the plant. The program has since coordinated efforts for D&D areas that operated before under the joint ownership and funding of the Advanced Nuclear Systems Division (now Nuclear Energy-Office of Remedial Action and Waste Technology), the Office of Military Operations, and the Office of Defense Programs. The reasons for this change were to minimize duplication of efforts, to effectively put to use unutilized resources, to minimize environmental safety and health risks, to allow activities to follow in a logical sequence, and to provide cost responsibility.

The D&D Program Areas, Operable Unit 6, currently address 12 areas with radioactively contaminated soils that are part of the Mound Plant D&D Program. Of these 12 areas, Area D has been remediated by the Mound Plant D&D Program and is awaiting verification sampling. The scope of this operable unit includes verification of cleanup (hazardous, radioactive, or mixed waste) following soil removal as part of the D&D Program. Examples of documents developed during these activities are presented in

Table I.1. Mound Plant D&D Program Areas, Operable Unit 6

Release Site	Known Contaminant by Source
Area 1, former thorium storage and redrumming area	Plutonium-238 and thorium[a]
Area 4, area surrounding WD Building	Plutonium-238, thorium[a], cesium-137, and cobalt-60
Area 4a, sewage sludge drying pits	Plutonium-238, thorium[a], cesium-137, and cobalt 60
Area 11, contamination from SM Building operations	Plutonium-238 and thorium[a]
Area 14, radioactive waste line break	Plutonium-238
Area 16, sanitary sewage septic tank and leach basin for the SM Building	Plutonium-238 and thorium[a]
Area 17, area under the SM Building	Plutonium-238 and thorium[a]
Area 19, underground waste transfer system	Plutonium-238
Area D, acid leach field for Building 38	Removal complete, area is awaiting verification
Old sanitary wastewater treatment plant	Plutonium-238 and cobalt-60
Contaminated soil box area	Plutonium-238
Underground radioactive waste lines	Plutonium-238 and cobalt-60

Source: DOE 1992e
[a]Total thorium
WD - waste disposal (Building)
SM - Special Metallurgical (Building)
D&D - Decontamination and Decommissioning

Appendix B. Table I.1 lists the current Operable Unit 6 areas and known contaminants identified in these areas. The soils in these areas were characterized for radioactive contamination by the Site Survey Project (Stought et al. 1988). The locations of the 12 D&D Program Areas are shown in Figure 1.3.

The DOE D&D Program is an ongoing environmental cleanup program that predates the passage of CERCLA. Current D&D work at Mound Plant is being performed under the authority of the Environmental Restoration Waste Management (ERWM) program. The major goals of the ERWM are to eliminate potential hazards to the public and the environment that are associated with contamination at ERWM sites and to make surplus real property available for other uses to the extent possible. Because the D&D Program is reducing potential impacts to human health and the environment, it is desirable to continue the removal of contaminated soil while remaining consistent with the CERCLA process. Because the Mound Plant is an NPL Site, the equivalencies of the D&D Program to CERCLA have been evaluated to facilitate a joint process. This process is presented graphically in Figure 1.4 and is described as follows:

- Scoping radionuclides: The Mound Plant Radiological Site Survey was completed in May 1988 (Stought et al. 1988). It provides a limited data set to design further characterization and to provide engineering cost estimates for D&D. It was equivalent to a CERCLA limited field investigation for scoping, but has not been reviewed by the EPA.

- Scoping hazardous constituents: A limited field investigation for hazardous constituents included sampling in July and August of 1989. It was completed solely for CERCLA scoping, but has not been reviewed by the EPA or the Ohio EPA. Reconnaissance work at this operable unit is described in "Reconnaissance Sampling Plan, Mound Plant, Decontamination and Decommissioning Program Sites, Operable Unit 6 (DRAFT)" (DOE 1989b). The plan includes a Reconnaissance Sampling Plan, a Quality Assurance/Quality Control Plan, and a Health and Safety Plan. Soil samples were collected in July and August of 1989 and were analyzed for target compound list (TCL) constituents. The Reconnaissance Sampling Report (DOE 1992a) has been issued and is in the review cycle. A preliminary evaluation of the data indicated that few of the samples were indicative of the presence of hazardous constituents.

- Radiological Assessment: Prior to the final design of soil removal, the D&D Program does a more extensive characterization in addition to the Mound Plant radiological site survey in order to augment that limited data base and support final cleanup specifications. This sampling and analysis is not equivalent to a CERCLA characterization, but a later step is equivalent.

- Removal of Radioactively Contaminated Soil: The D&D Program excavates radioactively contaminated soil in accordance with program cleanup protocols. These protocols currently are to start cleanup for soils with ≥ 100 picocuries per gram (pCi/g) of plutonium to cleanup levels of 25 pCi/g where practical. The excavated soil is shipped to a DOE disposal facility in Nevada. This cleanup is generally equivalent to a CERCLA removal action, because it is done to reduce potential hazards to public health and the environment. Included in this step are two other activities that are

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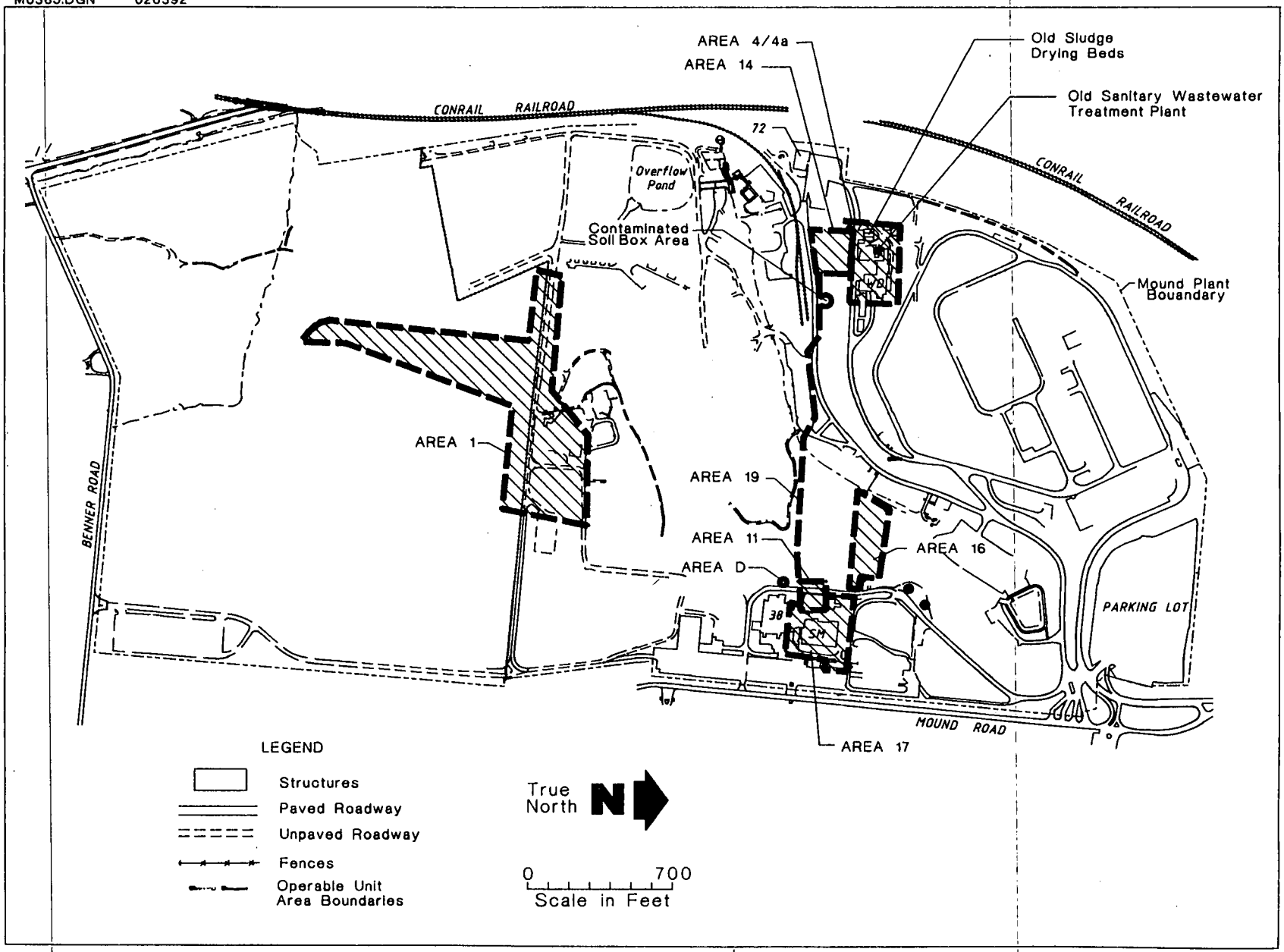


Figure 1.3. D&D Program Areas, Operable Unit 6.

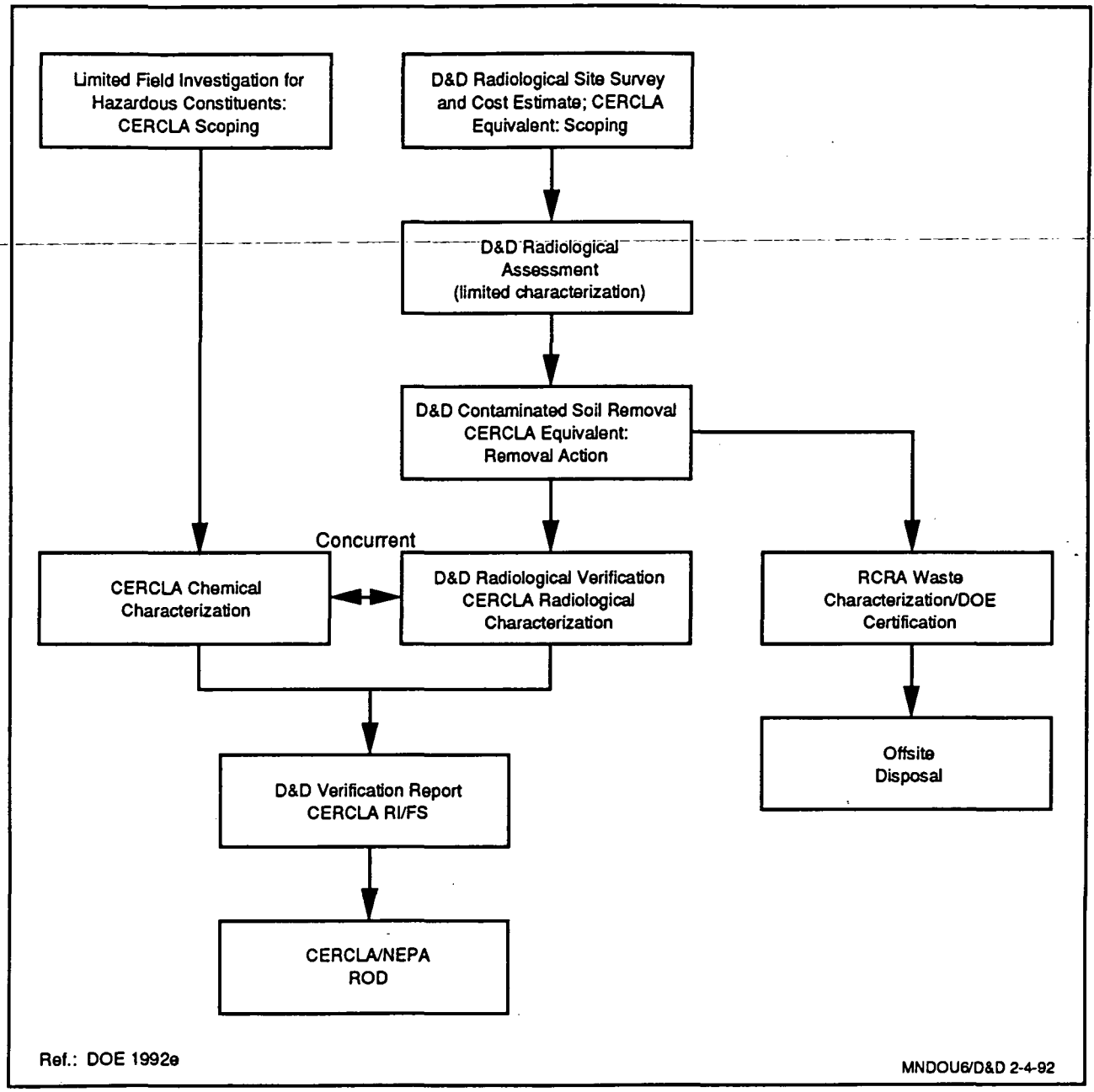


Figure 1.4. Integration of D&D cleanup of radioactively contaminated soil and CERCLA RI/FS.

completed by the DOE, pursuant to its responsibilities under the AEA, for the disposal of radioactive waste:

- RCRA waste characterization/certification: The DOE disposal facility for low-level radioactive waste requires determination of RCRA characteristics and certification that waste shipments do not contain mixed radioactive and hazardous wastes.

- Waste disposal: Low-level radioactive wastes without hazardous chemicals and nonhazardous higher activity wastes (including transuranic [TRU] wastes) from the Mound Plant are disposed of at the DOE Nevada Test Site (NTS). In the past, wastes have been shipped to Idaho, and in the future the wastes will be sent to the Waste Isolation Pilot Plant in New Mexico.

- Verification: the D&D Program and CERCLA compliance begin to merge after excavation of contaminated soil. When ready for verification planning, this work plan becomes the controlling document for the verification activities. A verification plan is prepared consistent with both DOE requirements (for radioactive contamination) and CERCLA DQOs (for radioactive and hazardous constituents). The radiological and chemical verification will be done concurrently to take advantage of easy access to the potentially contaminated surface of the excavation before it is backfilled with clean material.

  - Verification Report: Historically, the D&D Program has prepared verification reports, for radioactivity only, that addressed only DOE requirements. To support compliance with CERCLA, a verification report will be prepared including both the radiological and chemical data and using the combined data from the radiological and chemical verification.

  - Record of Decision (ROD): After the completion of all D&D Program verification activities, the data and evaluations contained individually in the site-specific verification reports will be accumulated for a comprehensive analysis. This may be done either in an RI/FS report for the Site as a whole or in support of a ROD for radioactively contaminated soil areas alone. The risk assessment will be developed to support a "no action" ROD or to develop the objectives for completion of the FS, depending on the risk posed by the residential contamination (if any).

The CERCLA compliance for the D&D Program Areas will be assembled sequentially because of the sequencing of already-completed D&D soil excavation for different release areas over several years. Although it is anticipated that the D&D soil removal will satisfy CERCLA cleanup requirements, it is possible that additional CERCLA remedial action could be required after the D&D cleanup is complete. A preliminary baseline risk analysis based on CERCLA protocols has been scheduled for FY 1992 to provide the basis for a comparison of current D&D Program cleanup levels to CERCLA requirements.

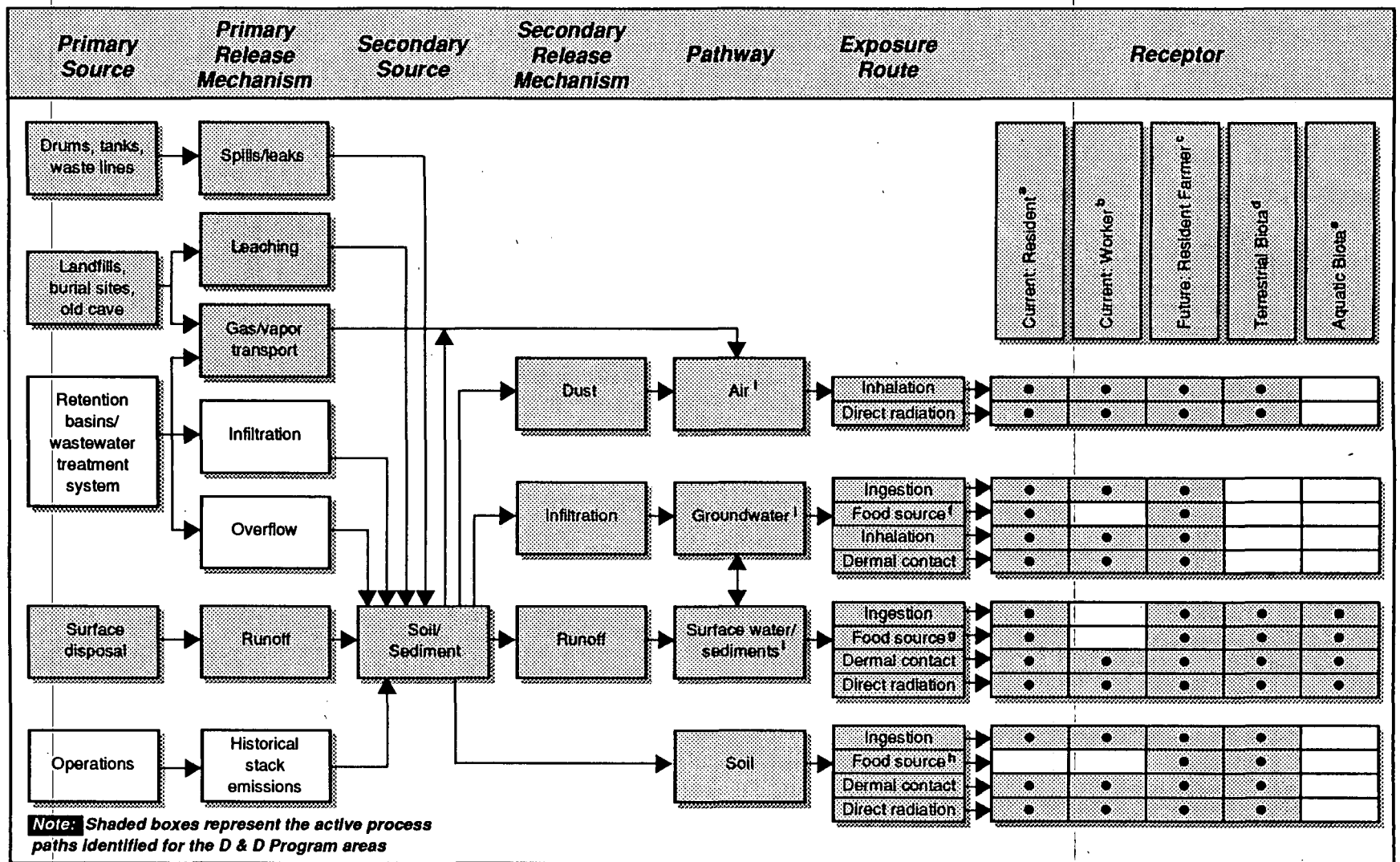
Assignment of radioactively contaminated soils at Mound Plant to operable units, including the currently defined Operable Unit 5, Radioactively Contaminated Soils, and Operable Unit 6, D&D Program Areas, is flexible to allow effective completion of remedial action and approval of a CERCLA

ROD. If the D&D Program is able to clean up sufficiently to meet the CERCLA requirements and it is verified that no significant levels of radionuclides or hazardous constituents remain after D&D, no CERCLA remedial action will be required, and a "no action" ROD will be completed.

The conceptual site model for Operable Unit 6, showing the relationship among the contaminant sources, release mechanisms, exposure pathways, and receptors, is shown in Figure 1.5. Elements of this model applicable to Operable Unit 6 appear shaded in the figure. Leaks and spills related to facility processes, storage of radioactive materials, and radioactive materials carried through waste lines, constitute the principal known sources within Operable Unit 6. The potential release mechanisms related to these sources include leaks, spills, and leaching due to the primary sources. Releases from primary sources result in a secondary source of contaminated soils. The secondary release mechanisms include dust, infiltration, and storm water runoff. The potential contaminant transport pathways in Operable Unit 6 include wind, surface water and sediments, and soil. Groundwater is considered a significant pathway and is retained in the conceptual site model until further data can be collected. The conceptual model may have to be modified if hazardous constituents at significant concentrations are found. Groundwater, except when encountered during D&D engineering activities, will be primarily investigated under Operable Units 1, 5, and 9. Should a groundwater contamination problem be identified with any specific Operable Unit 6 area, the problem would be handled as a CERCLA Removal Action or given to Operable Unit 9 for investigation.

The D&D Program has been assessing and remediating radioactively contaminated facilities for several years at Mound Plant. In addition to buildings, associated soils are also being excavated and disposed of offsite at the NTS. Extensive site characterization, risk assessment, and remedial cleanup level determination have been conducted. This program is currently active, with several projects scheduled and budgeted for the next several years. However, the characterization work by the D&D program did not initially address nonradioactive hazardous constituents; therefore, the ER Program will provide additional characterization, based on an RI/FS work plan, to complete the investigation.

A complete list of potential release sites for each operable unit is presented in the Operable Unit 9, Site-Wide Work Plan (DOE 1992e). This Verification Work Plan applies only to Operable Unit 6, Mound Plant D&D Program Areas. Operable Unit 6 incorporates the Mound Plant D&D Program into the CERCLA process and includes the following 12 areas:



LEGEND

a CURRENT RESIDENT – Visits the canal as a child, lives downgradient from the site in a house with a current-use domestic well.

b CURRENT WORKER – Works on the site as a laborer. Receptor is exposed to contaminants in environmental media; not an evaluation of occupational exposure.

c FUTURE RESIDENT FARMER – Establishes a farm onsite.

d TERRESTRIAL BIOTA – Analysis of terrestrial biota will include quantitative analysis to the extent possible but will not be possible for all exposure routes such as dermal contact.

e AQUATIC BIOTA – Analysis of potential impacts to aquatic biota does not include quantitative risk assessment.

f FOOD INGESTION from the groundwater pathway will be based on consumption of vegetables grown in gardens irrigated with contaminated groundwater.

g FOOD INGESTION from the surface water pathway will include ingestion of fish.

h FOOD INGESTION from the soil pathway will include ingestion of plants that have taken up contaminants from soil.

i Investigation to be conducted in OU9.

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Figure 1.5. Conceptual site model for the D&D Program Areas, Operable Unit 6.

- Area 1, formerly a thorium storage and redrumming area;
- Area 4, the area surrounding the WD Building where influent tanks containing polonium-210 and cobalt-60 overflowed;
- Area 4a, the old sewage sludge drying pits that were contaminated by polonium-210 and cobalt-60 as the result of a waste line break;
- Area 11, formerly a storage area for plutonium-238-contaminated wastes from the SM Building;
- Area 14, location of the 1969 waste transfer line break;
- Area 16, a sanitary sewage septic tank and a septic leach field formerly used for the SM Building;
- Area 17, the area under and surrounding the SM Building contaminated with plutonium-238 from plutonium processing and from the use of several tanks just outside the building;
- Area 19, underground waste transfer system (WTS);
- Area D, formerly an acid leach field for the PP Building (Building 38);
- The old sanitary wastewater treatment plant, located immediately west of the WD Building;
- Contaminated soil box area, located south and downgradient of the WD Building; and
- Underground radioactive waste lines, connecting process and research facilities on the Main Hill with the WD Building.

Appendix B provides additional selected background information, in the form of historical papers, describing Mound D&D Program activities.

If a new area is added to Operable Unit 6, the area history and physical description, including geology and contaminants, will be given in the SAPs for the specific area. This work plan will not be revised to include additions or deletions of areas. The areas currently funded by the ER Program are a subset of the total list of areas assigned to D&D. This subset consists of Areas 14, 17, D, and the waste lines.

2. SITE BACKGROUND

2.1. INTRODUCTION

This section provides background material that is relevant to Operable Unit 6 areas or that is necessary to orient readers not familiar with Mound Plant. In addition, background material specific to Operable Unit 6 is presented. The more extensive background material from which this was derived is presented in the Operable Unit 9 Site-Wide Work Plan (DOE 1992e).

2.1.1. Location and Setting

Mound Plant is located in the outer city limits of Miamisburg, Ohio, approximately 15 miles southwest of Dayton, Ohio (Figure 1.2). The major topographic feature in the region is the Great Miami River, which flows from north to south approximately 2,000 ft due west of the Site. Mound Plant occupies 306 acres on two adjacent hills overlooking the Great Miami River and the city of Miamisburg. Within the facility, these two hills are called the Main Hill and the SM/PP Hill (Figure 2.1).

2.1.2. Mound Plant Operations

Mound Plant originated as a technical organization in 1943 to determine the chemical and metallurgical properties of polonium as part of the Manhattan Engineer District (DOE 1986). This work was performed for the United States Army at several locations in the Dayton, Ohio, area. In 1946, 182 acres adjacent to the city of Miamisburg, Ohio, were purchased for the permanent Mound Plant site. Work being performed at the Dayton units was moved to this site in 1948. An additional 124 acres of adjoining land to the south was later added and remains undeveloped. This area is known as the "new property."

Currently, Mound Plant is an integrated research, development, and production facility that operates in support of the DOE weapons and energy programs (DOE 1986). Mound Plant manufactures non-nuclear components and tritium-containing components for nuclear weapons. Mound Plant also develops small heat sources for the space and defense programs. The radionuclide plutonium-238 is used in the production of heat sources because of its relatively short half-life (87.7 years) and high specific activity. The original polonium operations and the plutonium processing have contributed to the radioactive contamination of the areas being addressed by this work plan.

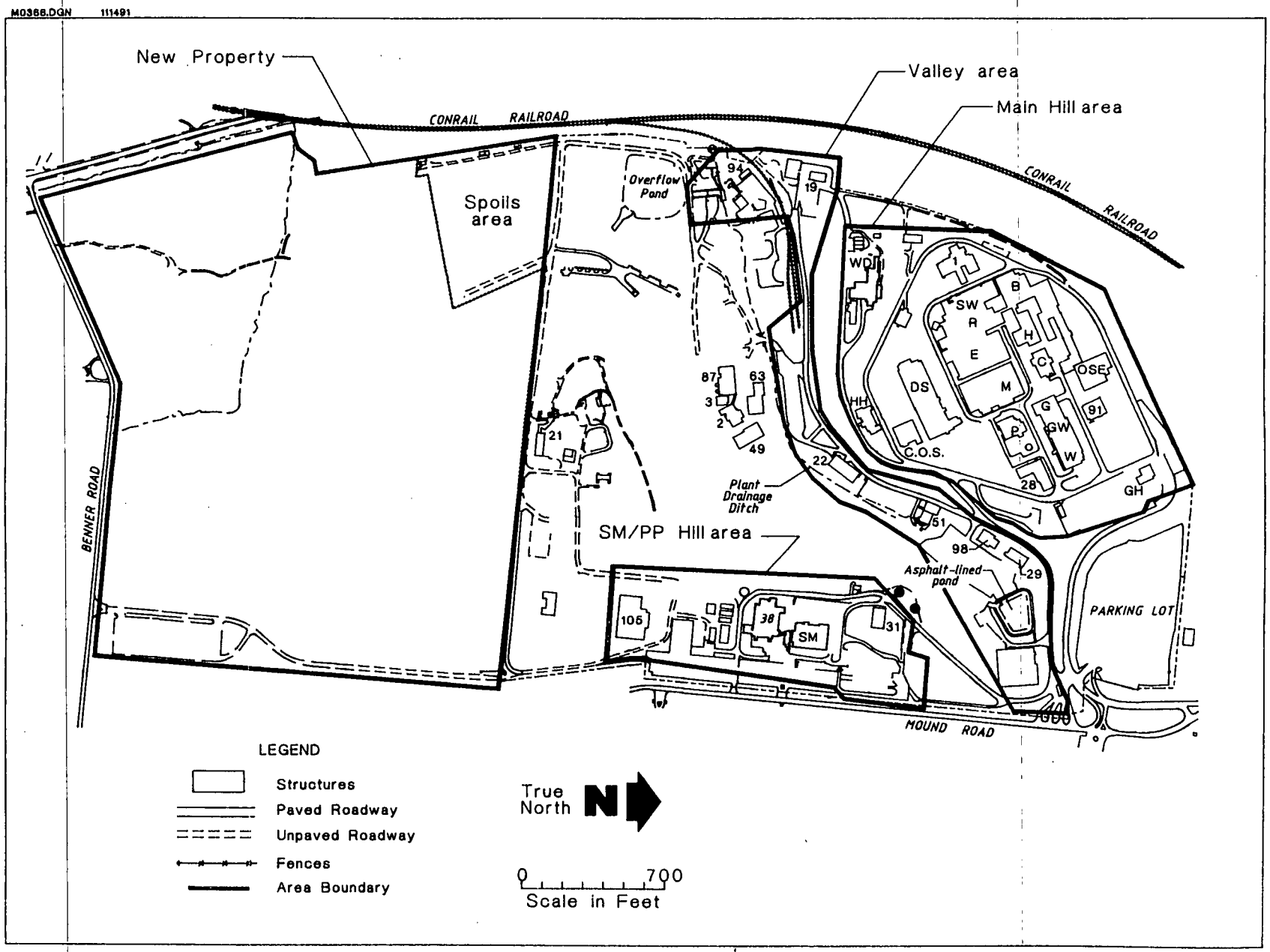

Figure 2.1. Mound Plant areas and main buildings.

2.2. GEOLOGY AND GEOMORPHOLOGY

2.2.1. Geomorphology

Mound Plant is situated on top of a river bluff overlooking the Great Miami River and the city of Miamisburg. Elevations range from approximately 700 ft to 900 ft above mean sea level. Topographic relief ranges up to 200 ft. Natural slopes range up to 20 degrees from horizontal. The topography of Mound Plant is shown in Figure 2.2.

The dominant features of Mound Plant are two adjoining hills (Main Hill and SM/PP Hill), consisting of bedrock shales and limestones covered by a thin veneer of glacial till. Much of the original surface of the hills has been regraded and reworked during plant construction; for example, the Main Hill was leveled in 1947 for foundation stability. Reworked materials (mostly tills) were relocated to the southern slopes of the Main Hill. The SM/PP Hill has not undergone as extensive regrading as the Main Hill, but the western slopes have periodically received construction debris and soil materials that have locally reshaped the hill slopes.

2.2.2. Geology

2.2.2.1. Bedrock

The bedrock immediately beneath Mound Plant belongs to the upper Ordovician Richmond Group, which ranges in thickness from 250 to 300 ft in the vicinity of Mound Plant and consists of calcareous shale with thin interbeds of limestone. Shale beds vary in thickness from 1 to 8 ft, while the limestone beds range from 2 to 6 inches in thickness and generally comprise less than half of the individual formations (Fenneman 1916). The Richmond Group underlies the Main and SM/PP Hills and is an important control on groundwater flow in those areas. Bedrock in the vicinity of Mound Plant is essentially flat lying; the regional dip is approximately 5 ft per mile to the northeast (Stout 1941).

2.2.2.2. Quaternary Glacial Deposits

Two major types of Pleistocene-age glacial deposits overlie the bedrock in the region of Mound Plant: till, which is an unsorted, unstratified mixture of clay, silt, sand, and coarse material; and outwash deposits of well-sorted sand and gravel in horizontal layers and cross beds. Outwash deposits are interstratified with glacial till in the Mound Plant valley and in the Great Miami River Valley.

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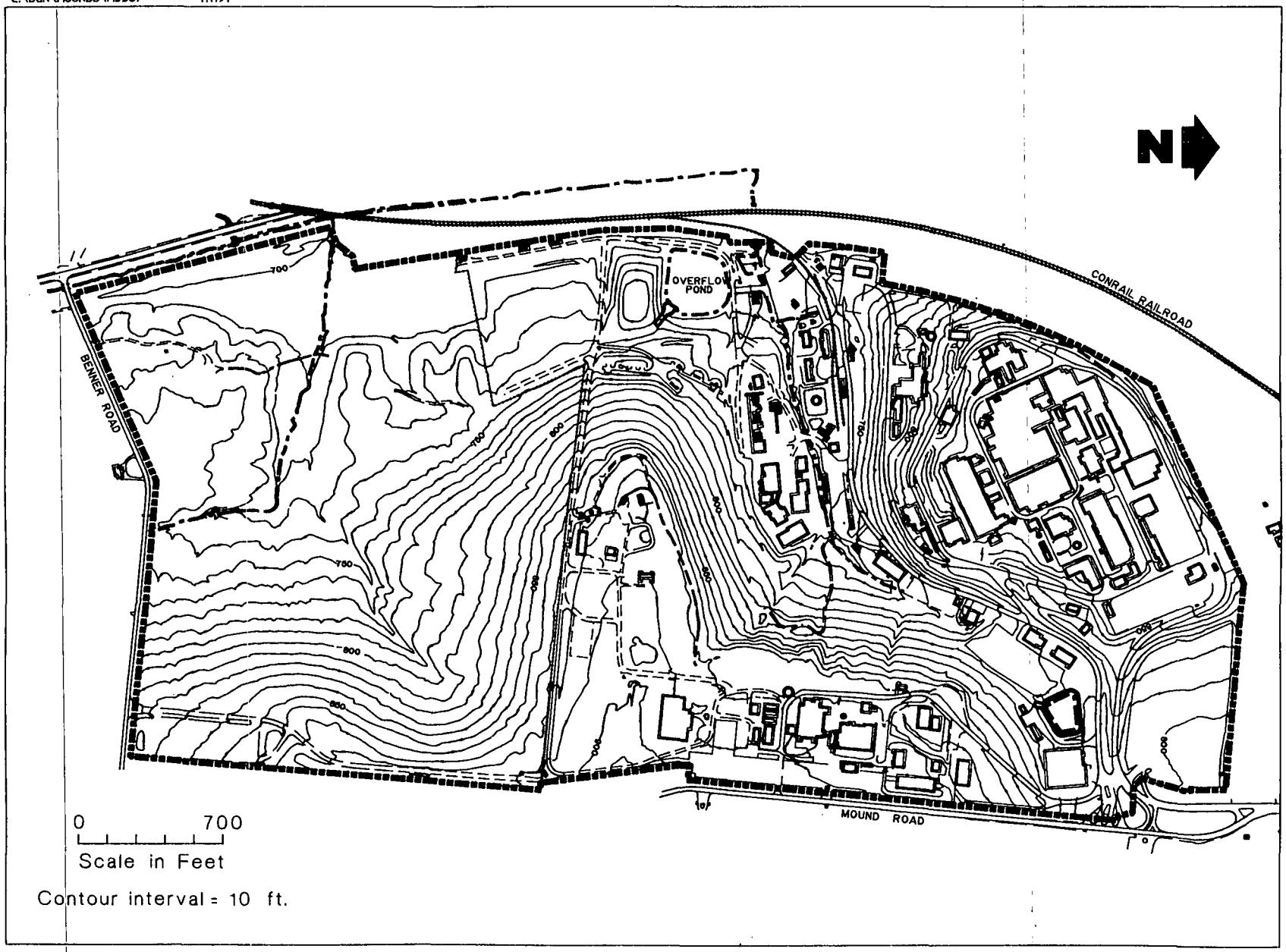

Figure 2.2. Mound Plant topography.

Unconsolidated deposits on the Main and SM/PP Hills range in thickness from zero ft (at bedrock exposures) to 20 ft. These deposits consist of glacial till and clay residual soils that developed from weathering of the shale and limestone bedrock. In addition, construction activities on the Main and SM/PP Hills have resulted in thick deposits of fill in many areas. The fill is generally composed of a mix of glacial till and residual soil.

2.2.2.3. Distribution of Quaternary and Bedrock Units

The majority of Mound Plant is covered by Quaternary deposits. Across the plant, the thickness of the Quaternary deposits ranges from zero ft (at bedrock exposures) to greater than 195 ft on the western edge of the new property. Over most of the Main and SM/PP Hills, these deposits are less than 20 ft thick. Throughout the extent of the Mound Plant valley, the Quaternary deposits are mostly 10 to 30 ft thick.

Bedrock outcrops sporadically at Mound Plant. Exposures are limited to the steeper, west-facing slopes of the SM/PP Hill and the new property. Bedrock is also exposed at some of the seeps on the Main Hill. Usually, the resistant limestone beds are exposed, since the shale intervals form slopes and are covered with float.

Figure 2.3 shows the approximate locations of the generalized stratigraphic cross sections. These cross sections (Figures 2.4 through 2.7) are presented to illustrate the distribution of bedrock and quaternary deposits beneath the various Operable Unit 6 areas. These cross sections are based on data that are subject to interpretation and that have been collected from boreholes logged over a wide time span by different geologists. Additional lithologic details may be found in the Operable Unit 9, Site Scoping Report: Volume 2 - Geologic Log and Well Information Report (DOE 1990); the Preliminary Geotechnical Study for the Mound Facility (New Property) (Bowser and Morner 1983); and the Test Boring Details and Locations (MRC 1976b).

2.3. HYDROLOGY

2.3.1. Surface Hydrology

2.3.1.1. General Description

The Main and SM/PP Hills are separated by a tributary valley of the Great Miami River, referred to as the Mound Plant valley. The valley contains the plant drainage ditch, which is underlain by fill material generated from plant grading and interbedded glacial till and outwash deposits, the latter possibly comprising a small tongue of the Buried Valley aquifer.

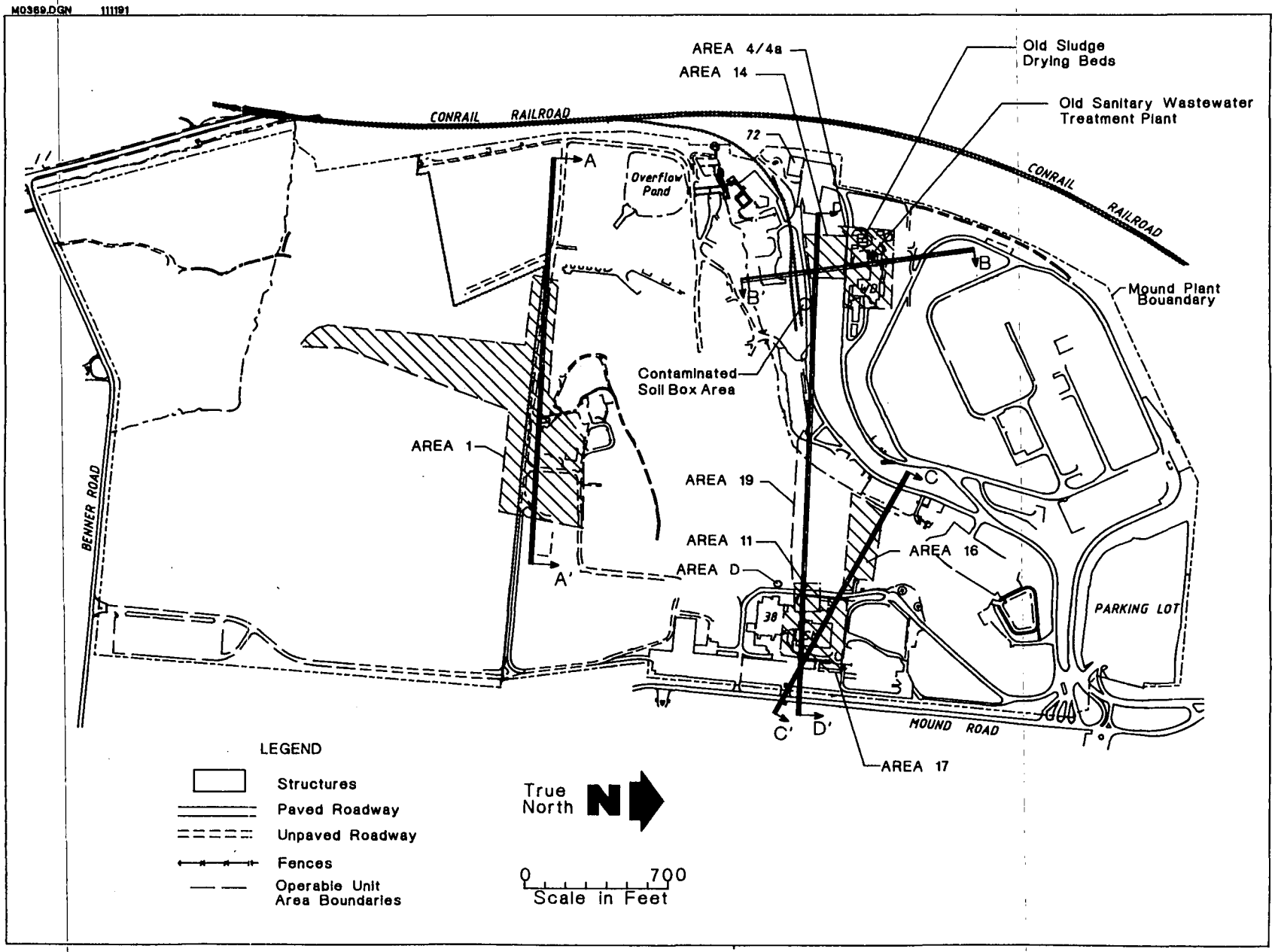

Figure 2.3. Approximate locations of stratigraphic cross sections in relation to the D&D Program areas.

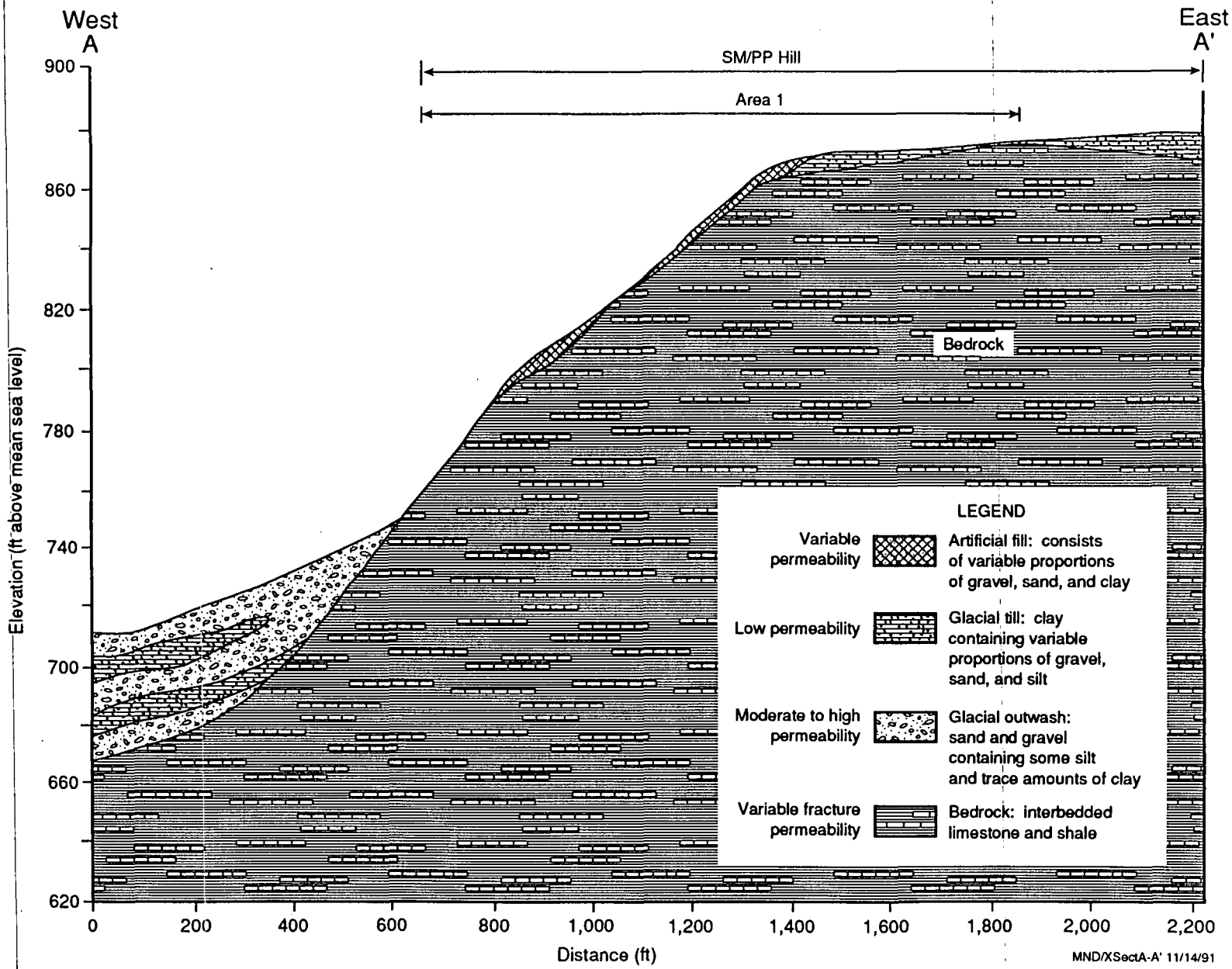

Figure 2.4. Generalized stratigraphic cross section A-A'.

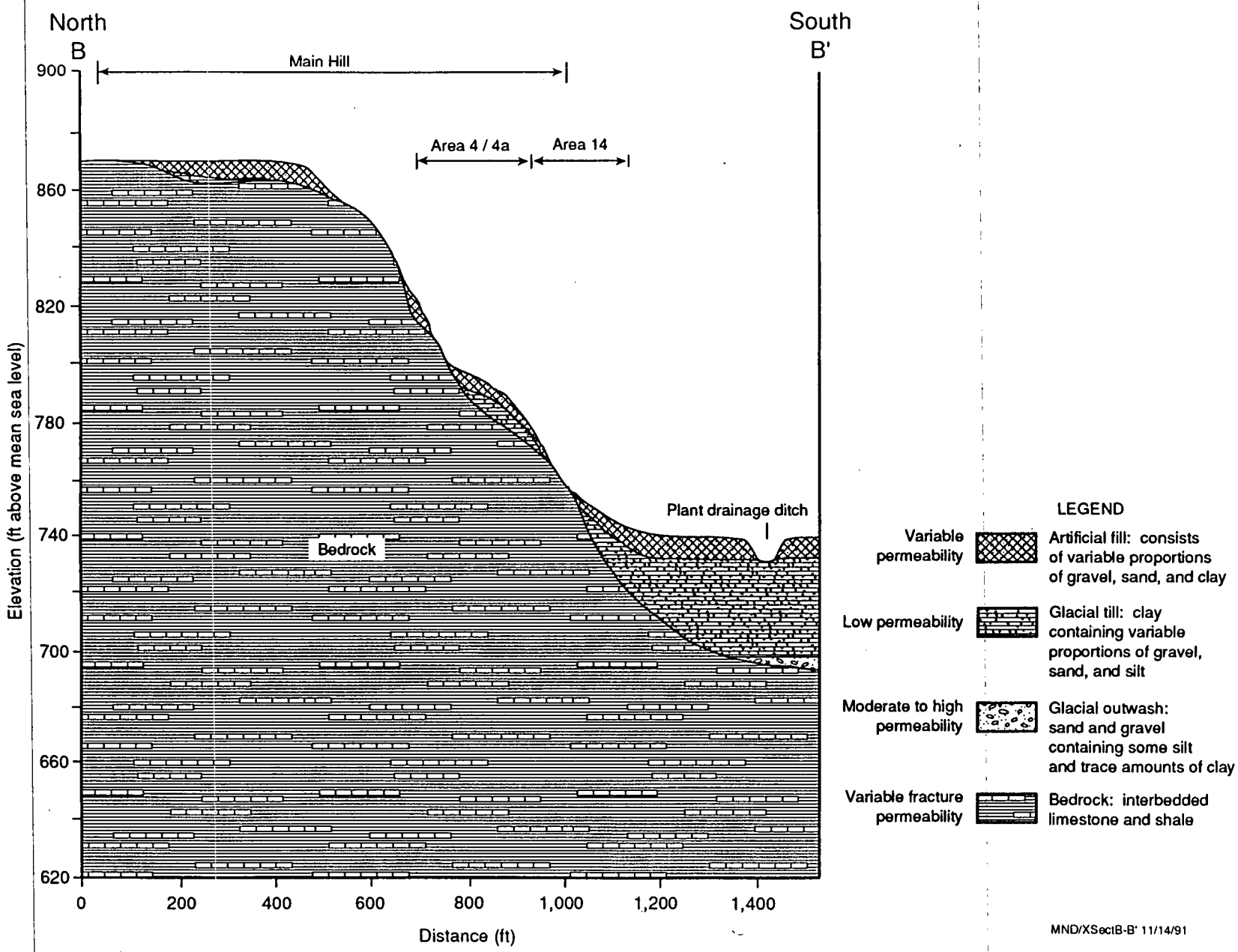

Figure 2.5. Generalized stratigraphic cross section B-B'.

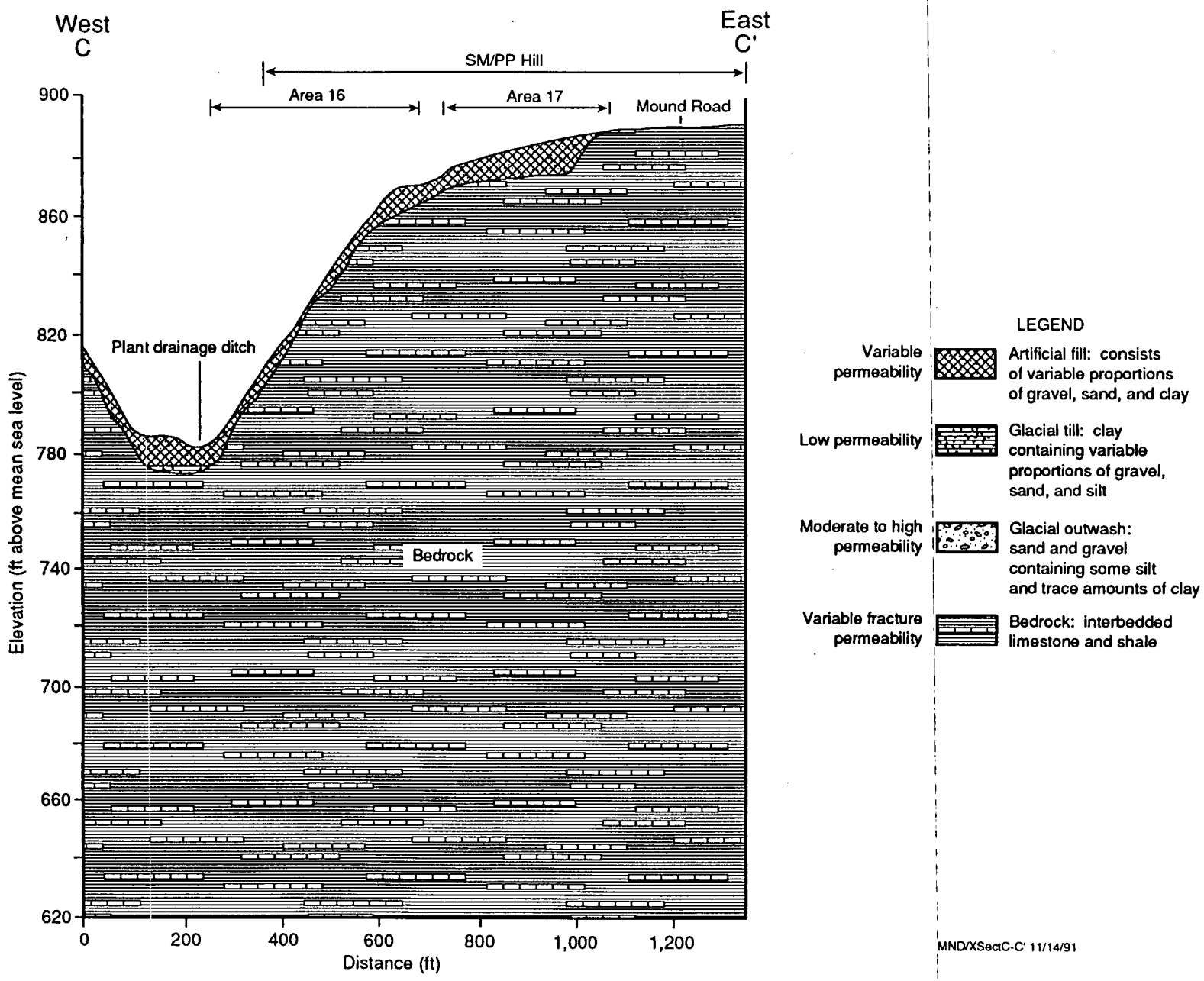

Figure 2.6. Generalized stratigraphic cross section C-C'.

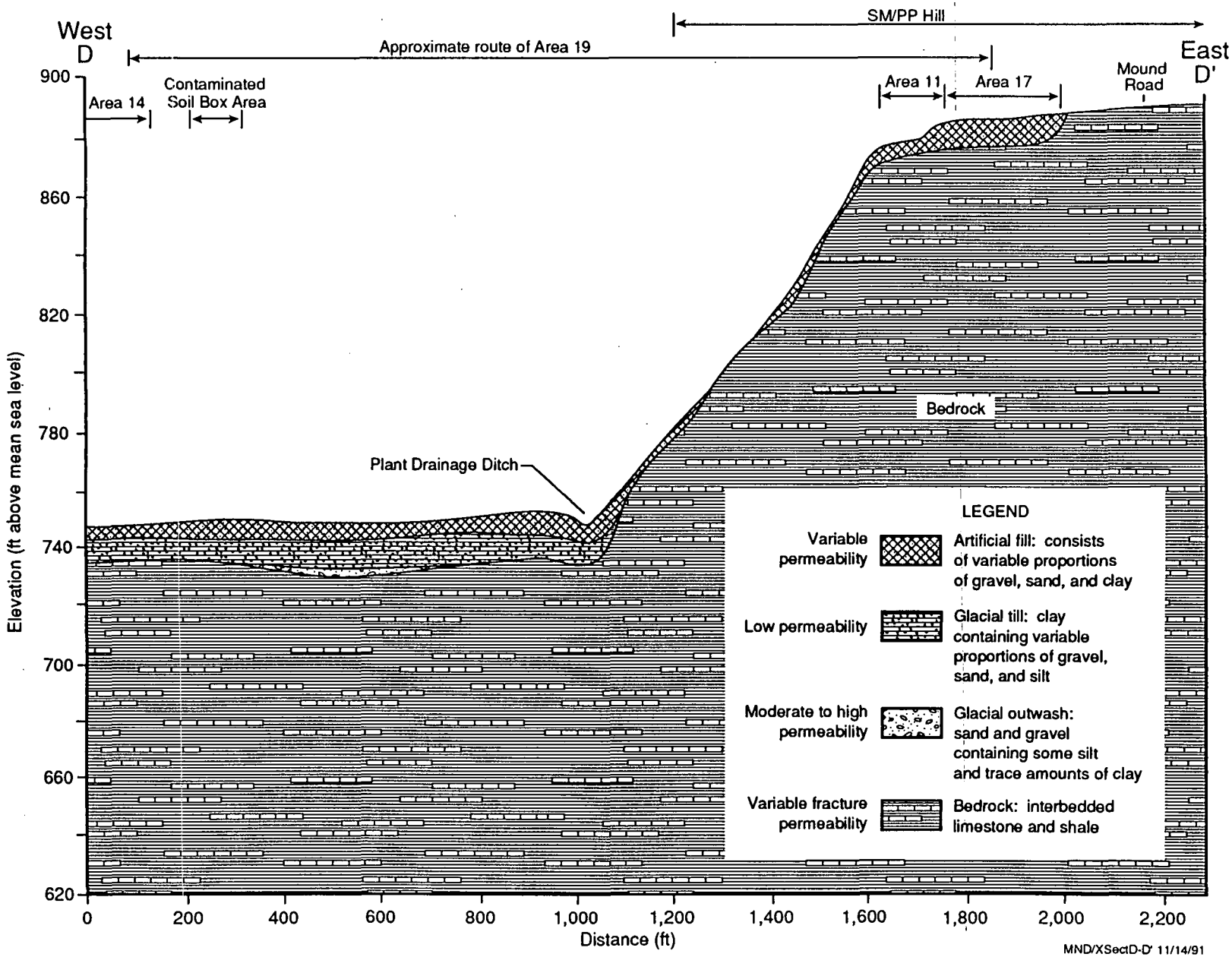

Figure 2.7. Generalized stratigraphic cross section D-D'.

Natural surface drainage over much of the Mound Plant site has been altered by roads and structural modifications as the facility expanded with time. During facility expansion, the plant drainage ditch was engineered to control surface water storage and discharge. The system of sediment settling basins along the plant drainage ditch is referred to as the storm water retention and discharge system (SRDS). The four major components of the SRDS (Figure 2.8) are: the asphalt-lined pond, the plant drainage ditch, the overflow pond, and the retention basins. This system allows for settling of silts and clay particles contaminated with low-level plutonium produced by erosion of surficial soils within the plant. Most of the surface water generated at Mound Plant is routed through the SRDS. Remaining volumes of surface water infiltrate the soil, evaporate, form small pools of standing water, or travel off-plant via minor runoff paths.

2.3.1.2. Subwatershed Areas

Mound Plant can be divided into five subwatersheds (Figure 2.9), with approximate areas shown below.

Subwatershed	Area (Acres)
1	99
2	33
3	142
4	18
5	14
	306 Total

The general direction of drainage flow in relation to each subwatershed is shown in Figure 2.10. Potential runoff from Operable Unit 6 areas would be into subwatersheds 1, 2, and 3. Within subwatershed 1, drainage patterns have been modified by plant development, although the plant drainage ditch follows approximately its original course as it flows between the Main and SM/PP Hills. Storm water runoff and sediment from the SM/PP and Main Hills are transported through the SRDS before being released through National Pollutant Discharge Elimination System (NPDES) Outfall 002. Overland flow from the hill slopes is collected by roads or locally lined open ditches and culverts. Continued development at Mound Plant has increased the storm water runoff in subwatershed 1, following a typical sequence that occurs when vegetated lands have been converted to industrial use. Impervious pavements and roof areas replaced grasslands that had allowed infiltration of rainfall. The additional runoff has overloaded the capacity of the original storm system and created minor flooding in several areas (MRC 1987).

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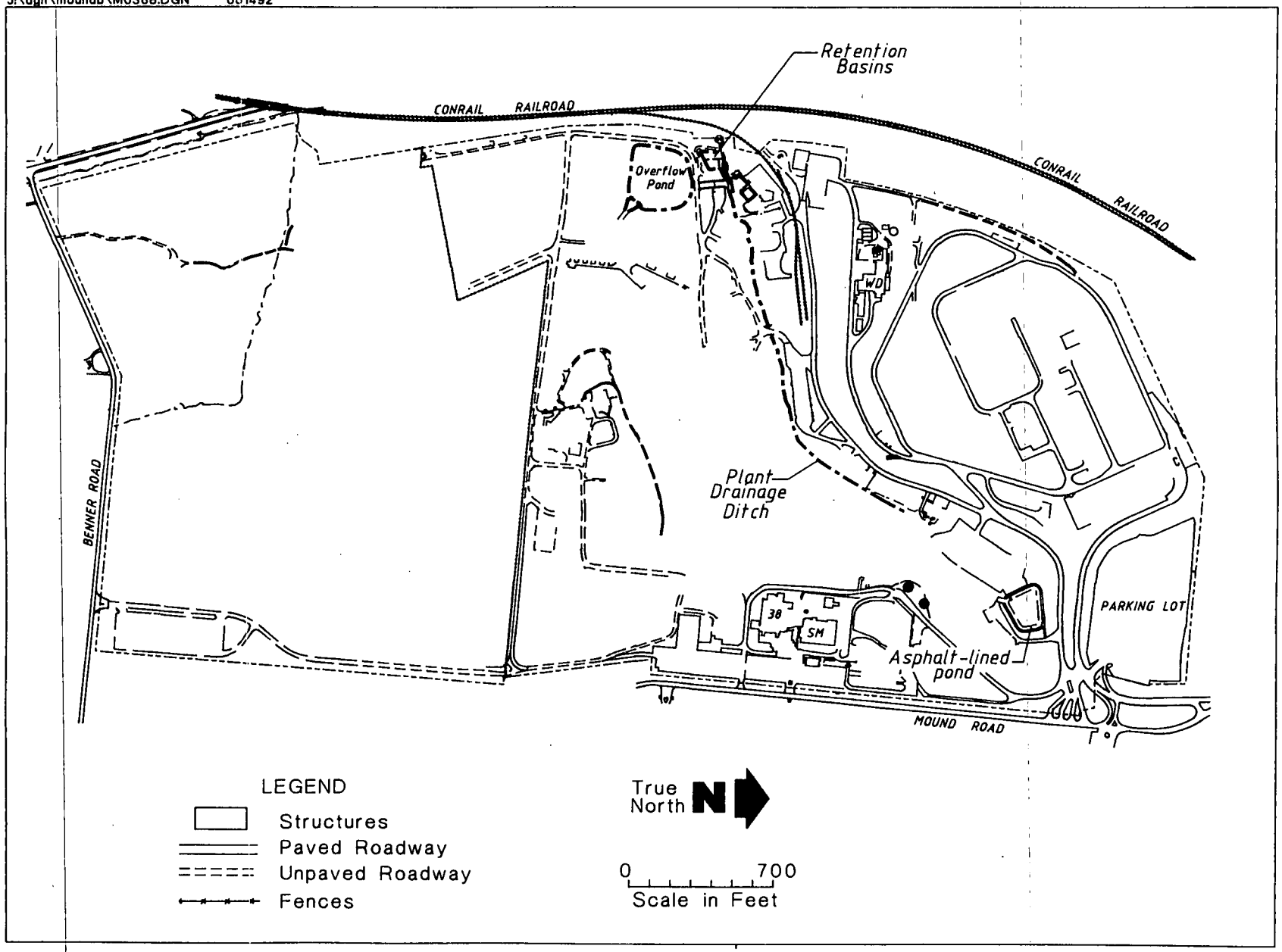


Figure 2.8. Mound Plant stormwater retention and discharge system.

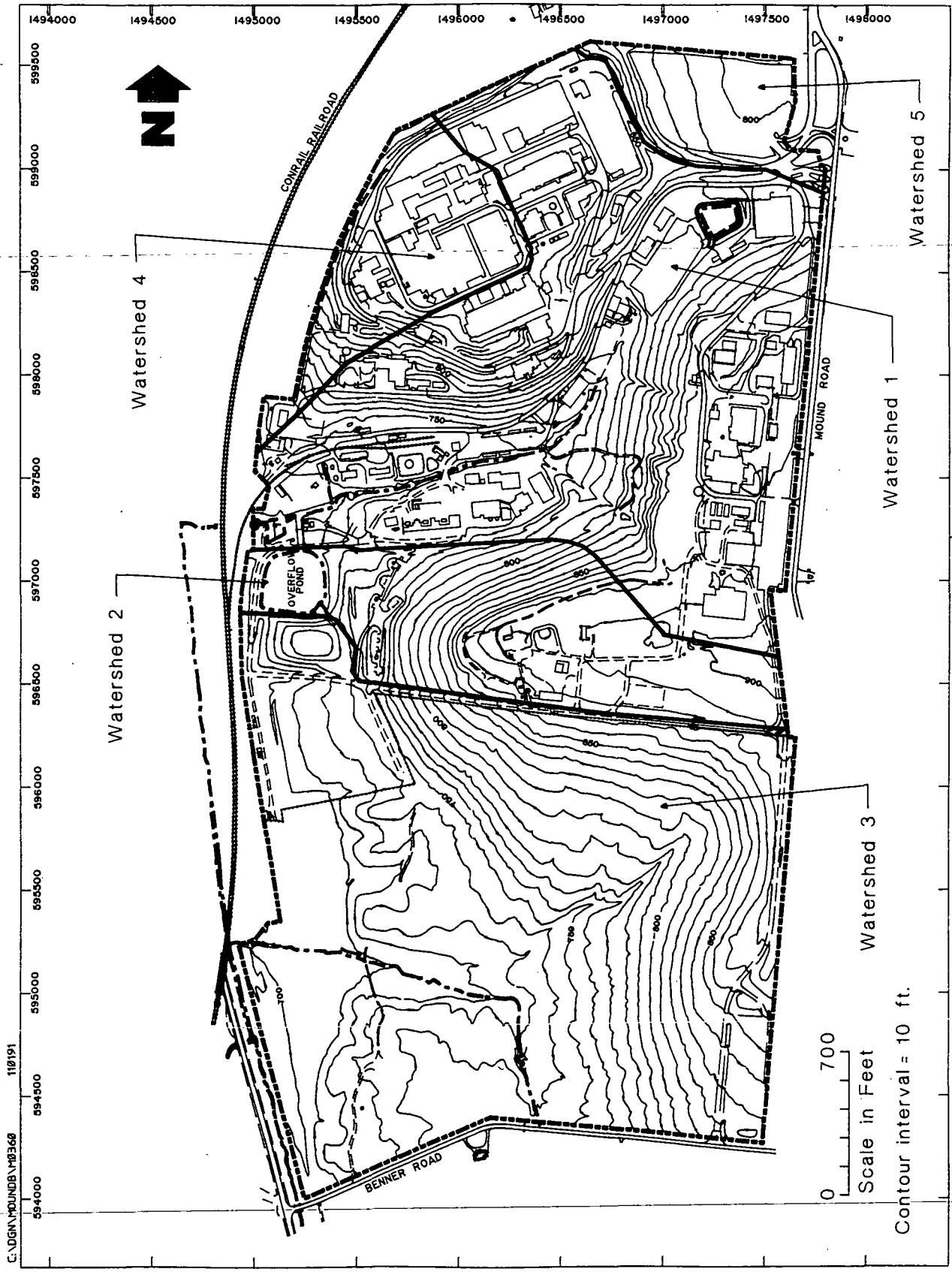


Figure 2.9. Approximate areas of subwatersheds at Mound Plant.

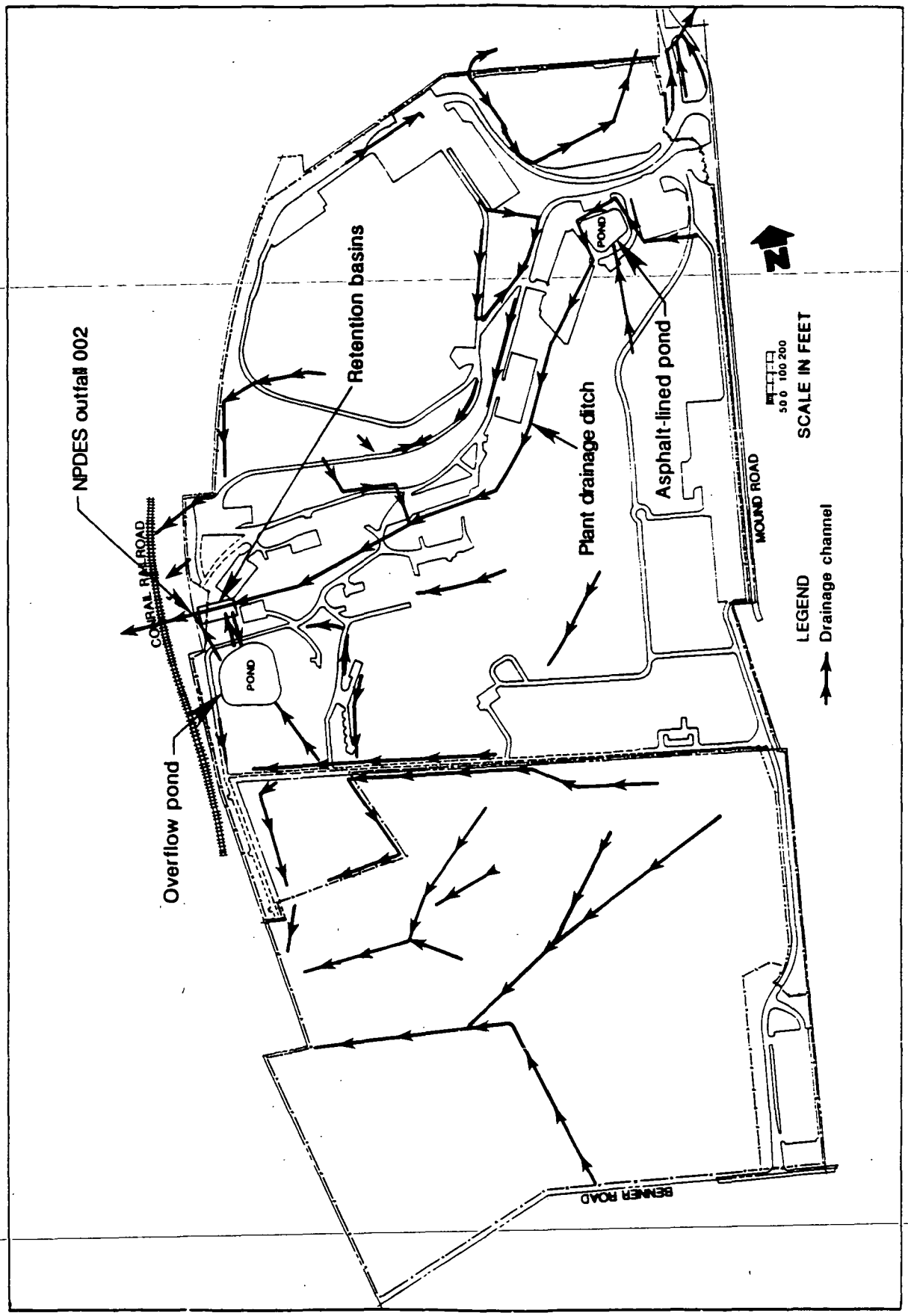


Figure 2.10. Drainage patterns at Mound Plant.

Subwatershed 2 flows into the overflow pond and also contributes to NPDES Outfall 002. On the northwest side of the SM/PP Hill, the water is diverted around the south side of the buildings in the valley to the overflow pond. Along the southern boundary of the subwatershed, runoff is carried west down a concrete-lined channel where it is diverted into the overflow pond behind the site sanitary landfill. The diversion of the natural divide allows runoff and surficially eroded soils to be diverted to the settling pond. The headwaters of subwatershed 2 include Area 1 soils that are known to be contaminated with radioactive material.

Subwatershed 3, on the new property, rivals the main plant for total catchment area. The natural east-west divide on the SM/PP Hill was engineered to divert some of the runoff into subwatershed 2. Along the new property northern boundary, runoff water and sediment that overflows the subwatershed 2 diversion channel moves southward along the west plant boundary to a low-lying area due south of the construction spoils area.

Soils and sediments in subwatersheds 1, 2, and 3 are thought to exhibit the highest potential for plutonium contamination. Sediment yields within the runoff in subwatershed 1 may result from erosion of surficial soils and other sediments along the plant drainage ditch, although erosion of soils is generally attenuated by heavy vegetative cover or paved areas, except where construction activities have removed the cover and exposed the soils.

Runoff from all Operable Unit 6 areas, with the exception of Area 1, occurs in subwatershed 1. Runoff from Area 1 is known to occur in subwatershed 2. Additionally, runoff from Area 1 was known to have occurred in subwatershed 3 before improvements were made to drainage channels and may still occur during periods of heavy precipitation. Rainfall runoff that flows along drainages related to each subwatershed has the potential to transport contaminated surface sediments to other locations within the Mound Plant boundary or off-plant. Most of the drainage from subwatersheds 1 and 2 flows to the SRDS and is discharged through NPDES Outfall 002 into a remnant of the Miami-Erie Canal. Subwatershed 3 directs flow to the southwest, also into the Miami-Erie Canal. Operable Unit 9 investigations will examine the SRDS and drainages within the individual watersheds for evidence of radioactive and nonradioactive contamination as the result of flooding or other transport mechanisms.

2.3.2. Subsurface Water and Groundwater Description

The hydrogeology and groundwater are more fully discussed in the Operable Unit 9, Site-Wide Work Plan (DOE 1992e) and are summarized here to provide the basis for evaluation of the interrelationships between the Mound Plant D&D Program actions and the environment.

The Upper Ordovician Richmond Group forms the bedrock beneath the Mound Plant. The differences in physical properties in the interbedded calcareous shale and limestone and the pattern, orientation, and size of fractures and partings control the groundwater flow in the bedrock. The relatively lower permeability of the bedrock versus the overlying unconsolidated deposits is one control on the groundwater flow on the Main Hill and on the SM/PP Hill. Water from the bedrock is typically classified as calcium bicarbonate-type water.

In the upland locations where most of the D&D areas are found, the bedrock is overlain by a thin (typically 3- to 10-ft-thick) veneer of glacial till reworked by cut and fill. Although not known to transmit substantial quantities of water, concepts for further investigations include monitoring well installation in the upland area as part of Operable Units 2 and 5. This unconsolidated overburden is relatively more permeable than the underlying bedrock. This permeability contrast promotes lateral flow on top of the bedrock and through the overburden.

Of lesser direct significance to the D&D Program areas, but of the greatest significance as a water resource, are the unconsolidated glacial deposits and alluvium associated with the Great Miami River Valley. The Buried Valley aquifer provides domestic and municipal water supplies through small residential wells and the city of Miamisburg well field. The aquifer also provides the industrial water for the Dayton Power and Light Hutchings Power Station and Mound Plant.

2.3.3. Hydrologic Flow

The hydrogeologic regime at Mound Plant consists of two different geologic environments: flow through the bedrock beneath the Main and the SM/PP Hills and flow within the unconsolidated glacial deposits and with alluvium associated with the Buried Valley aquifer in the Great Miami River Valley. The bedrock system, an interbedded sequence of shale and limestone, is dominated by fracture flow; the Buried Valley aquifer is porous flow with interbedded gravel lenses providing the major source of water.

The unconsolidated upland deposits, although of lesser general importance than the unconsolidated deposits in the Buried Valley aquifer, are of particular importance to the D&D Program areas. Groundwater flow in these deposits is controlled partly by the relatively lower permeability of the underlying shale, which therefore acts as a boundary to the downward infiltration of water, causing it to move laterally along the top of the shale.

Groundwater flow in the bedrock beneath the Main and SM/PP Hills is strongly controlled by differences in physical properties within the vertical sequence of shale and limestone beds and by the

frequency, orientation, and size of fractures and partings along bedding planes. Vertical movement of groundwater occurs along vertical fractures that are common in these units. Within the vertical sequence of rock units on the Main Hill, relatively impermeable, unfractured shale beds are known to occur at three horizons. The shale beds are commonly 5 to 8 ft thick. Seeps appear to be associated with the upper surface of the lower two shale beds. The presence of seeps indicates that the shale beds impede the downward flow of groundwater, leading to lateral flow of perched groundwater along fractures and bedding planes in the overlying rocks.

The Buried Valley aquifer occupies a deep bedrock channel that roughly follows the course of the present river. Tongues of outwash extend from the edge of the buried valley along tributaries, such as the Mound Plant valley that separates the Main and SM/PP Hills. The approximate boundary of the Buried Valley aquifer, in relation to Mound Plant and the Mound Plant D&D Program areas, is depicted in Figure 2.11. Water quality analyses for samples from the Buried Valley aquifer indicate that tritium and VOCs in the Buried Valley aquifer are found near the historical landfill (Area B) and the plant water supply wells. The VOC contamination declines within a short distance from the landfill, and only sporadic, trace amounts (less than 1 part per billion [ppb]) have been reported in monitoring wells outside the plant. Concentrations of tritium have ranged from less than the detection limit, 0.05 nanocuries per liter (nCi/L), to just over 20 nCi/L (DOE 1992e).

2.3.3.1. Recharge

At Mound Plant, the flow within the fractured bedrock forms two systems: one on the Main Hill and one on the SM/PP Hill. Recharge to the bedrock takes place areally, as infiltration of precipitation and sprinkler irrigation, and locally, as leakage from water transmission pipes and sewers. The topographic features of the area strongly influence the flow system as is demonstrated by the Main Hill seeps.

2.3.3.2. Discharge

Groundwater discharge is visible in the seeps on the steep flanks of the Main Hill and from the one seep that has been found on the SM/PP Hill. The degree of interconnection between the bedrock flow system and the Buried Valley aquifer has not been determined.

The geology and hydrology control the transportation, dispersion, and retardation of contaminants in groundwater, surface water, and soils at Mound Plant. Soil and rock chemistry buffer the aqueous solution chemistry and affect the solubility and sorbitivity of contaminants in solution. A complete discussion of the regional geologic and hydrologic setting of Mound Plant is given in the Operable Unit 9, Site-Wide Work Plan (DOE 1992e).

2.4. SOILS

The D&D verification activities will be more closely related to the soils at the Mound Plant than the other areas of the environment such as air or groundwater. Evaluation of cleanup methods requires knowledge of the potential for contaminant mobilization in the soil and subsoil, the interaction between the soil and the contaminant, and the possibility for contaminated material becoming airborne during cleanup. The soil properties of interest include soil depth, pH, Eh, chemical composition, and particle size. Local topography, available moisture, and soil permeability impact contaminant movement. Wetting and drying cycles impact the form of the hydrated contaminants.

The following discussion of soils includes a large proportion of information applicable to all of Mound Plant, rather than specifically to the D&D Program areas. It is included in this work plan because of the critical importance of soils and soil geochemistry to the potential migration of the contaminants of concern, especially plutonium and thorium, which, along with tritium, are the primary radionuclides of concern at Mound Plant. This material has previously been presented, in part, in the Operable Unit 9 Site-Wide Work Plan (DOE 1992e); but, because of the importance of the soils to contaminant migration, it has been augmented for the discussion below. In particular, additional discussion of the alkalinity or acidity of the soil has been added. Subsection 2.5 discusses plutonium and thorium geochemistry and should be related to the discussion of soil chemistry.

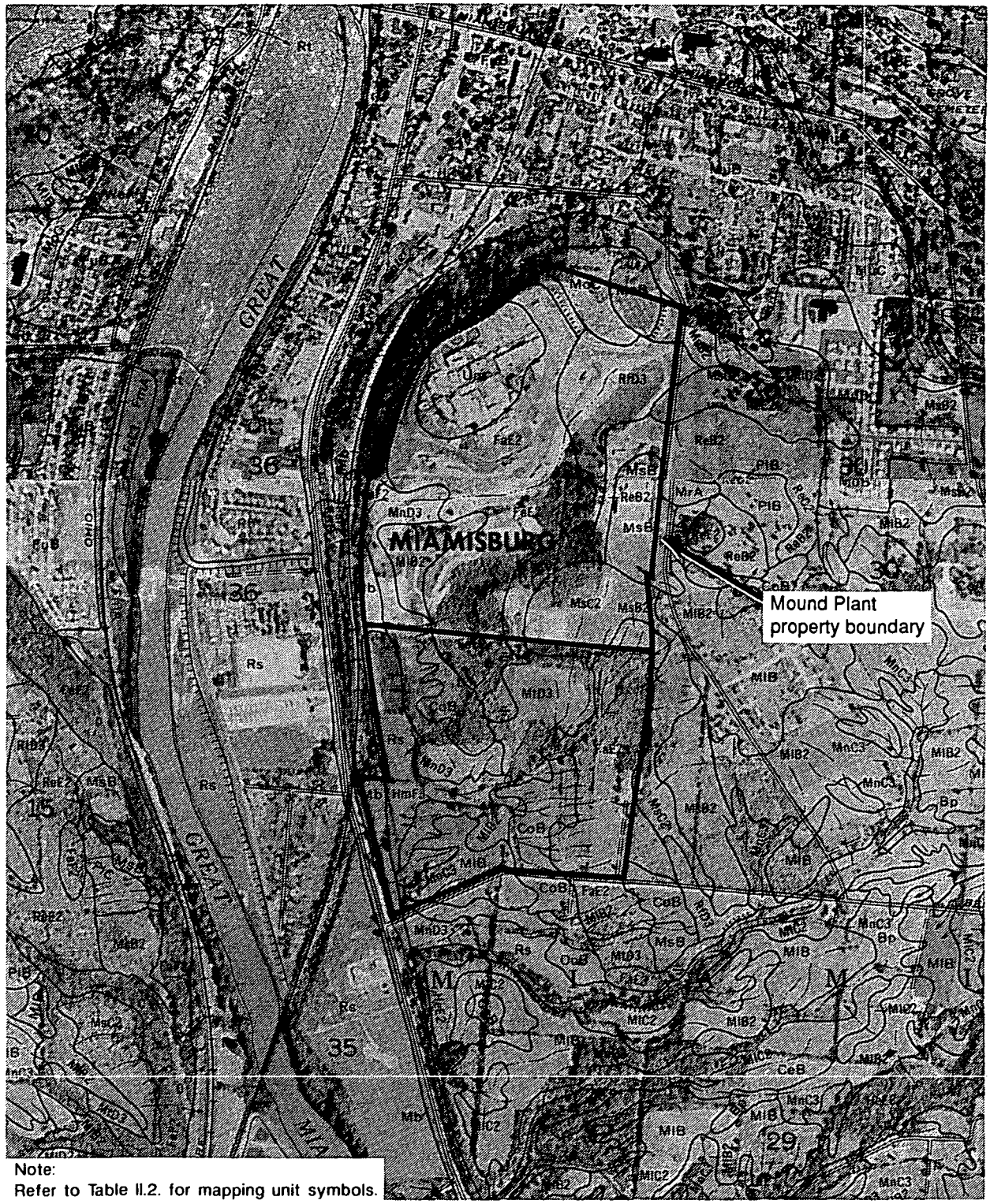
2.4.1. Soil Types and Related Geomorphology

At least nine distinct soil types have formed on the bedrock, glacial, and alluvial deposits at Mound Plant: Miamian, Fairmount, Milton, Made Land, Corwin, Ritchey, Ross, Hennepin, and Urban Land series (SCS 1976). The general soil morphologies of the Site are described in detail in the Operable Unit 9 Site-Wide Work Plan (DOE 1992e). A detailed soil survey of Montgomery County, published by the U. S. Department of Agriculture (USDA) Soil Conservation Service (SCS) (SCS 1976), provides a general guide to soil types found at Mound Plant and identifies specific soil series (defined as mappable units of similar morphology) and engineering properties of the soil units. The engineering properties of these soils are summarized in Table II.1. The distribution of these soils at Mound Plant and the surrounding area are shown in Figure 2.12. Table II.2 provides the symbols and descriptions for each soil type identified at the Mound Plant. Soils across Mound Plant, as mapped by the SCS, primarily consist of Fairmount, Milton, and Miamian. However, considerable portions of these areas have been disturbed over the years due to construction. It is estimated that approximately one-half of the property has been disturbed and is covered by buildings and pavement. The soils in the region range from the medium or strongly acidic Corwin Series to the moderately alkaline Ritchey and Hennepin Series. Table II.3 identifies the soil types expected for the various D&D areas.

Table II.1. Estimated Engineering Properties of Soils for Soil Types Located on the Mound Plant Property

Soil Series and Map Symbols	Depth from Surface (Typical Profile) (inches)	Dominant USDA[a] Texture	USCS[b] Classification	Percentage Passing Sieve				Hydraulic Conductivity[c] (cm/sec)	pH	Available Moisture Capacity (inches per inch of soil)	Permeability (inches per hour)
				No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Fairmount: FaE2 FaF2	0-7 7-19 19-24	Silty clay loam Silty clay Interbedded limestone and calcareous clay shale	ML,CL ML-CL,CH ----	90-100 100 ----	90-100 80-100 ----	80-90 75-90 ----	70-85 70-90 ----	4.4×10^{-4} - 1.4×10^{-3} 1.4×10^{-4} - 4.4×10^{-4} ----	6.6-7.3 6.6-7.8	0.16-0.22 0.14-0.18 ----	0.63-2.0 0.2-0.63
Miamian: MIB2,MnD3, MnC3, MoC	0-7 7-24 24-60	Silt loam Clay loam to clay Loam	ML,ML-CL CL CL,ML-CL	90-100 90-100 75-95	90-100 85-95 75-90	80-90 75-90 65-75	70-90 70-85 55-70	4.4×10^{-4} - 1.4×10^{-3} 1.4×10^{-4} - 4.4×10^{-4} 1.4×10^{-4} - 4.4×10^{-4}	5.1-6.5 5.8-6.5 7.4-8.4	0.17-0.20 0.14-0.19 0.06-0.10	0.63-2.0 0.2-0.63 0.2-0.63
Ross: Rs	0-22 22-34	Silt loam Fine sandy loam	ML,ML-CL SM,ML	90-100 100	90-100 100	80-90 50-70	70-85 30-55	4.4×10^{-4} - 1.4×10^{-3} 4.4×10^{-4} - 1.4×10^{-3}	6.6-7.8 6.6-7.8	0.18-0.24 0.12-0.15	0.63-2.0 0.63-2.0
Corwin: CoB	0-9	Silt loam	ML,ML-CL	----	100	90-100	80-90		5.1-6.5	0.18-0.22	0.63-2.0
Hennepin: HmF3 HeE2	0-4 4-12 12-60	Silt loam Clay loam to loam Loam	ML,ML-CL ML,CL CL,ML-CL	90-100 90-100 90-100	90-100 90-100 80-90	80-90 70-90 70-90	75-80 65-75 55-65	4.4×10^{-4} - 1.4×10^{-3} 4.4×10^{-4} - 1.4×10^{-3} 1.4×10^{-4} - 4.4×10^{-3}	6.1-6.5 6.1-7.3 7.4-8.4	0.15-0.19 0.14-0.18 0.06-0.10	0.63-2.0 0.63-2.0 0.2-0.63
Milton: MSB, MtD3, MSC2 MSB2	0-9 9-25 25-28 28-35	Silt loam Silty clay loam Clay Limestone	CL,ML-CL CL,ML-CL CH,ML-CL	90-100 90-100 75-95	90-100 85-95 75-90	80-90 75-90 65-75	70-90 70-85 55-70	4.4×10^{-4} - 1.4×10^{-3} 1.4×10^{-4} - 4.4×10^{-3} 1.4×10^{-4} - 4.4×10^{-3}	5.1-6.5 5.1-6.5 7.4-8.4	0.17-0.20 0.14-0.19 0.06-0.10	0.63-2.0 0.2-0.63 0.2-0.63
Ritchey: ReB2 RFD3	0-6 6-18 18-24	Silt loam Silty clay loam Limestone	ML,ML-CL ML-CL,MH	100 100	95-100 90-95	80-90 85-90	75-85 80-90	4.4×10^{-4} - 1.4×10^{-3} 4.4×10^{-4} - 1.4×10^{-3}	5.6-7.3 6.1-7.3	0.17-0.2 0.13-0.17	0.63-2.0 0.63-2.0
Urban Land: Um	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]
Made Land: Mb	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]

Note: Based on the Soil Survey Manual for Montgomery County, Ohio (SCS 1976).
[a]USDA - United States Department of Agriculture System
[b]USCS - Unified Soils Classification System
[c]Hydraulic conductivity calculated from permeability.
[d]Properties are variable and were not estimated



Note:
Refer to Table II.2. for mapping unit symbols.

N

0 1/4 1/2 3/4 1 Mile

0 1,000 3,000 5,000 Feet

(Ref: SCS 1976, sheets 68 and 75)

Figure 2.12. Distribution of soil classification series at Mound Plant and surrounding area.

Table II.2. Soil Mapping Unit Symbols

Legend

Symbol	Mapping Unit
CoB	Corwin silt loam, 2 to 6% slopes
FaE2	Fairmount silty clay loam, 12 to 15% slopes, moderately eroded
FaF2	Fairmount silty clay loam, 25 to 50% slopes
HeF2	Hennepin and Miamian silt loam, 18 to 25% slopes, moderately eroded
HmF3	Hennepin and Miamian soils, 18 to 50% slopes, severely eroded
MIB	Miamian silt loam, 2 to 6% slopes
MnC3	Miamian silt loam, 6 to 12% slopes, severely eroded
MnD3	Miamian silt loam, 12 to 18% slopes, severely eroded
MoC	Miamian-Urban Land Complex
MtD3	Milton silty clay loam, 6 to 18% slopes, severely eroded
MsB	Milton silt loam, 2 to 6% slopes
MsC2	Milton silt loam, 6 to 12% slopes, moderately eroded
Mb	Made Land
ReB2	Ritchey silt loam, 2 to 6% slopes, moderately eroded
RfD3	Ritchey silty clay loam, 6 to 18% slopes
Rs	Ross silt loam
Um	Urban Land

Table II.3. Soil Types Expected for D&D Program Areas, Operable Unit 6

D&D Program Area	Facility Description	Expected Soils Identified by Series
Area 1	Former thorium storage and redrumming area	Corwin, Fairmount, Milton, Miamian, and Ritchey
Area 4	WD Building soils	Fairmount
Area 4a	Old Sanitary Wastewater Treatment Plant sludge drying beds	Fairmount
Area 11	Former storage area for plutonium-238-contaminated waste	Ritchey and Milton
Area 14	1969 waste transfer line break	Fairmount
Area 16	SM Building leach field	Ritchey
Area 17	Soils beneath and surrounding the SM Building	Milton and Ritchey
Area 19	Soils surrounding the underground waste transfer lines	Fairmount and Ritchey
Area D	Former acid leach field for Building 38	Ritchey
Old Sanitary Wastewater Treatment Plant	Old Sanitary Wastewater Treatment Plant and adjacent soils	Fairmount
Contaminated Soil Box Area	Staging for boxed soils generated during remediation of Area 14	Fairmount
Underground Radioactive Waste Lines	Soils surrounding underground radioactive waste lines on the Main Hill	Fairmount and Urban Land

D&D - decontamination and decommissioning
SM - special metallurgical
WD - waste disposal

Soils are often evaluated and classified rather subjectively into groups or rankings for some specific purpose or use. Soils can be classified by capability groups based on the suitability of a soil for field crops, by wildlife habitat, or by engineering properties or description (color, grain size, mineralogy, and organic content).

Soils are usually grouped first as series; series are subdivided into phases. A mapping unit is essentially the same as a phase; however, phases may be intermixed or identifiable in such small areas that is not practical to show on a map. For the discussion that follows, the term phase and mapping unit are interchangeable. The term soil complex is used when soils are so intermingled or so small in size that they cannot be individually identified at the scale of the soil map. The names of these soil complexes are identified by the hyphenated names of the dominant soils. Undifferentiated soils are made up of two or more soils that could be delineated, but delineation is not practical for mapping purposes.

More than one soils series may be grouped as an association, based on some similarity of characteristics such as pattern of occurrence, origin, texture, and suitability for a specific use. As an example, the Milton-Ritchey-Millsdale association, found in the area of Mound Plant, is described in a soil survey of Montgomery County, Ohio, as

> moderately deep and shallow, nearly level to very steep, well-drained and very poorly drained soils that have a moderately fine texture and fine textured subsoil; formed in glacial till over limestone. This association occurs in small, scattered areas throughout the county. It consists of bedrock-controlled hills that rise above the till plain and off the walls of stream-cut valleys. (SCS 1976)

This soil association also includes the Fairmount soils that are well-drained and sloping to very steep. In general, the soils are well drained that fall into the silty clay loam soil types. Surface runoff is usually rapid, and the moisture availability in the root zone is not high. In the steeper slope areas and in the uplands, erosion has taken place. In the total area investigated in the SCS study (SCS 1976), the Hennepin soil series makes up approximately 50 percent of the area, the Miamian makes up about 35 percent, and other soil series types make up about 15 percent.

2.4.2. Soil Descriptions

The following is a description of the soils series that occur in the D&D Program areas at Mound Plant. These descriptions are based on the 1976 SCS study.

2.4.2.1. Corwin Series

Corwin series soils are typically found in upland areas, are nearly level, and may have a silt cap of loess up to 18 inches thick. The root zone is medium to strongly acid; moisture capacity is characterized as medium; the permeability is moderately slow; and surface runoff is medium to rapid. The soil may be seasonally saturated for short periods in the winter and early spring. The Corwin is a silt loam soil type with high organic matter. The soils are well suited to farming; however, erosion is the major limitation to farming activities.

2.4.2.2. Fairmount Series

Fairmount series soils are silt clay loams that are formed on moderate to very steep slopes. They have a shallow root depth and are neutral to moderately alkaline; they are moderately eroded; they characteristically have low available moisture capacity and low permeability and are well drained; they are dark-colored and moderately eroded. The surface loam is typically approximately 7 inches thick over olive colored silty clay.

2.4.2.3. Miamian Series

Miamian series soils are derived from calcareous glacial till and form on moderate to steep slopes. These are silt loams and clay loams and are moderately to severely eroded except in the Miamian Urban Land Complex, which is one of the four mappable units in the series. The soils are well drained with rapid runoff; the root zone is strongly acid with the acidity decreasing with depth; vegetation may be slow or difficult to establish.

2.4.2.4. Milton Series

Milton series soils consist of four mapping units of silt loams and silty clay loams. These are well-drained soils formed in 20 to 40 inches of glacial till and limestone bedrock. The top layers are typically approximately 5 inches of brown silt loam on a 9-inch soil layer of silty clay loam. Below this is clay weathered from the limestone bedrock. The permeability is slow; the root zone is deep; the soil is moderately acid to neutral in the upper 18 inches with the acidity increasing with depth.

2.4.2.5. Ritchey Series

Ritchey series soils are made up of well-drained silt loam soils formed in calcareous glacial till and residuum from limestone and clay shale bedrock. Bedrock is at a depth of 10 to 20 inches. These

soils are found in upland areas and are gently sloping to very steep. They are droughty and have very low available moisture and moderate permeability. Ritchey soils are medium acid to neutral in the upper part and neutral to moderately alkaline in the lower part. This decrease in acidity with depth is characteristic of soils in this region that overlie limestone-containing bedrock.

2.4.2.6. Urban Land

Urban Land soil is found in upland areas and is underlain by glacial till or limestone bedrock. The glacial till is loamy but compact. Surface runoff is mostly medium to rapid.

Land areas consisting of this soil type have been developed for residential, business, or industrial use to the extent that most of the acreage is under roof or pavement. New construction sites on this land type are a potential source of silt pollution in nearby drainage ways.

3. DECONTAMINATION AND DECOMMISSIONING ACTIVITIES

This section describes previous D&D Program activities, including a history of previously completed D&D projects and a preliminary review of results of the 1989 sampling and analysis of contaminated soil areas. A report on the 1989 sampling activities has been prepared and is in the review cycle (DOE 1992a).

This historical description provides a general perspective on D&D at Mound Plant. Also, because of the commitment in the Inter-Program Agreement (EPA 1988b) for the ER Program to implement CERCLA compliance where D&D has already been completed, the description is necessary to provide documentation about complete D&D projects.

3.1. HISTORICAL DECONTAMINATION AND DECOMMISSIONING ACTIVITIES

D&D at Mound Plant began in 1955, eight years after Mound Plant began operations. The impetus for the early activities was primarily associated with buildings and returning them to use, stand-by, or readiness for use on a short-term basis. Therefore, the majority of completed D&D projects were for buildings that have been rededicated to either continuing nuclear or non-nuclear operations.

3.1.1. Semi-Works (SW) Building

The first D&D activity, undertaken in 1955, lasted approximately two years and involved a 4,000-ft^2 actinide- and radium-processing area. The methods used in the decontamination ranged in intensity from washing to entombment. The entombed "cave" is still in place and forms the floor of the SW Building, Room 19 (SW-19). The decontaminated portions of the area are being used in more recent programs. This project was carried out under the direction of the Dayton Area Office of the Atomic Energy Commission. Air sampling for alpha radiation and radon were included in the monitoring program. Surface wipe samples as well as direct surface surveys and personnel monitoring also took place. Personnel protection included the use of half- and full-face supplied-air masks and bubble suits. The Mound-Synder supplied-air bubble suit was developed and used during this project.

3.1.2. Special Metallurgical (SM) Building

The second D&D activity was started in 1968 and was completed in 1972. During the activity, the interior of the SM Building, where plutonium-238 was processed, was decontaminated. In the 15,000-ft^2 building, approximately 585 linear ft of glove box lines, fume hoods, and other laboratory equipment, along with interior partitions, ceilings, services, and floor covering, were removed. Control

and decontamination techniques used in this effort included foaming, bagging, tenting, three-zone concept, painting and sealing, in-line cleaning, high pressure water blasting, chemical cleaning, and dry ice immobilization. The monitoring activity included air sampling and direct contamination surveys, gamma-neutron surveys, and soil and water sampling.

Funding to continue the SM Building D&D project was initiated in 1983. Complete demolition of the SM Building and decontamination of all associated soil are the ultimate goals of this project, which is expected to conclude in the late 1990s. The contaminated soil corresponds to Area 17. Since 1983, the concrete floor, drain lines, and underlying soil have been removed. Many building attachments, such as support structures, docks, services, and underground tanks, have been removed. In 1987, removal of the SM Annex was begun by replacing the concrete block with sheet metal walls. In 1989, the structural steel, the roof, and the sheet metal walls were removed using a remotely controlled shear and grapple; in 1990, the foundation was removed. A leach field was built to accommodate the SM Building before a sanitary sewer was installed. Contamination of the field was suspected so excavation began in the spring of 1991.

3.1.3. Technical (T) Building

Polonium-210 was processed in the T Building for both commercial sale and space programs until 1972. The radioactive processing portion of the building encompassed approximately 32,000 ft^2 on two floors and contained 236 linear ft of glove boxes. Because of polonium-210's short half-life (138.4 days) and chemical characteristics, only conventional scrubbing and removal techniques were required. The D&D was performed from 1971 through 1973. All of the decontaminated areas are being reused in both radioactive and nonradioactive work.

3.1.4. Plutonium Processing (PP) Building

In the mid 1970s, the DOE's concern for the presence of large quantities of unencapsulated plutonium in facilities that did not meet the current design criteria near a large metropolitan area, resulted in the issuance of a directive to remove large quantities of unencapsulated plutonium-238 from Mound Plant. Most of the PP Building (Building 38) operations were subject to this directive, were therefore no longer needed, and were subsequently shut down. The D&D activity began in 1978 with glove box cleaning. In the following years, the glove boxes, the interconnecting overhead conveyor system, the interior partitions, and the surplus services were removed from the operations floor. Decontamination of the lower service floor, which contained the common building services, involved equipment and service removal. Completion of this project is expected in 1992.

3.1.5. Research (R) Building

Concurrent with the PP Building D&D project, a number of plutonium-238-contaminated laboratory rooms in the R Building were decontaminated. This consisted of removal of glove boxes and utility services as well as removal of the ceiling, plaster, wooden-stud wall, and concrete floor cap. Each decontaminated area was restored to minimum standards with a new floor cap, metal-stud walls, and metal ceiling. Restored services included HVAC and electricity. The HVAC is used to maintain pressure differentials within the building, limiting the spread of potential contaminants. One laboratory, the crawl space above the affected area, and a filter bank remain to be decontaminated in this building.

3.1.6. Waste Transfer System (WTS) - Areas 14 and 19

The sixth D&D project to begin at Mound Plant was the complete demolition of the WTS that was built in 1967 to transfer high and low activity waste solutions from the PP Building to the WD Building. This system included approximately one mile of piping (2,565 ft of dual lines) and a lift station (Building 41) located below the WD Building. Between the PP Building and the lift station, the contaminated soil was designated as Area 19; between the lift station and the WD Building, it was designated as Area 14. Leaks in the piping contaminated the surrounding soil and led to the system being shut down in 1976. Extensive soil excavation was involved in this project because the piping was buried from 6 to 23 ft below the ground surface, and the Building 41 storage tanks and pumps were also underground. Soil decontamination was accomplished by excavation, packaging, and shipment to a disposal site. Field work was started in 1982 and completed in 1991.

3.1.7. Historical Confirmation Activities

Verification of cleanup has been done on a continuing basis as a section or room of the area or of the building being cleaned up was completed. Table III.1 summarizes the verification of the cleanup actions discussed in subsection 3.1. Independent surveys were performed at Mound D&D's request to serve as a confirmation of the surveys conducted by Mound. In order to provide independence from the line management of the D&D Program, the DOE initiated the independent verification of D&D cleanup, under contract to DOE Headquarters rather than to Mound Plant (DOE 1989b). When DOE began the independent contractor verification program, Mound chose to continue its own confirmation program. The confirmation program continues to serve as a check on Mound's surveys and to make the verification process more certain. To date, only the portion of the WTS from Building 41 to the WD Building, discussed in 3.1.6, has been both confirmed and verified.

Table III.1. Summary of Historical Cleanup Actions and Confirmation Activities

R Building Laboratory Rooms	Confirmed By	FY
R-143	Battelle Columbus Labs	1981
R-145, 147	Battelle Columbus Labs	1981
R-127	Battelle Columbus Labs	1983
R-159B	Battelle Columbus Labs	1983
R-128	Battelle Columbus Labs	1985
R-130, 131	Battelle Columbus Labs	1985
R-120, 118, 123A	Battelle Columbus Labs	Post 1986
R-149	Battelle Columbus Labs	Post 1986
All of R Building was confirmed by Battelle Columbus Labs		

PP Building Rooms	Confirmed By	FY
PP-128, 130, 142E	Battelle Columbus Labs	1984
158E, 159, 160, 162	Battelle Columbus Labs	1984
163, 164, 175, 176, 177	Battelle Columbus Labs	1984
and 178	Battelle Columbus Labs	1984
PP-124, 126, 146, 147, 148	Battelle Columbus Labs	1985
149, 150, 151, 152, 153, 154	Battelle Columbus Labs	1985
155, 156, 157, 158W	Battelle Columbus Labs	1985
PP-6W, 51, 52, 102,103, 105	Battelle Columbus Labs	1986
106, 119, 121, 122, 135, 140	Battelle Columbus Labs	1986
143, 144, and 145	Battelle Columbus Labs	1986
PP-13	IT Corporation	1991
All of PP Building except PP-13, 24, 10, and 14 was confirmed by Battelle Columbus Labs		

Waste Transfer System	Confirmed By	FY
PP Building to Building 41	Battelle Columbus Labs	1986
Building 41 to WD Building	Argonne National Labs	1990

Table III.1. (page 2 of 2)

The following cleanup activities have been completed, but confirmation activities and reports have not been completed. These buildings are currently under DOE use.

Location	Cleanup Completed
PP Building	
PP corridor 16H	1-89
140	5-88
EF corridor	5-83
CD corridor	10-83
B1-B4	9-85
WS Building	
WS 177	11-83
WS 178	5-85
WS 150 - 156	12-84
WS 134	4-85
WS 141	4-85
WS 146 - 149	9-85
R Building	
R 159A	10-88
Corridor 5N	10-88
R 159A	12-87
R 118	12-87
R 120, 123	12-87
R 149	12-87
R 120, 118, 123	11-86
R 127	6-83
R 128 - 131	11-83
R 128 - 131	5-85
R 159	12-84
R 127	1-83
R 159	9-82
R 143, 147	10-80
R 143, 147	6-80

3.2. EVOLUTION OF THE D&D PROGRAM AND DEVELOPMENT OF OPTIONS

The D&D program has always been oriented toward carrying out cleanup activities in an expedited manner. This is consistent with current guidance from both DOE and EPA. An options study carried out in 1975 established the initial categories for D&D cleanup. The options considered were

- Readiness - a condition that would permit full operation of a laboratory within one calendar quarter or less after notification and with a minimal cost expenditure;
- Partial decontamination (standby) - a condition that would permit full operation of a laboratory within one year of notification and with a reasonable expenditure of funds;
- Extensive decontamination - the removal of internal glove box piping and services. The glove boxes themselves and other equipment and services would be removed, and the room or building would undergo intensive structural decontamination to as low as reasonably achievable (ALARA) levels; and
- Complete decontamination - to an uncontaminated or unrestricted condition, requiring complete demolition of the building because of the known or expected contamination that exists in structural members and in inaccessible locations.

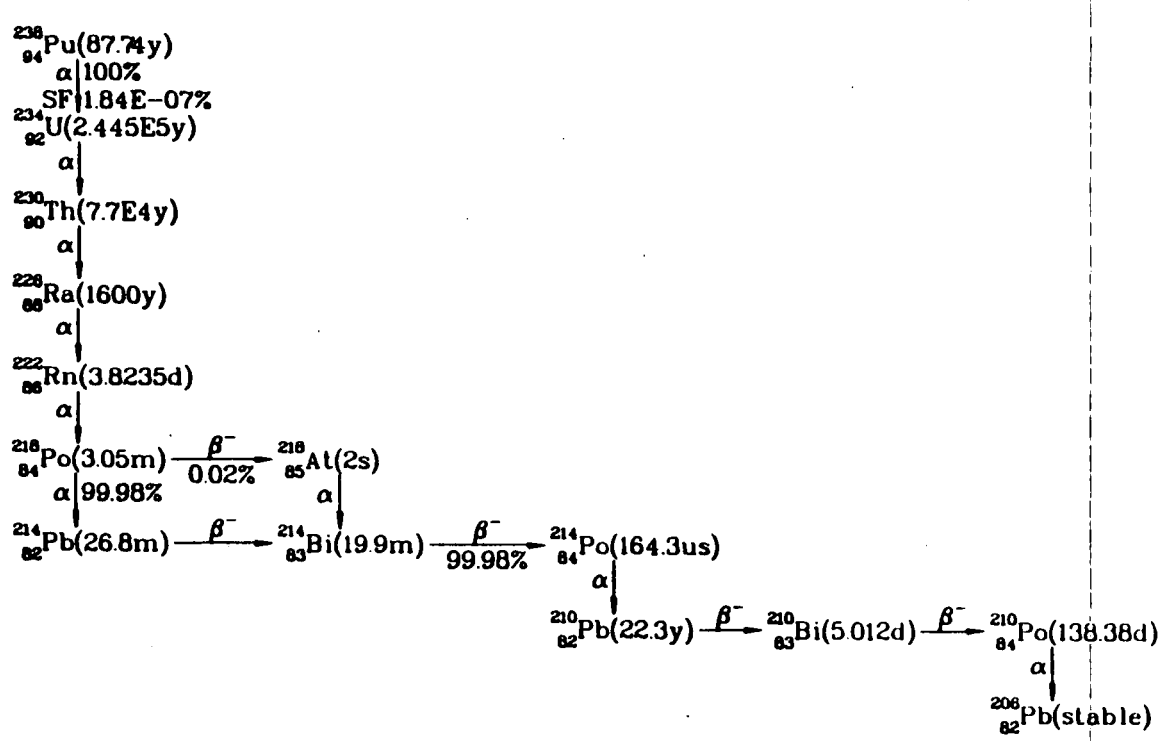
The D&D program has undergone change from a building/facilities-oriented activity to one currently more associated with soils remediation.

3.3. CURRENT D&D PROGRAM SITES

The following section presents a brief physical description of the current Operable Unit 6 D&D areas. Three documents were relied on substantially in preparing this section (DOE 1991e, DOE 1989b, and Stought et al. 1988) and are not specifically referenced.

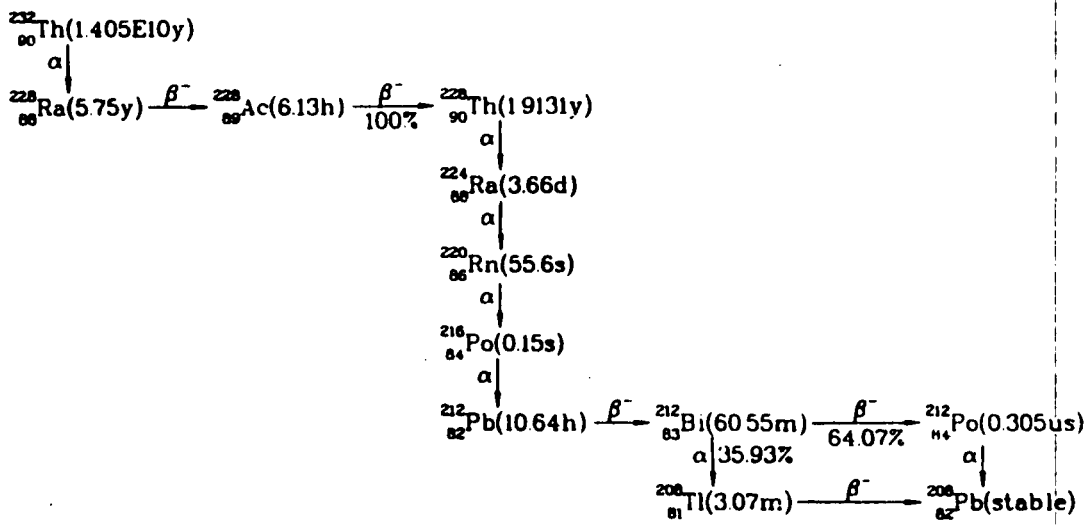
Soils within Operable Unit 6 areas were contaminated by a number of past Mound Plant activities, including radioactive waste line breaks, leakage of thorium and plutonium waste packages, and use of septic or acid leach fields. Investigations performed by Mound Plant personnel have confirmed radioactive soil contamination, mainly plutonium-238 and thorium, within many of the Operable Unit 6 areas. Additional radioactive contaminants included cesium-137, cobalt-60, and polonium-210 (now decayed). Decay series for these contaminants are provided in Figures 3.1 through 3.5. One such investigation performed by Mound Plant personnel for potential radioactive contaminants on Mound Plant property was the Mound Site Survey Project (Stought et al. 1988).

Thorium-232 is the parent of radium-228 and radon-220. Analysis for thorium-232 would determine if contamination exists that would include radium-228 and radon-220. Californium-252 was only used



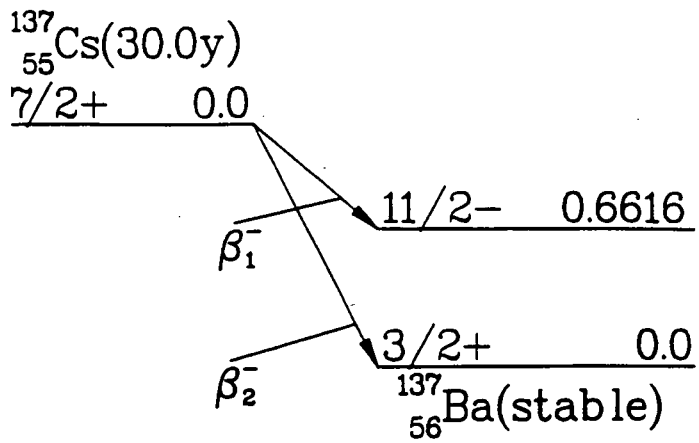
Ref.: ICRP 1979

Figure 3.1. Plutonium-238 decay series.



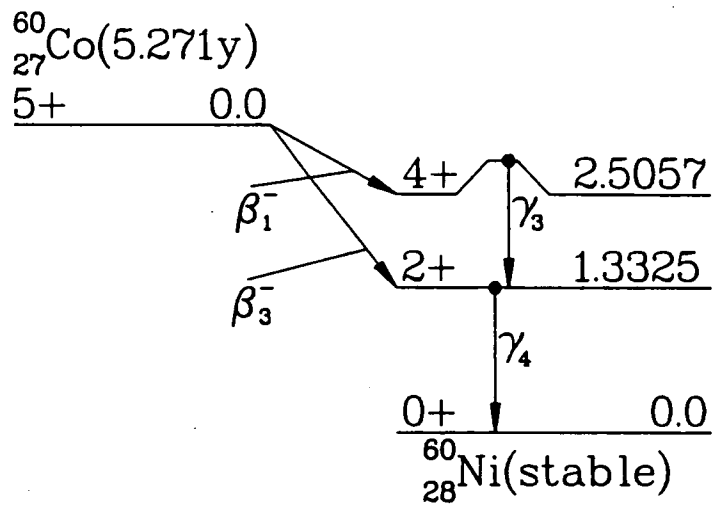
Ref.: DOE 1989

Figure 3.2. Thorium-232 decay series.



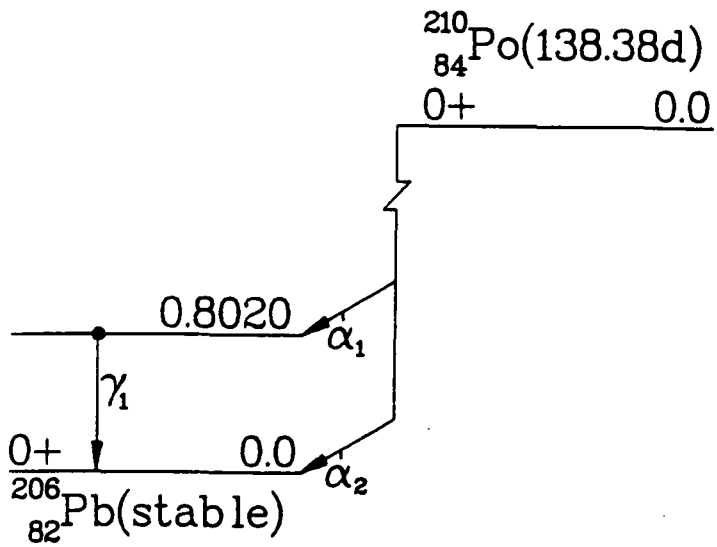
Ref.: ICRP 1983

Figure 3.3. Cesium-137 decay series.



Ref.: ICRP 1983

Figure 3.4. Cobalt-60 decay series.



Ref.: ICRP 1983

Figure 3.5. Polonium-210 decay series.

as an encapsulated source. Small research level quantities of curium-244 were used. No waste is expected to have been generated. Actinium-227 will be calculated from thorium-227 values during site characterization in activities outside of verification. If appreciable levels are found, radon-219 will be investigated. Isotopic thorium levels will also be investigated. Appropriate radionuclides will be included in verification, based on the results of site characterizations.

The Mound Site Survey Project consisted of a systematic survey of radioactively contaminated soils conducted from 1982 through 1985. The survey was conducted to document the radionuclide levels present in the exposed land areas within the Mound Plant boundaries and to characterize environmental radioactive contaminants on a Site-wide basis in order to provide the DOE with the basis for estimating the cost and time required for stabilizing or removing radioactively contaminated soils.

During the Site Survey Project, surface and subsurface soil samples collected from the now-designated Operable Unit 6 areas were analyzed primarily for plutonium-238 and thorium (all isotopes). References to thorium in this section are to be interpreted as total thorium unless specified otherwise. Select samples were additionally analyzed for cobalt-60, cesium-137, radium-226, americium-241, and actinium-227. Information obtained from this survey is presented in the Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey (DOE 1991b). Table III.2 lists the estimate of waste volumes. Table III.3 lists the maximum radioactivity concentrations observed in soil samples collected from Operable Unit 6 areas during the Site Survey Project.

Much of what is known concerning the nature and extent of nonradioactive (i.e., chemical) contaminants within Operable Unit 6 is derived from historical waste handling and process information. Operable Unit 6 areas may have been affected by chemicals from known contaminated sites through natural processes (wind, surface water or groundwater transport, and erosion) or by actions of man (excavation, hauling, dumping, etc.). Information on potential contaminants is available from a review of waste management and operating practices used to develop a list of chemicals used at Mound Plant (DOE 1991e). Additionally, all Operable Unit 6 areas are in locations directly affected by grounds maintenance operations. These operations use fertilizers, herbicides, pesticides, and ice removal materials (DOE 1986). In order to quantify this information, soils within nine Operable Unit 6 areas were sampled during a reconnaissance investigation conducted in the summer of 1989 (DOE 1989b). The objectives of this investigation were to identify potential nonradioactive contaminants within the soils and to determine if a hazardous or mixed waste problem existed at the nine areas prior to soil remediation by the Mound Plant D&D Program. Because of radioactive contamination, it was determined that the Operable Unit 6 D&D areas would be remediated by soil excavation followed by disposal at a DOE-operated repository. If these soils could be considered a hazardous or mixed waste, the repository would not be able to accept the excavated soils and an alternate remedial activity would

Table III.2. Estimates of Waste Volumes

	Plutonium-238		Thorium	
	> 100 pCi/g (ft^3)	> 10 pCi/g (ft^3)	> 10 pCi/g (ft^3)	> 2 pCi/g (ft^3)
Bldg 21, Area 1	114,587	374,156	79,187	207,996
WD, Area 4	78,651	135,085	-	-
Area 14[a]	17,662	64,744	-	14,620
SM leach field, Area 16	2,964	57,971	-	74,918
SM project, Area 17	60,663	250,925	-	233,056
WD, Area 4a	-	10,869	-	23,861

[a]Area 14 cleanup is finished. The total estimated material removed is 305,000 ft^3. The totals, including the excavation of Building 41, are 332,000 ft^3 (Bond 1991). The estimated range was 327,000 - 352,000 ft^3. Based on Mound Site Survey (Stought et al. 1988; DOE 1991b), except where indicated.

Table III.3. Maximum Radioactivity Concentrations Observed in Soil Samples Collected During the Mound Site Survey Project

Site	Plutonium-238 (pCi/g)	Thorium (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)	Actinum-227 (pCi/g)	Bismuth-207	Bismuth-210m
Area 1	34,000	54.30	1.67	LDL	0.6	1.1	LDL	-	-	-
Areas 4/ 4a	355.00	<2	-	LDL	LDL	1.2	1.0	-	-	-
Area 11	870	5.65	-	-	-	-	-	-	-	-
Area 14	133.90	2.24	-	LDL	LDL	1.2	LDL	-	-	-
Area 16	144.0	3.46	0.35	LDL	LDL	1.2	LDL	-	-	-
Area 17	494	9.99	-	LDL	LDL	0.9	LDL	-	-	-
Area 19[a]	1057	-	-	-	-	-	-	-	-	-
Area D	0.98	<2	-	-	-	-	-	-	-	-
Current Remedial Action Guidelines[b]										
NA	100/25[c]	5 surface 15 subsurface	5,200	80	80	5 surface 15 subsurface	20	25	NE	NE

[a]Sampling of Area 19 was verification sampling conducted after remedial action.
[b]Current remedial action guidelines are subject to change, pending additional pathways analysis and risk assessment.
[c]Current D&D cleanup level is 100 pCi/g; 25 pCi/g, if feasible (as low as reasonably achievable [ALARA]).
- Dash indicates that no data are available for the given area and given radionuclide.
LDL - The measurement concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-214; and 1 pCi/g for radium-226 and actinium-227.
NA - Not applicable
NE - Not established
pCi/g - picocuries per gram
pCi/mL - picocuries per milliliter
Ci - curies

need to be planned for the Operable Unit 6 areas. During the reconnaissance investigation, surface and subsurface soil samples were collected and analyzed for Target Analyte List (TAL) metals, TCL VOCs and semivolatile organic compounds, pesticides, and polychlorinated biphenyls (PCBs). Contract Laboratory Program (CLP) protocols were used for the analyses. Additionally, collected soil samples were screened at the Mound Plant Soil Screening Facility for plutonium-238 and thorium-232, in accordance with Mound Plant protocols. This radionuclide analysis was for transportation purposes only.

A report incorporating analytical data validation according to EPA guidelines, together with a discussion on the collected data, can be found in the Reconnaissance Sampling Report, Decontamination and Decommissioning Areas, Operable Unit 6 (DOE 1992a).

3.3.1. Area 1, Bulk Transfer of Thorium Drums (Historical)

Area 1 is a large area surrounding Building 21 on the southern edge of the SM/PP Hill (Figure 3.6). The area covers approximately 400,000 ft^2 and includes the following two drainage pathways: one approximately 300 ft long, extending southwest onto the new Mound Plant property; and one approximately 600 ft long, extending west along the north side of a paved road. The latter drainage pathway was excavated and covered with concrete in the summer of 1989. Excavated soils were placed immediately adjacent to the drainage pathway.

Area 1 was used for staging drums containing thorium and for the transfer of thorium from drums to storage bins in Building 21. Building 21 was constructed in 1964, and thorium from aged drums was placed in this building in bulk form. Soils that became contaminated with thorium during the transfer process were removed in 1966, and the area was backfilled with clean soil. In 1967, Area 1 was used as a staging area for plutonium-238 waste packages, resulting in some small plutonium-238 releases. In 1969, a drum containing plutonium-238 leaked, and the area was cleaned up and backfilled. In 1975, the bulk thorium stored in Building 21 was removed, and an initial cleanup of the building was conducted in 1976. Following cleanup, drums of Cotter concentrate were staged in the building. Cotter concentrate is a high-activity material resulting from uranium milling and contains uranium decay products such as thorium and radium. This material was removed in 1987.

The Mound Site Survey Project collected and analyzed soil samples from Area 1. Maximum plutonium-238 and thorium concentrations of 34,000 pCi/g and 54.3 pCi/g, respectively, were observed. This stated plutonium-238 concentration is much higher than all other concentrations of plutonium-238 observed in Area 1. Soil samples collected during the 1989 reconnaissance investigation and screened at the Mound Plant Soil Screening Facility reflected maximum plutonium-238 and thorium-232 concentrations of 40 pCi/g and 185 pCi/g, respectively. During the 1989 reconnaissance investigation,

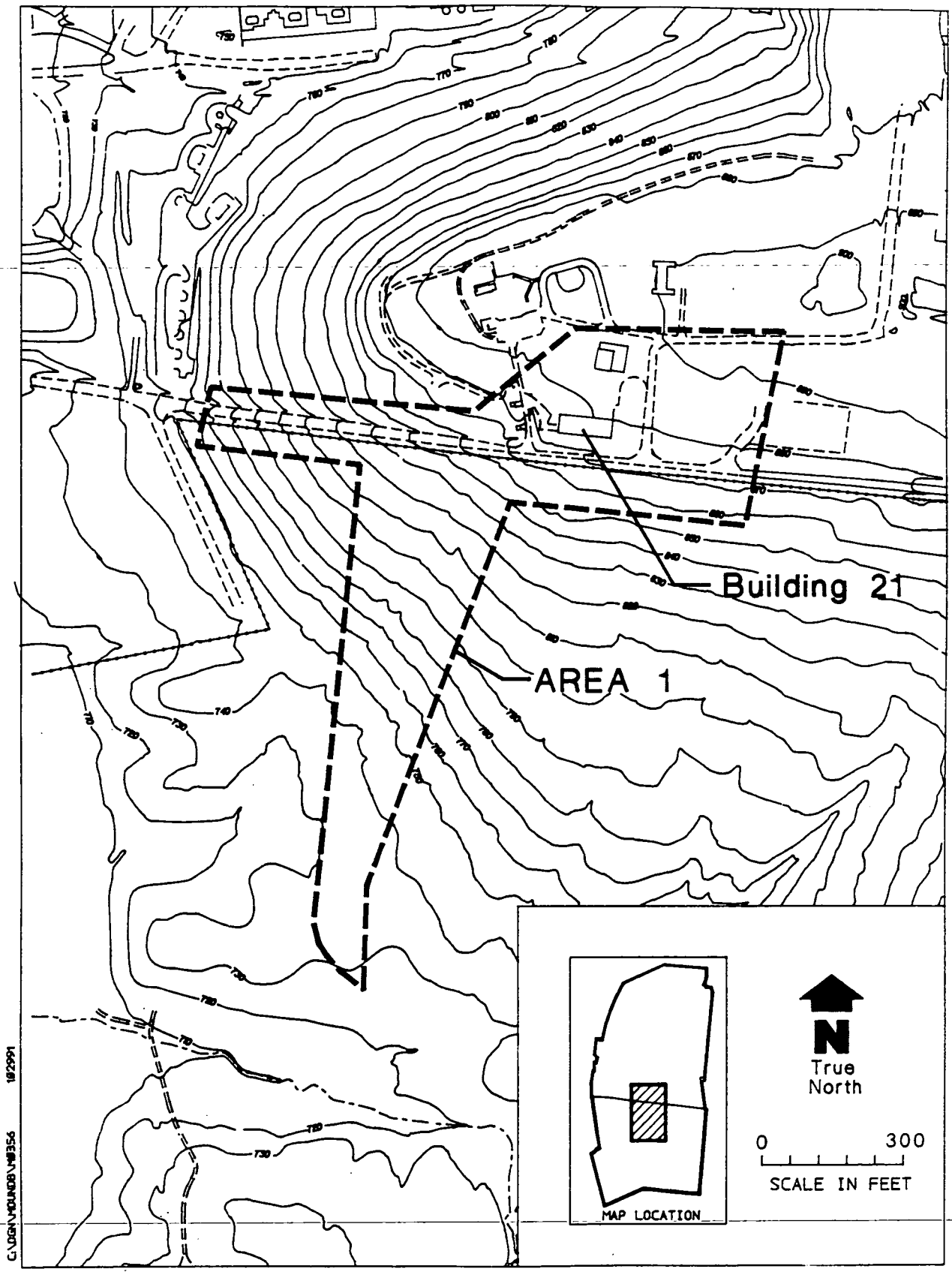


Figure 3.6. Area 1.

surface and subsurface soil samples were collected from twenty-six sampling locations within Area 1 for the analyses of TAL and TCL constituents.

3.3.2. Contaminated Soil Box Area

The contaminated soil box area is located south of the WD Building, at the approximate former location of Building 41 (Figure 3.7). Building 41 was razed when the WTS remedial action was begun by the Mound Plant D&D Program in 1982. It is reported that soils contaminated with up to 300 pCi/g of plutonium-238 were present beneath Building 41 (Carfagno 1990). The contaminated soil was excavated to an average plutonium-238 concentration of 100 pCi/g (Carfagno 1990).

Boxes of plutonium-238-contaminated soil excavated from Area 14 were staged at the contaminated soil box area before removal for offsite disposal at the NTS. The boxes were filled with excavated soil, sealed, decontaminated, and screened in an access-controlled area before being moved to the contaminated soil box area, minimizing the spread of any contaminants.

Concentrations of plutonium-238 in the boxes of excavated soil varied greatly, depending on the location and depth of excavation. Soils in Area 14 were excavated to a target cleanup level of 100 pCi/g of plutonium-238.

The contaminated soil box area has not been characterized for either radioactive or nonradioactive contaminants. There is no information concerning the presence of nonradioactive contaminants in this area.

3.3.3. Underground Radioactive Waste Lines

Some liquid radioactive wastes at Mound Plant were originally transmitted from research and process areas on the Main Hill to the WD Building and the WD Building Annex through underground waste lines, which were divided into two systems: one to carry alpha wastewater and a second to carry beta wastewater, primarily tritium-contaminated wastewater. Figure 3.8 provides the locations of these waste lines. An additional figure entitled Hot Waste Sewers, Mound Plant Drawing No. 5-1398, can be found in the Site Scoping Report: Volume 7 - Waste Management (DOE 1992e). These lines are constructed of either cast iron, polyvinyl chloride (PVC), or vitreous clay pipe. As it became apparent that these underground lines were susceptible to breaks and leaks, the wastes were transmitted through other means. Above-ground, doubly encased lines are now used along with a tanker truck to move radioactively contaminated liquid wastes to the WD Building and the WD Building Annex; however, certain underground lines have not been completely abandoned. The WD Building continues to process liquids from some underground lines; these liquids are suspected of containing in-leakage

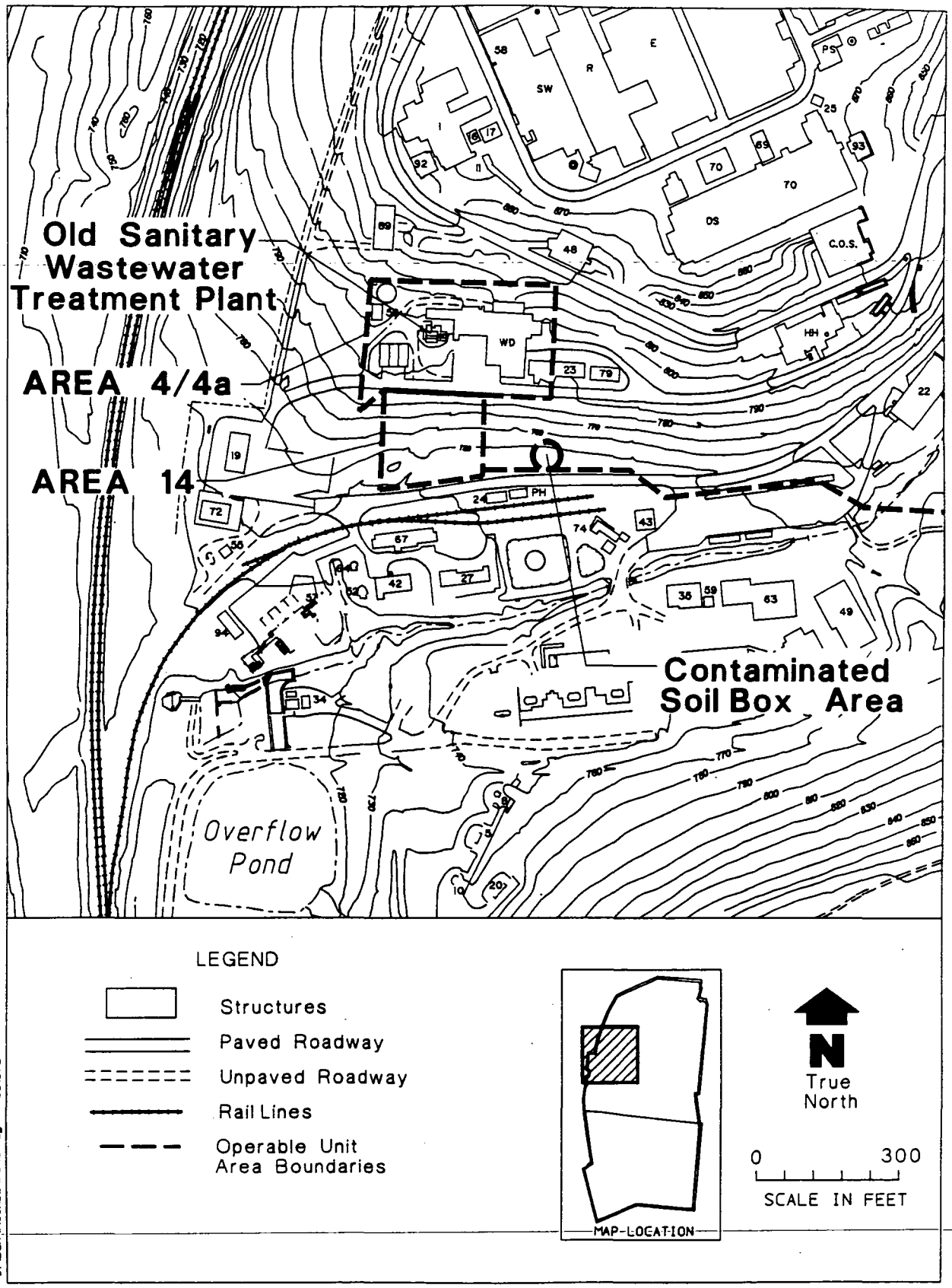


Figure 3.7. Contaminated Soil Box Area, Area 4/4a, Area 14, Old Sanitary Wastewater Treatment Plant.

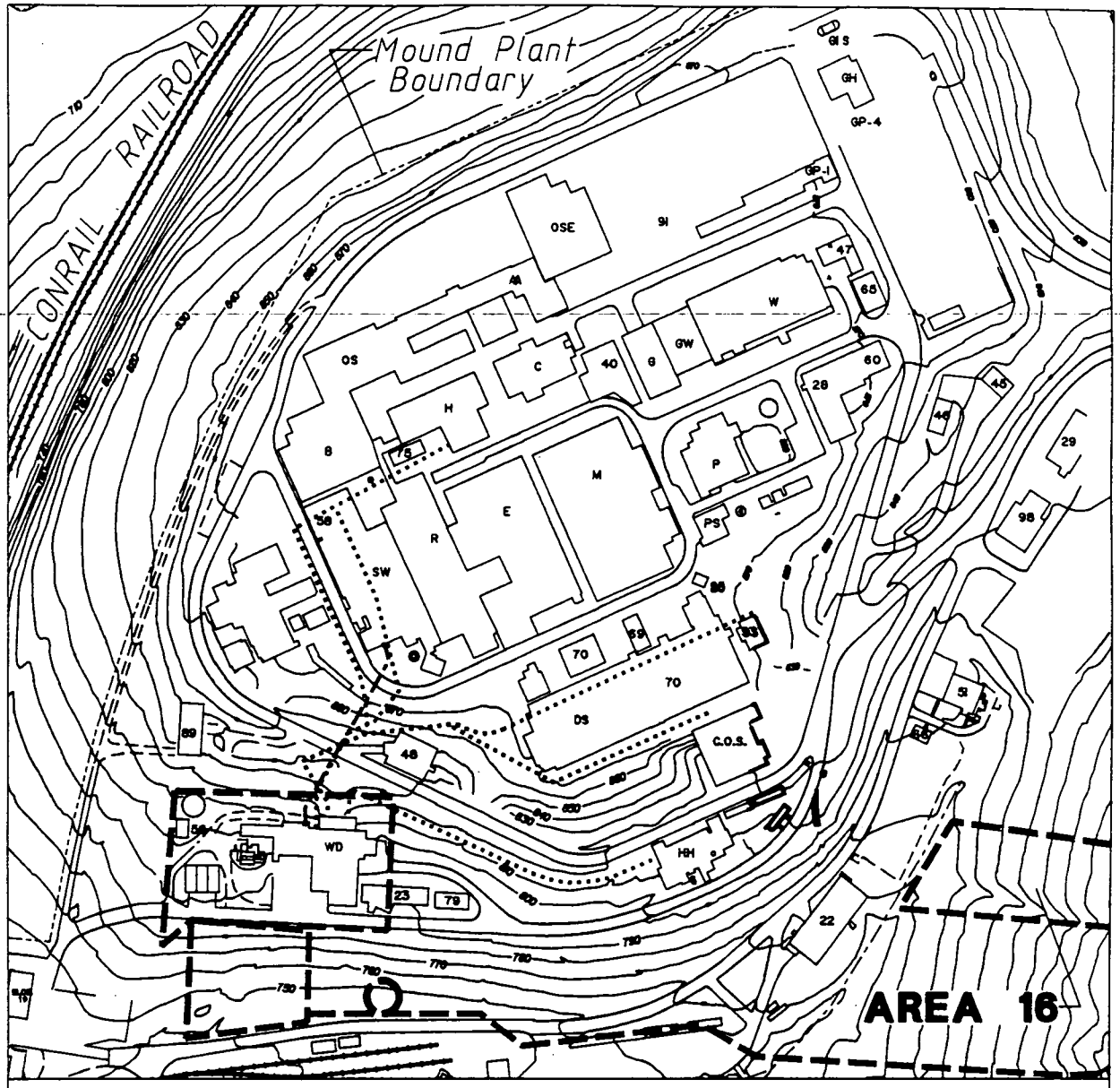


Figure 3.8. Underground radioactive waste lines.

of groundwater and possibly small quantities of uncontaminated process aqueous wastes from cross connections.

During removal of the lines and associated contaminated soil, radiological surveys will be conducted and the soils will be sampled and analyzed for both radioactive and nonradioactive contaminants. The locations of these lines are currently being surveyed. All segments of the underground waste lines, with the exceptions of those located beneath existing buildings, will be excavated and removed. Segments of lines beneath existing buildings will be abandoned in place. Contaminants associated with underground radioactive waste lines will be identified in the SAP when it is prepared for this area.

3.3.4. Area 4, WD Building Influent Tank Overflow, and Area 4a, Sludge Drying Pits

Areas 4 and 4a are located on the southern slope of the Main Hill, surrounding the WD Building. The Area 4 influent tanks are located on the north side of the WD Building. The Area 4a sludge drying pits are immediately west of the WD Building and south of Building 56 (Figure 3.7). The combined size of Areas 4 and 4a is approximately 25,000 ft^2 (DOE 1986).

In 1965, the WD Building influent tanks overflowed, contaminating the surrounding area with polonium-210 and cobalt-60. Plutonium-238 has also been detected in the area, but the exact source is unknown. Three major possibilities are storage of waste packages in this area, sanitary disposal facility operations that include contaminated storm sewer inflow, or the 1969 cleanup in Area 14.

In 1965, the sludge drying pits were contaminated with polonium-210 and cobalt-60 when the WD influent tanks overflowed. The liquid waste flowed southwest around the WD Building, contaminating the drying pits. A waste line break near Building 48 (Area 5 of Operable Unit 5) may also have contributed some polonium-210 and cobalt-60 contamination to the drying pits as a result of cross contamination of the sanitary and process sewer lines.

Because of its short half-life, 138.4 days, the polonium-210 is no longer present due to radioactive decay. The polonium was formed by the activation of aluminum-encapsulated bismuth-209. Activation of the aluminum encapsulation resulted in the formation of cobalt-60 from the cobalt impurity in the aluminum. Cobalt-60 has a longer half-life, 5.6 years, and would still be present in small amounts.

In 1974, a TRU waste container leaked plutonium-238 in concentrations greater than 100 nCi/g. The leak occurred on the south side of the WD Building, adjacent to the loading dock.

The Mound Site Survey Project collected and analyzed soil samples from Areas 4 and 4a. Concentrations of plutonium-238, radium-226, and americium-241 at 355, 1.2, and 1.0 pCi/g, respectively, were observed in these areas. Concentrations of thorium above 2 pCi/g (background) were not observed, and concentrations of cobalt-60 were below the lower detection limit. Soil samples collected during the 1989 reconnaissance investigation and screened at the Mound Plant Soil Screening Facility reflected maximum plutonium-238 and thorium-232 concentrations of 225 pCi/g and 9 pCi/g, respectively. During the 1989 reconnaissance investigation, surface and subsurface soil samples were collected from eight sampling locations within Areas 4 and 4a for analyses of TAL and TCL constituents.

3.3.5. Area 11, Contamination from SM Building Operations

Area 11 is located on the SM/PP Hill west of the PP Building (Building 38). It is mostly confined to the east side of the SM/PP road (Figure 3.9). Area 11 is approximately 50 by 75 ft (3,700 ft^2) and is covered by approximately 3 to 5 ft of fill dirt. Area 11 was used before 1965 as a staging area for wastes from the SM Building, including contaminated equipment.

The Mound Site Survey Project analyzed soil samples collected from Area 11 for plutonium-238 and thorium. Maximum concentrations observed for plutonium-238 and thorium were 870 pCi/g and 5.65 pCi/g, respectively. Soil samples collected during the 1989 reconnaissance investigation reflected maximum concentrations of plutonium-238 and thorium-232 of 64,000 pCi/g and 69 pCi/g, respectively. During the 1989 reconnaissance investigation, surface and subsurface soil samples were collected from nine sampling locations within Area 11 for the analyses of TAL and TCL constituents.

3.3.6. Area 14, Radioactive Waste Line Break

Radioactively contaminated liquid waste was transferred from the SM/PP Hill to the WD Building via two parallel underground pipelines. The liquid waste was gravity fed from the SM/PP Hill to Building 41, where it was held in two underground storage tanks. The waste was then pumped uphill to the WD Building. The WTS began operation in 1967 and handled primarily solutions of plutonium-238 in nitric acid and, to a lesser extent, solutions of plutonium-238 in sodium hydroxide.

At various times throughout the operation of the WTS, leaks occurred in the waste lines, and unknown amounts of solutions were released to the environment. A waste line rupture in 1969 released a large quantity of plutonium-238 waste upslope from Building 41, in what is now known as Area 14 (Figure 3.7). The surrounding soils became contaminated with plutonium-238. A partial cleanup of the area was performed in 1969, during which approximately 964 ft^3 of soil were removed and shipped

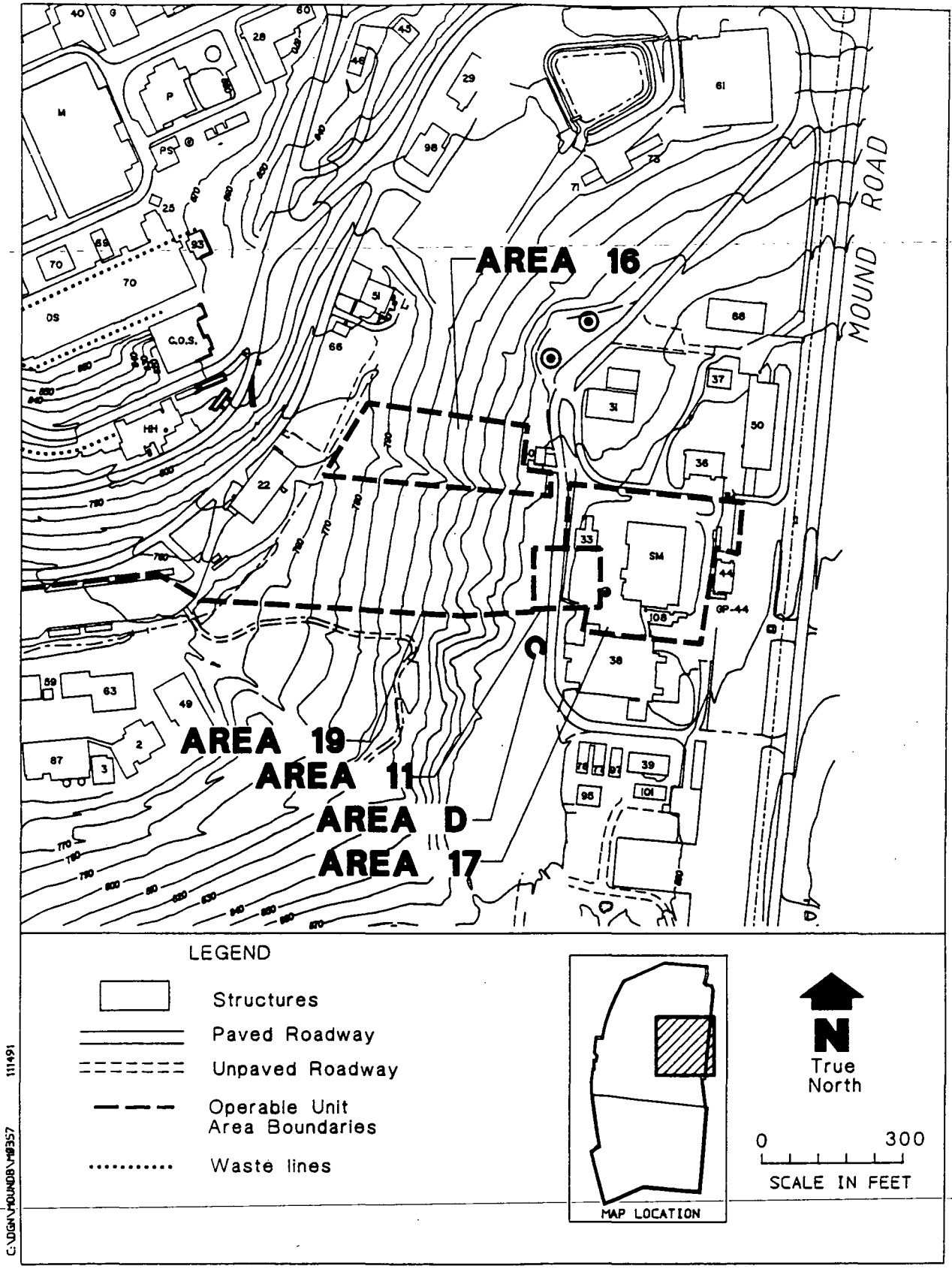


Figure 3.9. Areas 11, 16, 17, and D.

offsite for disposal. The area was then backfilled with clean soil. A rainstorm during remediation caused some of the plutonium-contaminated soil to be washed away from the original point of deposition through the plant drainage ditch to an abandoned remnant of the Miami-Erie Canal (Operable Unit 4). The WTS continued to operate until 1976, when the system was permanently shut down. The final remediation of the WTS was performed between 1985 and 1990. As part of this remediation, Building 41 and its tanks were removed in 1987.

Limited sampling was performed in Area 14 during the Site Survey Project, because remedial actions by the Mound Plant D&D Program were pending. The results of the sampling are presented in Table III.3. Soil samples collected during the 1989 reconnaissance investigation and screened at the Mound Plant Soil Screening Facility reflected maximum plutonium-238 and thorium-232 concentrations of 8,400 pCi/g and 20 pCi/g, respectively. The Mound Plant D&D Program verified the remediation of radioactively contaminated soils by conducting field instrument for the detection of low energy radiation (FIDLER) surveys and collecting soil samples for radionuclide analyses at the Mound Plant Soil Screening Facility. The results from these surveys have not yet been published. In 1990, the remediated area was sampled by Argonne National Laboratory (Argonne 1990) to independently verify the remediation of radioactively contaminated soils as a check of the Mound Plant D&D Program. Results from the Argonne sampling indicated concentrations of plutonium-238 remaining in the area ranged from 0.1 pCi/g to 240 pCi/g, with an average concentration of 19 pCi/g. During the 1989 reconnaissance investigation, surface soil samples were collected from 16 sampling locations within Area 14 for the analyses of TAL and TCL constituents.

In August 1991, sampling was conducted to identify potential nonradioactive contaminants in a subsection of Area 14 where a proposed fuel oil storage system is to be constructed. The report of the verification results for the Area 14 sampling is currently in the review process (DOE 1992c). Preliminary conclusions indicate that the area is not contaminated. Cleanup levels, however, are not available at this time.

3.3.7. Area 16, Sanitary Sewage Septic Tank and Leach Field for the SM Building

Area 16 is located on the west side of the SM/PP Hill, below Building 30 (Figure 3.9). The area covers approximately 15,500 ft^2. The SM Building was constructed in 1960 and served as the nuclear processing facility for plutonium-238. The SM Building septic tank and leach field were used from 1960 to 1963 or 1964, when the building was connected to the site sanitary sewage disposal system. The septic tank and leach field were connected only to the toilets within the building. Process wastewater, floor drains, and sink drains were treated by a wastewater treatment system within the SM Building. In 1966, the process wastewater was disconnected from the SM treatment system and

was piped to the WD Building for treatment. The Mound Plant D&D Program is currently (January 1992) removing radioactively contaminated soils, the septic tank, the tank distribution box, and a storm sewer head wall from Area 16.

The Mound Site Survey Project analyzed soil samples that were collected from Area 16. Maximum plutonium-238 and thorium-232 concentrations observed were 144 pCi/g and 3.46 pCi/g, respectively. Soil samples collected during the 1989 reconnaissance investigation and screened at the Mound Plant Soil Screening Facility reflect maximum plutonium-238 and thorium-232 concentrations of 2,400 pCi/g and 5 pCi/g, respectively. This contamination may have originated from surface water runoff from a storm sewer that runs through the area or from contaminated floor mop water that was disposed of by pouring down the SM Building toilets. The western edge of Area 16, downgradient of the leach field, may also be contaminated as a result of receiving drainage from the leach field. During the 1989 reconnaissance investigation, surface and/or subsurface soil samples were collected from eight locations within Area 16 for the analyses of TAL and TCL constituents.

3.3.8. Area 17, The Area Under the SM Building

Area 17 is located under and immediately surrounding the SM Building (Figure 3.9). The area around the SM Building includes an asphalt parking lot and Buildings 34 and 44. Area 17 covers approximately 40,000 ft^2. The SM Building was used from 1960 to 1970 for special metallurgical studies and is being decontaminated and decommissioned by the Mound Plant D&D Program. Soils beneath the building are contaminated, mainly with plutonium-238, as a result of leaks in sumps, piping, and tanks used during processing activities. The sumps, piping, tanks, and other structures once present in the SM Building have all been removed by the Mound Plant D&D Program.

The Mound Site Survey Project collected and analyzed soil samples from Area 17. Maximum concentrations for plutonium-238 and thorium measured were 494 pCi/g and 9.99 pCi/g, respectively. Sampling was not conducted beneath or inside the SM Building, where the highest contamination existed. Soil samples screened at Mound Plant Soil Screening Facility during the 1989 reconnaissance investigation reflected maximum plutonium-238 and thorium-232 concentrations of 3,300 pCi/g and 6 pCi/g, respectively. Surface and/or subsurface soil samples were collected from nine sampling locations within Area 17 for the analyses of TAL and TCL constituents during the 1989 reconnaissance investigation.

In September 1991, sampling was conducted to identify potential nonradioactive contaminants in a subsection of Area 17 known as the SM Annex. The SM Annex was a structural addition to the north side of the SM Building that was razed in 1989 and 1990. The verification report from this activity

is currently in the review process (DOE 1992d). Preliminary results indicate that the area is not contaminated. Cleanup levels, however, are not available at this time.

3.3.9. Area 19, Underground Waste Transfer Line (Waste Disposal Pipeline)

Area 19 consists of soils that surrounded two underground waste transfer lines (1.5- and 2-inch-diameter) that were used to transfer low-activity and higher-activity plutonium-238 liquid waste from the PP Building (Building 38) on the SM/PP Hill to Building 41 (razed) immediately below the WD Building (Figure 3.10). These lines were part of the WTS. Use of the lines began in 1967. The lines, each approximately 1,800 ft long, were flanged at 10-ft intervals and operated by gravity feed. The depth of the waste lines varied from approximately 4 ft to 17 ft below ground surface. Use of the low-activity line was discontinued in September 1974, and use of the higher-activity line was discontinued in April 1976 because of leakage. Samples were not collected in Area 19 during the Mound Site Survey Project because this area was in the process of being remediated by the Mound Plant D&D Program.

The lines were removed by the Mound Plant D&D Program from 1982 to 1986. As the waste lines were removed, the adjacent soils were screened, and radioactively contaminated soils were removed. The target cleanup level was 100 pCi/g of plutonium-238.

A study to verify this cleanup was performed by Battelle in 1986 and included the analysis of 248 soil samples from 62 locations. This verification sampling was performed after all excavations were backfilled. The verification study concluded that more than 90% of the samples analyzed contained levels of plutonium-238 within one standard deviation of the 100 pCi/g cleanup level. Because the study was conducted after all excavations were backfilled, original soils may not have been sampled at all depths and the results may not be representative of the remaining plutonium-238 concentrations in Area 19. During the verification study, two hotspots were encountered at 410 and 1,057 pCi/g of plutonium-238. Because the Mound Plant D&D Program guideline for cleanup is to an average concentration of 100 pCi/g and a maximum of 300 pCi/g of plutonium-238, soils at these locations were removed. Soil samples collected during the 1989 reconnaissance investigation reflected maximum plutonium-238 and thorium-232 concentrations of 68 and 1 pCi/g, respectively. During the 1989 reconnaissance investigation, surface and subsurface soil samples were collected from eight sampling locations within Area 19 for the analyses of TAL and TCL constituents.

3.3.10. Area D, The Acid Leach Field

Area D is located west of the PP Building (Building 38) on the upper slope of the SM/PP Hill (Figure 3.9). The leach field was constructed to treat material spilled within the acid preparation room in the PP Building (Building 38). Inside the building, tanks that contained nitric acid or caustic solutions were surrounded by a metal tray to catch leaks or spills. In the event of a leak or spill, the liquid would be collected by the tray and routed through a pipe to the leach field. The leach field, which was placed in service in 1967, had a surface area of approximately 10 ft by 10 ft and was filled with limestone to neutralize any acid routed to it. In 1987, the acid and caustic tanks within the PP Building were taken out of service, and the pipeline from the building leading to the leach field was capped. During its operational life, the leach field was used infrequently and not on a routine basis.

The Mound Site Survey Project collected and analyzed one soil sample from Area D. No significant plutonium-238 or thorium contamination was detected in the sample (0.98 pCi/g of plutonium-238 and less than 2 pCi/g of thorium). Soil samples screened at the Mound Plant Soil Screening Facility reflected maximum plutonium-238 and thorium-232 concentrations of 18 pCi/g and 1.5 pCi/g, respectively. During the 1989 reconnaissance investigation, surface and subsurface soil samples were collected from five locations within Area D for the analyses of TAL and TCL constituents. D&D is complete, and the area is awaiting verification.

3.3.11. Old Sanitary Wastewater Treatment Plant

The old sanitary wastewater treatment plant is located immediately west of the WD Building (Figure 3.7). It was first used in 1948, was taken out of service in 1975, and was replaced by the new sanitary wastewater treatment plant. The old sanitary wastewater treatment plant consisted of a pump room, primary settling tank, aeration tank, digester, chlorinator, and effluent baffle chamber. All treatment units are open-topped, in-ground structures constructed of reinforced concrete. The entire plant covers a surface area of approximately 44 ft by 47 ft. The system treated sanitary wastewater and some process effluent from Mound Plant. Sources of wastewater included restrooms, showers, laundry facilities, lab sinks, and rinse water from a metal-finishing operation. Contamination of the area occurred in December of 1970 when a line broke near Building 48. The contamination was from polonium and perhaps cobalt-60.

Treated effluent was discharged to the sanitary sewer and on to the Great Miami River. The dried sludges were historically spread across the plant or disposed of offsite. Sludge was disposed of offsite as a low-level radioactive waste. No releases have been documented from the in-ground structures, and the integrity of the concrete walls and bottoms appeared to be good (EPA 1988b). No radioactive

soil contamination was detected during the Mound Site Survey Project. The soils immediately around and beneath the treatment plant have not been

4. REQUIREMENTS AND DATA QUALITY OBJECTIVES (DQOs)

4.1. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The FFA between the DOE and the EPA requires the determination of ARARs and describes the process for ARAR determination, including a meeting of the DOE and the EPA remedial project managers. Although the following is not a draft ARAR determination, it is presented because potential ARARs affect the rationale for verification sampling.

4.1.1. Introduction

The DOE must generally comply with all provisions of federal environmental statutes and regulations, as well as applicable state and local requirements. In performing D&D, the DOE is acting under the authority of the AEA; however, the verification of cleanup must be done both under the authority of the AEA and in compliance with CERCLA. Therefore, the verification and any further action required under CERCLA would require DOE to comply with all ARARs.

The National Contingency Plan (NCP) (Section 300.5) defines "applicable requirements" as

> those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

The NCP also defines "relevant and appropriate requirements" as

> those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent that federal requirements may be relevant and appropriate.

There are more flexibility and discretion in making relevant and appropriate determinations than in determining the applicability of a requirement. Only those requirements that are both relevant and appropriate are ARARs. A requirement may be relevant, but not appropriate, because of the site

circumstances. Such a requirement would not be considered an ARAR. Relevant and appropriate requirements are intended to carry the same weight as applicable requirements. Examples of federal statutes specifically cited in CERCLA from which requirements may apply include the Toxic Substances Control Act (TSCA), the Safe Drinking Water Act (SDWA), the Clean Air Act (CAA), and the CWA.

In the absence of federal- or state-promulgated regulations, there are many nonpromulgated criteria, advisories, guidance values, and proposed standards that, while not legally binding, may serve as useful guidelines for setting protective cleanup levels. These are not potential ARARs, but are classified as "to be considered (TBC) necessary for protection" by EPA; their use is discretionary. In general, TBCs are not formally promulgated criteria or standards and are developed, using best professional judgement, on the basis of the latest available information.

4.1.2. Type of ARARs

There are, in general, three different types of ARARs, although some requirements do not fit neatly into these categories. These are:

- chemical-specific requirements,
- location-specific requirements, and
- action-specific requirements.

Ambient or chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that establish acceptable concentrations of chemicals or discharge limits for particular chemicals; for example, maximum contaminant levels (MCLs) that establish safe levels in drinking water (EPA 1989a). Only a limited number have been promulgated.

The results of a risk assessment are used in establishing cleanup goals that are health-based. The total carcinogenic risk or hazard index for all chemicals of concern in a medium is calculated in this risk assessment. As a starting point for setting cleanup goals, the risk calculations are developed using chemical-specific requirements. If there are no chemical-specific ARARs, then specified federal or state TBC values are used in the calculations.

Initially, during the RI work plan stage, chemical-specific ARARs may be identified based on a limited amount of data. At this point, chemical-specific ARARs have meaning only in that they may be used to establish appropriate detection limits, so that data collected will be amenable for comparison to

ARAR standards. These proposed chemical-specific ARARs are not necessarily representative of the final ARARs that will ultimately define cleanup standards.

Location-specific ARARs are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they occur in special locations. Examples of areas regulated under various federal laws include floodplains, wetlands, and locations where endangered species or historically significant cultural resources are present. Location-specific ARARs have been identified so that information may be gathered to determine if restrictions have been placed on the concentration of hazardous substances or on the conduct of an activity solely because it occurs in a special location.

Action-specific ARARs are usually technology-based requirements or limitations on actions taken with respect to waste management and site cleanup. Examples include the RCRA Subtitle C requirements for hazardous waste management and the land disposal restrictions. Action-specific ARARs are usually identified during the detailed analysis of alternatives. However, preliminary action-specific requirements have been identified in this report for Operable Unit 6.

4.1.3. Regulatory Authority for ARARS of Operable Unit 6

In accordance with current EPA guidance, ARARs are to be progressively developed and applied as information concerning a given site becomes available. The initial step in the process entails the listing of all potential ARARs for the remedial actions proposed at the subject site. A comprehensive listing of potential ARARs for all of the operable units for the Mound Plant was completed as part of the Operable Unit 9, Site-Wide Work Plan (DOE 1992e).

The following sections present a review of potential ARARs that may be applied to Mound Plant D&D Program Sites, Operable Unit 6. These ARARs are not all-inclusive, but they do present the federal and state requirements that may be considered as ARARs. This list of potential ARARs will be modified and refined as additional information concerning Operable Unit 6 is obtained.

Regulation of exposures to ionizing radiation in the United States is primarily the responsibility of the EPA. The U.S. Nuclear Regulatory Commission (NRC) is responsible for regulating commercial users of radioactive materials in a manner that assures that the limits imposed by the EPA are not exceeded. Similarly, DOE is responsible for establishing policies and procedures to ensure compliance with EPA limits at DOE facilities. It should be noted that DOE orders are not promulgated requirements and fall under the category of TBCs; however, compliance with them is fundamental at Mount Plant.

4.1.4. Preliminary Remediation Goals

CERCLA Section 121 specifically requires attainment of all ARARs. Moreover, as explained in the preamble to the NCP (55 FR 8741), in order to attain all ARARs, a remedial action must comply with the most stringent requirement, which then ensures attainment of all other ARARs. Furthermore, CERCLA requires that the remedies selected must attain ARARs and be protective of human health and the environment. Consequently, preliminary remediation goals based on ARARs will require modification as new information and data are collected, including the baseline risk assessment (to be conducted), when ARARs are not available or are determined to be inadequate for protection of human health and the environment.

In order to fully integrate the AEA-authorized D&D of contaminated soil areas with CERCLA compliance, D&D specifications must be consistent with the final remedial action objectives as described in a ROD. In order to accomplish this integration, the DOE has started the development of conservative preliminary remediation goals. When completed, those goals will be assumed as D&D project specifications. Preliminary remediation goals are currently being developed and initial values are currently in the review process (DOE 1992b) but have not been agreed to by the reviewing parties.

4.1.5. Chemical-Specific ARARs For Operable Unit 6

Table IV.1 lists the potential contaminants of concern identified for Operable Unit 9 (DOE 1992e), and the potential list of contaminants associated with Operable Unit 6 is listed in Table IV.2. This list is based on analytes identified as either estimated at levels below the detection limit or found above the detection limit in D&D areas sampled. This list is separate from the list developed for use during site characterization in Operable Unit 9 and is based on separate rationale. Both lists and the results of analyses carried out during site characterization will provide the information needed to plan the verification sampling and prepare a verification SAP on an area-specific basis. The area-specific SAPs will describe any specific analytical requirements not identified in this work plan. In this case, a Quality Assurance Project Plan (QAPP) addendum will be written to provide the accompanying quality assurance information. Using the list of potential contaminants, lists of potential chemical/radionuclide-specific ARARs have been prepared based upon two different types of media: surface water and soils/sediment. These potential chemical/radionuclide-specific ARARs/TBCs are presented in Tables IV.3 and IV.4, and are defined below.

Table IV.1. Operable Unit 9 - Potential Contaminants of Concern

Compound	Compound
Acetone	Antimony
Acetonitrile	Beryllium
Acrylonitrile	Bismuth
Ammonia	Cadmium
ANCO ALGAECIDE No. 1 (2-benzyl-4-chlorophenol) [a]	Chromium
ANCOOL 3310 (triazole) sodium molybdate[a,b]	Cobalt
Arsenic	Cyanide
Benzene	Copper
Calcium	Iron
Carbon disulfide	Lead
Carbon tetrachloride	Lithium
Chloroform	Magnesium
Cresols (methylphenol)	Manganese
Diethyl benzene	Mercury
Fluoride	Nickel
Freon-TF (Freon 113, trichlorotrifluoroethane)	Selenium
Hexane	Silver
High explosives	Vanadium
PETN	Zinc
RDX	Actinium-227
HMX	Americium-241
Iodomethane	Bismuth-207
Methylene chloride	Bismuth-210m
Methyl ethyl ketone (2-butanone)	Cesium-137
Methyl isobutyl ketone (4-methyl-2-pentanone)	Cobalt-60
NALCO 2532 bis(tributyltin) oxide[a]	Plutonium-238,239/240
PCBs	Radium-226
Phenol	Strontium-90
Potassium	Thorium-228, 230, 232
Sodium	Tritium
Tetrachloroethane	Uranium-234/235, 238
Toluene	Rare earths (lanthanides)
Tribromomethane (bromoform)	Nitrate-nitrite
Trichloroethane	Nitrite
Trichloroethene	Chloride
Xylene	Sulfate
Aluminum	

Table IV.1. (page 2 of 2)

Other possible radioactive contaminants at Mound Plant - list developed from decay series and other sources.

Compound	Compound
Cadmium-113	Protactinium-231
Neptunium-237	Radon-222
Neptunium-239	Silver-108
Nickel-59	Thorium-227
Nickel-63	Tin-121
Plutonium-236	Uranium-232
Pluntonium-241	Uranium-233
Pluonium-242	Uranium-236
Polonium-209	
Polonium-210	

Notes:
[a]Indicator compound
[b]Analyze for molybdenum in the TAL method, not for the molybdate; analyze for tin, not for the oxide.
HMX - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (cyclotetramethylenetetranitramine)
PETN - pentaerythritol tetranitrate
PCB - polychlorinated biphenyl
RDX - Hexahydro-1,3,5-trinitro-s-triazine (cyclotetramethylenetetranitramine)

Table IV.2. Potential Contaminants Associated with Operable Unit 6

Part I

Organics	Above Detection Limit	Estimates Below Detection Limit
1,1,1-Trichloroethane	Area 11, Area 14, Area 16	Area 17, Area 19
2-Butanone		Area 11, Area 14, Area 16, Area 17, Area 19
2-Methylnaphthalene		Area 4/4A
4-Methyl-2-pentanone		Area 14, Area 19
Acenaphthene		Area 19
Acetone	Area 11	Area 1, Area 14, Area 16, Area 17, Area 19
Anthracene		Area 19
Aroclor 1260		Area 17
Benzo(a)anthracene		Area 11, Area 14, Area 17
Benzo(a)pyrene		Area 11, Area 14, Area 17, Area 19
Benzo(b)fluoranthene		Area 11, Area 14, Area 16, Area 17, Area 19
Benzo(g,h,i)perylene		Area 17, Area 19
Benzo(k)fluoranthene		Area 11, Area 14, Area 17, Area 19
Beta BHC	Area 11, Area D	
Bis(2-ethylhexyl) phthalate	Area 11	Area 1, Area 14, Area 16, Area 17
Bromodichloromethane		Area 16
Butylbenzylphthalate		Area 11
Chrysene		Area 11, Area 17, Area 19
Di-n-butylphthalate		Area 4/4A, Area 11
Di-n-octylphthalate		Area 14, Area 17
Dibenzo(a,h)anthracene		Area 19
Dichloromethane		Area 1, Area 11, Area 14, Area 16, Area 19
Endosulfan I alpha		Area 11, Area 17
Endrin Ketone	Area 11, Area D	
Ethylbenzene		Area 11, Area 19
Fluoranthene	Area 19	Area 11, Area 17
Indeno(1,2,3-cd)phenanthrene		Area 11, Area 17, Area 19
N-Nitroso-Di-n-phenylamine		Area 1, Area 4/4A, Area 11, Area 19
Phenanthrene		Area 4/4A, Area 11, Area 14, Area 19
Phenol		Area 16
Pyrene	Area 11, Area 19 and Area 14	Area 16, Area 17, Area 19
Toluene		Area 1, Area 14, Area 17, Area 19

Table IV.2. (page 2 of 2)

Organics	Above Detection Limit	Estimates Below Detection Limit
Tetrachloroethane		Area 11, Area 14, Area 17
Trichloroethene		Area 14, Area 17
Trichloromethane (Chloroform)		Area 11, Area 16

Part II

Inorganics reported not associated with specific areas[a,b]	
Aluminum	Magnesium
Arsenic	Manganese
Barium	Mercury
Beryllium	Nickel
Cadmium	Nitrate
Calcium	Potassium
Chromium (total)	Silver
Cobalt	Sodium
Copper	Sulfate
Cyanide	Vanadium
Iron	Zinc
Lead	

[a]The following were not found during verification in Areas 14 & 17: antimony, beryllium, cadmium, selenium, sodium, thallium, and nitrate.
[b]*For reconnaissance sampling,* detection limits were not reported by the laboratory.

[a]EPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141 and 143 (as of May 1990) (EPA 1990b). 56 FR 3527, 30 January 1991.
[b]EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, and 143, Final Rule, effective July 30, 1991.
[c]EPA, Quality Criteria for Protection of Aquatic Life, 1986. CWA §304.
[d]EPA Health Advisories which describe nonregulatory concentrations of drinking water contaminants at which adverse health effects would not be anticipated to occur over specific exposure durations (US EPA Region V memo, 2-2-89).
[e]EPA published a proposed rule establishing procedures and technical requirements for implementing corrective action for solid waste management units on July 27, 1990 (55 FR 30798) (FR 1990b). These standards were identified from Appendix A: Examples of Concentrations Meeting Criteria For Action Levels. These values are for information only and should be used as TBCs.
[f]Refers to radium-226 and radium-228 combined.
[g]Human Health Criteria For Carcinogens Reported For Three Risk Levels. Value Presented is the 10^{-6} Risk Level.
[h]Hardness Dependent Criteria (100 mg/L used).
[i]30-day average
[j]Agricultural water supply
[k]Insufficient Data to Develop Criteria. Value Presented is the LOEL--Lowest Observed Effect Level.
[l]Total Trihalomethanes: chloroform, bromoform, bromodichloromethane, dibromochloromethane, and trichloromethane.
[m]Outside mixing zone, 30 day average
[n]Outside mixing zone, human health, 30 day average
[o]TBD standard is based on water hardness values.
g/L = grams per liter
mg/L = milligrams per liter
ng/L = nanogram per liter
P/L = particles per liter
μg/L = micrograms per liter
ARAR = applicable or relevant and appropriate requirement
AWQC = Ambient Water Quality Criteria
CWA = Clean Water Act
DWEL = Drinking Water Equivalent Lifetime (the DWEL is derived from multiplying the RFD by the adult body weight (70 kg) and divided by the adult daily water consumption (2 liters/day).
RFD = Reference Dose
SDWA = Safe Drinking Water Act
TBC = to be considered
WQC = Water Quality Criteria

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Table IV.4. Potential Chemical/Radionuclide-Specific ARARs/TBCs For Operable Unit 6
Federal Soil Criteria
(mg/kg)

Parameter	Type	Soil Criteria	
		55 Federal Register 30798[a]	40 CFR 192.12
Acenaphthene	Semivolatile		
Acetone	Volatile	8E + 03	
Anthracene	Semivolatile		
Aroclor 1260	PCB		
Benzene	Volatile		
Benzo(a)anthracene	Semivolatile		
Benzo(a)pyrene	Semivolatile		
Benzo(b)fluroanthene	Semivolatile		
Benzo(g,h,i)perylene	Semivolatile		
Benzo(k)fluroanthene	Semivolatile		
Beta BHC	Pesticide		
Bis(2-ethylhexyl)phthalate	Semivolatile		
Bromodichloromethane	Volatile	5E - 01	
Bromoform	Volatile	2E + 03	
Butylbenzylphthalate	Semivolatile	2E + 03	
Chloroform	Volatile	1E + 02	
Chrysene	Semivolatile		
Di-n-butylphthalate	Semivolatile		
Di-n-octylphthalate	Semivolatile		
Dibenzo(a,h)anthracene	Semivolatile		
1,1-Dichloroethane	Volatile		
1,2-Dichloroethane	Volatile	8E - 00	
1,2-*trans*-Dichloroethene	Volatile		
Dichloromethane	Semivolatile		
Endosulfan I alpha	Pesticide		
Endrin ketone	Pesticide		
Ethyl benzene	Volatile	8E + 03	
Fluoranthene	Semivolatile		
Indeno(1,2,3-cd) phenanthrene	Semivolatile		
N-Nitroso-Di-n-phenylamine	Semivolatile		
Phenanthrene	Semivolatile		
Phenol	Semivolatile		
Pyrene	Semivolatile		
Styrene	Volatile	2E + 04	
Tetrachloroethene	Volatile	1E + 01	
Toluene	Volatile	2E + 04	
Trichloroethene	Volatile	6E + 01	

Table IV.4. (page 2 of 3)

Parameter	Type	Soil Criteria	
		55 Federal Register 30798*	40 CFR 192.12
1,1,1-Trichloroethane	Volatile	7E + 03	
Xylenes (total)	Volatile	2E + 05	
N as Nitrate	Anion		
N as Nitrate + Nitrite	Anion		
N as Nitrite	Anion		
Asbestos (fibers > 10 μm)	Particulate		
Aluminum	Metal		
Antimony	Metal	3E + 01	
Arsenic	Metal	8E + 01 80 mg/kg	
Barium	Metal	4E + 03	
Beryllium	Metal	2E - 01	
Cadmium	Metal		
Calcium	Metal		
Chromium	Metal		
Chromium VI	Metal	4E + 02	
Cobalt	Metal		
Copper	Metal	2.96E + 03	
Cyanide	Metal	2E + 03	
Iron	Metal		
Lead	Metal		
Magnesium	Metal		
Manganese	Metal	8E + 03	
Mercury	Metal	2E + 01	
Nickel	Metal	2E + 03	
Potassium	Metal		
Selenium	Metal		
Silver	Metal	2E + 02	
Thallium	Metal		
Vanadium	Metal	5.6E +02	
Zinc	Metal	1.6E + 04	
Actinium-227	Radionuclide		
Americium-241	Radionuclide		
Bismuth-210	Radionuclide		
Cesium-137	Radionuclide		
Cobalt-60	Radionuclide		
Plutonium-238	Radionuclide		

Table IV.4. (page 2 of 3)

Parameter	Type	Soil Criteria	
		55 Federal Register 30798[a]	40 CFR 192.12
Radium-226	Radionuclide		5pCi/g[b]/15pCi/g[c]
Thorium-228	Radionuclide		
Thorium-230	Radionuclide		
Thorium-232	Radionuclide		
Tritium	Radionuclide		
Uranium-233	Radionuclide		
Uranium-234	Radionuclide		
Uranium-235	Radionuclide		
Uranium-238	Radionuclide		
Gross Alpha	Radionuclide		
Gross Beta	Radionuclide		

Note: Radionuclides: 25 mrem/yr (while body)
75 mrem/yr (any critical organ)

The prerequisite for the applicability to this requirement is: DOE facilities, NRC licenses, and non-DOE federal facilities, except from doses from radon-220, radon-222, and their decay products; facilities regulated under 40 CFR 190-192; and low-energy accelerators and users of sealed sources (40 CFR Part 61).

[a]EPA published a proposed rule establishing procedures and technical requirements for implementing corrective action for solid waste management units on July 27, 1990 (55 FR 30798) (FR 1990b). These standards were identified from Appendix A: Examples of Concentrations Meeting Criteria For Action Levels.

[b]Averaged over the first 15 cm of soil below the surface.

[c]Averaged over 15-cm-thick layers of soil more than 15 cm below the surface.

ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
DOE - U.S. Department of Energy
EPA - U.S. Environmental Protection Agency
NRC - Nuclear Regulatory Commission
RCRA - Resource Conservation and Recovery Act
TBC - to be considered
mrem/yr - millirems per year
pCi/g - picocuries per gram
mg/kg - milligrams per kilogram

The last set of standards that were reviewed and included in Table IV.3 as TBCs were federal Health Effects Advisories (HEAs) (EPA 1990b). Although these advisories are not legally binding standards, and may not be fully current, they may provide the best available standard for a protection chemical for which no binding standard exists. HEAs provide information on the health effects, analytical methods, and treatment technology useful for dealing with drinking water contamination. HEAs describe nonregulatory concentrations of drinking water contaminants at which adverse health effects would not be anticipated to occur over specific exposure durations. As additional information is compiled on Operable Unit 6, the HEAs should be evaluated using the procedures outlined in the Superfund Public Health Evaluation Manual (CFR 1990d); and if the standard is necessary to achieve a protective remedy, it should be used.

Additional chemical-specific ARARs/TBCs may also include NRC Regulation 10 CFR Section 20 and DOE Order 5400.5.

4.1.5.2. Operable Unit 6 Soil ARARs/TBCs

One medium for which chemical-specific ARARs do not currently exist is soils; however, EPA's proposed requirements under RCRA for corrective action levels have been included in Table IV.4 as a potential TBC. In addition, as the RI/FS proceeds, information may become available to perform a baseline risk assessment which would allow a determination of acceptable contaminant concentrations in the soils to ensure environmental "protectiveness." Potential chemical-specific ARARs and TBCs include

- Uranium Mill Tailings Radiation Control Act (40 CFR 192)
- RCRA (40 CFR sections 286, 261.2, 261 Appendix 11, and 240-257)
- OSHA
- TSCA
- NRC Regulations
- DOE Orders, as applicable (see subsection 4.1.8)

4.1.6. Location-Specific ARARs

A site's location is a fundamental determinant of its impact on human health and the environment. The following is a list of location-specific requirements, established under several statutes, that are potential ARARs.

- RCRA
  - Fault zone
  - Floodplain
  - Salt dome formation
- National Historic Preservation Act
- Endangered Species Act
- CWA
  - Wetlands
- Wilderness Act
- Fish and Wildlife Coordination Act
- Wild and Scenic Rivers Act
- Coastal Zone Management Act
- National Ambient Air Quality Standards (NAAQS)

Based upon existing background information at Mound Plant, this list of potential ARARs has been reviewed to develop Mound Plant Operable Unit 6 site-specific tables of potential ARARs, Table IV.5 and Table IV.6. At present, these tables contain requirements established under a number of different federal and state environmental statutes. As additional information becomes available on Operable Unit 6, these tables will be revised to eliminate action criteria as ARARs; or, as additional requirements are identified, these tables will be expanded to include these new location-specific requirements.

4.1.7. Performance, Design, or Other Action-Specific ARARs/TBCs for Operable Unit 6

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. Because the D&D Program is being conducted under the authority of the AEA, the AEA is the primary applicable requirement. Others, such as RCRA, are relevant and appropriate.

4.1.8. DOE Orders

Compliance with DOE Orders is a requirement for DOE internal organizations, and compliance is a contractual requirement for contractors. Table IV.7 lists the historical and current DOE Orders commonly used at Mound Plant. The requirements stated in the Orders come from a number of sources and together form a set of management guidance and technical directives to be used under a broad set of situations. DOE Orders, although not promulgated at the same level as federal regulations, pass on and provide for the implementation of a wide range of federal regulations. As examples, work was historically done in accordance with DOE Order 5480.2 "Hazardous and

Table IV.5. Potential Location-Specific ARARs/TBCs for Operable Unit 6, Federal Requirements

Location	Requirement	Prerequisite	Citation
Within 100-year flood plain	Facility must be designed, constructed, operated, and maintained to avoid washout	RCRA hazardous waste treatment, storage or disposal	40 CFR 264, 18(b)
Within flood plain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur in a floodplain; i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood prone areas	Protection of floodplains, b/ (40 CFR 6, Appendix A); Fish and Wildlife Coordination Act (40 CFR 6.302)
Avoid long- and short-term adverse impacts		Evaluate potential effects prior to project start	10 CFR 1022
Wetlands a/	Action to prohibit discharge of dredge or fill material into wetlands without permit	Wetlands as defined in U.S. Army Corps of Engineers regulations	CWA, Section 404; 40 CFR Part 230, 33 CFR parts 320-330
	Action to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible	Action involving construction of facilities or management of property in wetlands, as defined by 40 CFR Part 6, Appendix A, Section 4(j)	40 CFR Part 6, Appendix A
Area affecting stream or river	Action to protect fish or wildlife	Diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife	Fish and Wildlife Coordination Act (40 CFR 6.302)
NAAQS Attainment Areas	New major stationary sources shall apply best available control technology for each pollutant, subject to regulation under the Act, that the source would have potential to emit in significant amounts.	Major stationary source as identified in 40 CFR Section 52.21(b)(1)(i)(a) that emits, or has the potential to emit, 100 tons per year or more of any regulated pollutant; any other stationary source that emits, or has the potential to emit, 250 tons per year or more of any regulated pollutant.	40 CFR Section 52.21(j)(CAA)
	Owner or operator of proposed source or modification shall demonstrate that allowable emissions increases or reductions (including secondary emissions) will not cause or contribute to a violation of the NAAQS or applicable maximum allowable increase over baseline concentrations.		
NAAQS Non-Attainment Areas	Source must obtain emission offsets in Air Quality Control Region of greater than one-to-one.	Any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 100 tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutants) [CAA Section 302(j)	CAA Part D, Section 173(1)
	Some subject to LAER as defined in 40 CFR Section 51.1(j)(xiii).		CAA Part D, Section 173(2)
	All major stationary sources owned or operated by the person in the state are in compliance, or on a schedule for compliance, with all applicable emission standards.		CAA Part D, Section 173(3)

a/ 40 CFR Part 6 Appendix A sets forth EPA policy for carrying out the provisions of Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Executive orders are binding on the level (e.g., federal or state) of government for which they are issued.

ARAR - applicable or relevant appropriate requirements
CAA - Clean Air Act
CFR - Code of Federal Regulations
CWA - Clean Water Act
LAER - lowest achievable emission rate
NAAQS - National Ambient Air Quality Standards
RCRA - Resource Conservation and Recovery Act
TBC - to be considered

Table IV.6. Potential Location-Specific ARARs/TBCs for Operable Unit 6, State Requirements

Location	Requirement	Prerequisite	Citation
Within 100-year flood plain	Facility must be designed, constructed, operated, and maintained to avoid washout	Ohio hazardous waste; treatment, storage or disposal	OAC, Title 3745, 3745-54-18(B)
Water use designation criteria for the Great Miami River Basin	Water quality standards consist of two parts: designated uses and numerical or narrative criteria designed to protect the uses. Each water body in the state is assigned one or more aquatic life habitat use designations or the nuisance prevention use designation. Each water body may be assigned one or more water supply use designations and/or one recreational use designation.	Use designation must be determined for the water body in or around Operable Unit 6 (aquatic life designations or the nuisance prevention use designation; or one or more water supply designation or one recreational use designation.	OAC, Title 3745, 3745-1-21
Pollution of waters	Prohibits pollution of waters within the state Prohibits noxious exhalation or smells, obstruction or pollution of water courses, or other nuisances	The water body in or around Operable Unit 6 must be designated nuisance prevention on a triennial basis. This triennial review was completed in 1990.	Ohio Regulatory Code 6111 Ohio Regulatory Code 3767
Well abandonment	Regulates the abandonment of test holes or wells	Wells or test holes at or near Operable Unit 6 that will have to be closed must be done so in accordance with this criteria.	OAC, Title 3745, 3745-9-10

Reference: OEPA 1990
ARAR - applicable or relevant and appropriate requirement
TBC - to be considered
OAC - Ohio Administration Code

Table IV.7. Plant Engineering DOE and DOE AL Orders

Number	Title	Date of Current Order	Status
DOE 1324.2A	Records Disposition	09/13/88	Current
DOE 1332.1A	Uniform Reporting System	10/15/85	Current
DOE 2250.1C	Cost and Schedule Control Systems Criteria (CSCSC)	12/21/88	Current
DOE 4010.1	Value Engineering	02/17/89	Current
DOE 4240.1J	Designation of Major System Acquisitions and Major Projects	03/18/91	Current
DOE 4300.1B	Real Property and Site Development Planning	07/01/87	Current
DOE 4300.2A	Non-DOE Funded Work	12/19/86	Current
DOE 4320.1B	Site Development Planning	01/07/91	Current
DOE 4330.2C	In-House Energy Management	03/23/88	Current
DOE 4700.1	Project Management System	03/06/87	Current
DOE 5000.3A	Occurrence Reporting and Processing of Operations Information	05/30/90	Current
DOE 5100.3	Field Budget Process	08/23/84	Current
DOE 5400.5	Radiation Protection of the Public and the Environment	02/08/90	Current
DOE 5440.1D	NEPA	02/22/91	Current
DOE 5480.10	Contractor Industrial Hygiene Program	06/25/85	Current
DOE 5480.11	Radiation Protection for Occupational Workers	12/21/88	Current
DOE 5480.1B	Environment, Safety, and Health (ES&H) Program for DOE Operations	09/23/86	Current
DOE 5480.2	Hazardous and Radioactive Mixed Waste Management	12/13/82	Replaced by 5400.3
DOE 5400.3	Hazardous and Radioactive Mixed Waste Program	02/22/89	Current
DOE 5480.4	Environment Protection Safety and Health Protection Standards	09/20/91	Current
DOE 5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and for Hazardous Work	07/09/85	Current
DOE 5480.5	Safety of Nuclear Facilities	09/23/88	Current
DOE 5480.6	Safety of DOE-Owned Nuclear Reactors	09/23/86	Current
DOE 5480.7	*Fire Protection*	11/16/87	Current
DOE 5480.14	CERCLA Requirements	04/26/85	Replaced by 5400.4
DOE 5400.4	CERCLA Requirements	10/06/89	Current
DOE 5480.9	Construction Safety and Health Program	11/18/87	Current
DOE 5480.19	Conduct of Operations Requirements for DOE Facilities	07/09/90	Current
DOE 5481.1B	Safety Analysis and Review System	09/23/86	Current
DOE 5483.1A	Occupational Safety and Health Program for Government-Owned, Contractor-Operated Facilities	06/20/83	Current
DOE 5484.1	Environmental Protection, Safety and Health Protection Information Reporting Requirements	02/24/81	Current
DOE 5560.1A	Priorities and Allocations Programs	05/08/85	Current

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Number	Title	Date of Current Order	Status
DOE 5700.2C	Cost Estimating, Analysis and Standardization	11/02/84	Current
DOE 5700.6B	Quality Assurance	09/23/86	Replaced by 5700.6C
DOE 5700.6C	Quality Assurance	08/21/91	Current
DOE 6430.1A	General Design Criteria Manual	04/06/89	Rescinded
AL 1324.2	Records Disposition	05/10/84	Rescinded
AL 1330.2B	Uniform Contractor Reporting System	03/02/83	Rescinded
AL 2250.1C	CSCSC for Contract Performance Measurement	07/07/89	Rescinded
AL 4010.1	Value Engineering	02/20/90	Rescinded
AL 4300.1B	Real Estate Management	07/30/90	Rescinded
AL 4320.1	Site Development and Facility Utilization Planning	05/17/82	Rescinded
AL 4330.2C	AL Energy Management Program	09/13/88	Rescinded
AL 4700.1	AL Project Management System	07/02/90	Rescinded
AL 5440.1B	Implementation of the NEPA	11/12/82	Rescinded
AL 5480.1A CHP.XI	Requirements for Radiation Protection	07/20/82	Rescinded
AL 5480.1B	ES&H Program for AL Operations	02/19/87	Rescinded
AL 5480.4	ES&H Production Standards	07/29/88	Rescinded
AL 5480.5	Safety of Nuclear Facilities	07/17/87	Rescinded
AL 5480.6	Safety of DOE-Owned Reactors	04/17/87	Rescinded
AL 5480.9	Construction Safety and Health Program	01/26/89	Rescinded
AL 5481.1B	Safety Analysis and Review System	01/27/88	Rescinded
AL 5482.1A	AL ES&H Appraisal Program	04/30/84	Rescinded
AL 5483.1A	Occupational Safety and Health Program for Government-Owned, Contractor-Operated Facilities	10/19/84	Rescinded
AL 5700.2C	Independent Cost Estimating and Cost Standardization	07/08/88	Rescinded
AL 5700.6B REV.2	General Operations Quality Assurance	07/07/89	Rescinded
AL 5820.2A	Radioactive Waste Management	09/26/88	Rescinded
AL 5484.1	ES&H Protection Information Reporting Requirement	02/24/81	Rescinded
AL 5482.1B	ES&H Protection Appraisal Program	09/23/85	Rescinded
AL 5000.3	Unusual Occurrence Reporting System	11/02/84	Rescinded
AL 5481.1B	Safety Analysis and Review System	09/23/86	Rescinded
AL 5480.11	Radiation Protection for Occupational Workers	12/21/86	Rescinded
AL 5400.5	Radiation Protection for Public and Environment	02/08/90	Rescinded

Radioactive Mixed Waste Management," which responded to 40 CFR 116, 261, and 761 and DOE Order 8480.14, which responded to 40 CFR 300 Appendix A and Public Law 96 - 510. DOE Order 5480.2 has been superseded by 5400.3, and DOE Order 5480.14 has been superseded by 5400.4. When additional information or interpretation is needed or where local issues arise, DOE operations offices may issue operations office, local level orders for use in their activities. DOE takes the option of developing and using stronger requirements than those promulgated by other organizations.

4.2. DATA NEEDS AND DATA QUALITY OBJECTIVES (DQOs)

The data needs associated with Operable Unit 6 are those associated with defensibility for demonstration of the conditions of cleanliness of contaminated and decommissioned areas resulting from D&D cleanup activities (DDCAs). The goals are two-fold: first to allow reuse of the area for Mound Plant activities; and second, to allow a negotiation of a ROD as outlined in the FFA. This is consistent with the ultimate goal of site delisting.

Typically, data collected during the RI/FS phase of the site effort must be used to delineate the nature and extent of contamination and then develop, on a site-wide basis, a baseline risk assessment. The response objectives and evaluation of the remedial action alternatives are also based on the nature and extent of the contamination as well as available technology, cost, and the applicable requirements and yet-to-be-established cleanup criteria. Until the cleanup criteria are established and reviewed, existing ALARA-based criteria for radionuclides will continue to be used. The needs of the Mound Plant for continued activities and land use also impact this process. D&D activities to facilitate DOE reuse should not be inconsistent with the long-term goal of NPL delisting just as short term CERCLA removal actions must be consistent with long-term remediation.

4.2.1. Data Needs and Data Quality Objectives (DQOs)

Data needs for Operable Unit 6 activities fall into the following two categories:

- after D&D, verifying the cleanup of radionuclides to a given level to potential ARARs and preliminary remediation goals; and
- ensuring that data of an appropriate quantity and quality are provided to support a risk assessment based on all radioactive and non-radioactive contaminants remaining following D&D actions.

DQO data analytical levels require consistency across operable units to provide for mutual use of data. For this use, the DQOs for Operable Unit 6 will parallel those for Operable Unit 5 and Operable Unit 3. Level IV analysis, see Table IV.8, with full reporting, is necessary for this level of activity. Data generated during the verification sampling require the data validation discussed in the Operable Unit 6 QAPP.

4.2.1.1. Verification Analysis

The primary data needs category is for analysis that supports the verification of cleanup in support of either reuse of the facility or for support of the ROD. These data must also meet defensibility requirements for ROD support activities. Defensible in this context refers to the documentation and traceability associated with the sample collection and analysis so that the data may be evaluated and used in the future. This documentation includes assumptions made during planning activities, the rationale for the decisions made during planning and data collection, and any changes from plan that require evaluation for impact to the activity. The decisions include sampling approaches and analytical options to ensure that the resultant data meet data quality needs for verification and risk assessment. Because the cleanup criteria resulting from the risk assessment activity have not been determined, specific data requirements cannot be established on that basis at this time. For this reason, a conservative approach must be maintained. A reevaluation of data needs will be required as the cleanup standards are developed and implemented to assure that quantification and detection limits needs are met by the DQOs and are controlled by the QAPP. The limits of detection also must be sufficient and sufficiently reproducible to allow the cleanup activity to be statistically verifiable against the cleanup criteria. The "proof" is a statistical demonstration. Verification activities will be done according to verification sampling plans and to specific procedures and quality assurance controls.

Both planning for verification sampling and the analysis of the analytical results require the use of the uniform methods provided for by use of statistical analysis. The SAP is an area-specific planning document that provides the appropriate place for detailed statistical discussion of the analytes to be verified.

Table IV.8. Summary of analytical Levels Appropriate to Data Uses

Data Uses	Analytical Level[a]	Type of Analysis	Limitations	Data Quality
Site characterization, monitoring during implementation	Level 1	Total organic/ inorganic vapor detection using portable instruments Field test kits and screening	Instruments respond to naturally occurring compounds	If instruments calibrated and data interpreted correctly, can provide indication of contamination
Site characterization, evaluation of alternatives, engineering design, monitoring during implementation	Level II	Variety of organics by GC, inorganics by AA, XRF Tentative identification, analyte-specific Detection limits vary from low ppm to low ppb	Tentative identification Techniques/ instruments limited mostly to volatiles, metals	Dependent on quality assurance/quality control steps employed Data typically reported in concentration ranges
Risk assessment, site characterization, evaluation of alternatives, engineering design, monitoring during implementation	Level III	Organics/inorganics, using EPA procedures other than CLP, can be analyte-specific RCRA characteristic tests Gross alpha and beta[a]	Tentative identification in some cases Can provide data of same quality as Level IV	Similar detection limits to CLP Less rigorous quality assurance/quality control
Risk assessment, evaluation of alternatives, engineering design	Level IV	TCL organics/TAL inorganics by GC/MS, AA, ICP Low ppb detection limit	Tentative identification of non-TCL parameters Some time may be required for validation of packages	Goal is data of known quality Rigorous quality assurance/quality control
Risk assessment	Level V	Nonconventional parameters Method-specific detection limits Modification of existing methods Radiochemical analyses, gamma spectrometry, and non-CLP parameters	May require method development modification Mechanism to obtain services requires special lead time	Method-specific

aThese analytical levels have been specifically identified by the EPA Region V.

AA - atomic absorption
CLP - Contract Laboratory Program
EPA - Environmental Protection Agency
GC - gas chromatography
ICP - inductively coupled plasma
MS - mass spectrometry
ppb - parts per billion
ppm - parts per million
RCRA - Resource Conservation and Recovery Act
TAL - Target Analyte List
TCL - Target Compound List
XRF - X-ray fluorescence
Reference: EPA 1987.

The level of confidence associated with concluding that the site is protective to the population when it is actually not protective must be determined. The number of samples required for the demonstration must be calculated. This number is based on prior knowledge of the analyte distribution and the cleanup standards and includes potential for the existence of hot spots. This number of samples must be distributed over the area to be verified in a manner that allows for clear interpretation.

Decision choices include

- random versus systematic sampling,
- simple versus stratified,
- sequential sampling,
- sampling depth, and
- composite versus single location sampling.

Whenever NEPA-level documentation is required for CERCLA activities for Mound, planning will include all components necessary to satisfy environmental impact statement or environmental assessment requirements. Appendix A contains information on the interaction between NEPA, CERCLA, and RCRA compliance. Table IV.9 identifies the analytical methods expected for radionuclides.

Table IV.9. Radiochemical Analytical Methods

Analysis	Method
Thorium-232, thorium-230, thorium-228	Ion exchange Solvent extraction Alpha spectroscopy
Neptunium-237	
Uranium-238, uranium-235, uranium-234	
Plutonium-242, plutonium-239/240, plutonium-238	
Americium-241	
Cobalt-60	Gamma spectroscopy
Cesium-137	
Strontium-90	Carbonate precipitation Liquid scintillation detection
Plutonium-241	Ion exchange liquid scintillation detection
Actinium-227	Gamma spectroscopy when not calculated from thorium-227

- the combination and variability of contaminating substances, the potential for mixed wastes, and the operability of the method used on each contaminating substance;
- technological uncertainty of the method;
- site characteristics;
- organizational site needs;
- public reaction and acceptance;
- the potential to construct mobile or transportable units for both the operating equipment and the wastes generated;
- the total cost of remediation; and
- the availability of a disposal site.

Options available for plutonium-contaminated lands are discussed by Smith and Lambert in "Technology and Costs for Cleaning Up Land Contaminated with Plutonium" (Smith and Lambert 1976). Although this paper was aimed at the cleanup of farm land, the conclusion for available technology is much the same as that reached by Mound Plant. This paper indicates that contamination level, cleanup level, and size of the contamination area are the tradeoff factors for plutonium-contaminated areas. Shipping excavated material is a major factor to be considered in cost tradeoffs.

Based on the criteria above and the lack of a risk-based cleanup level, the methods used at Mound Plant appear appropriate. The remaining decisions appear to be those associated with the choice of method for isolation of the contaminated soil layers.

5. PROJECT MANAGEMENT AND CERCLA COMPLIANCE

This section describes project management for verification with respect to CERCLA compliance. Modifications to existing, previously used protocols are described that will integrate CERCLA compliance with the Verification process. These modifications include changes in project management, field control of excavation, and work plan and report format. The formal D&D process (Appendix C) is the precursor to verification, is the source of much of the information needed to plan verification sampling, and includes the contaminants identified and the statistical information that allows the numbers of samples needed for verification to be calculated.

5.1. D&D VERIFICATION SAMPLING AND ANALYSIS PLAN

The following is the minimum information to be supplied in an area-specific verification SAP written under the control of this Verification Work Plan for D&D activities. These SAPs implement the Verification Work Plan and provide the connection between the upper tier work planning document and the standard operating procedures (SOPs) (DOE 1992e) that control specific field actions and other routine supporting activities.

The purposes of the verification SAPs are to provide sufficient sample and analysis information for the evaluation and review of the verification activity proposed as well as to guide the field activity.

The format described below is suggested and follows the format used in two previous verification activities (in Areas 14 and 17) in Operable Unit 6.

5.1.1. Verification Sampling and Analysis Planning Document Content

The verification SAP will cover the following information as applicable:

- presampling,
- sampling,
- analysis methods, and
- data use.

The plan will describe any short lead time samples taken prior to the start of the full sampling activity to assure that the area has not been recontaminated by runoff or by deposition from solid, liquid, or airborne material. This subactivity is based on the condition in the area of interest and the conditions

and time frames for decontamination or remediation. These activities require discussion at the same level of detail and planning as the main sampling activity.

The main sampling activity requires information for the justification and rationale for the sampling, including number of samples and all sampling parameters. This includes the types of samples, individual or composite; the total number of samples and the rationale for this decision; sample locations; and frequency. The sample plan geometry, grid nodes, identification of random samples locations within the grid areas, and grid intervals are to be described. Planning must also include consideration of tank sites transferred to Operable Unit 6. Tank site identification and information is given in Appendix D (DOE 1991a). Any impacts from the sampling methods chosen need to be discussed. This material should include applicable field quality assurance planning information and field health and safety information. Applicable SOPs must be referenced and must be attached to the sample and analysis plan if not part of the associated QAPP and Health and Safety Plan. Specific methods of sample collection must be identified along with the equipment to be used. Sample handling requirements must also be identified. Cost factors impacting the choice of sampling methods should be discussed. The identification of proposed analytical methods and rationale for the choices must be presented. This provides the connections to both history and process knowledge for the area and the DQOs presented in the QAPP. Any cost rationale or impacts associated with the analysis should be discussed. Laboratory quality assurance/quality control needs are to be addressed as well as data validation strategies. The data package material requested from the laboratory is to be identified. The intended use of the data must be described. The emphasis should be how the data support the short-term and long-term program goals and are intended to be used in the verification process. Changes to SAPs are done through a change control system of internal review and approval by the organization initiating the change, and a review and approval by the same organization that reviewed and approved the original plan.

5.1.2. Verification Sampling and Analysis Plan Format

An annotated outline of the preferred format for the SAP is as follows:

1. Introduction

   Include site description and general background. It is assumed that this Verification Work Plan provides a source of material for the site and area and that this should provide a main reference. In the future, areas may be added to Operable Unit 6 as the need for D&D is established. In these cases, full area descriptions, including history, geology, and other information needed to plan the verification sampling and interpret the resulting analytical data, must be included in the Verification SAP. The Work Plan will not be revised for these areas. Specific material on source of contaminants and history should be included so that the planning sections of the SAP can be properly evaluated. Sufficient process information

should be given to be able to evaluate the potential uses of process knowledge. A discussion of existing available data and their quality should be included. The cleanup criteria that the area is expected to meet must be identified and discussed. The removal or remedial actions performed prior to the verification sampling should also be discussed.

ALTERNATIVES

The EPA document "Technological Approaches to the Cleanup of Radiologically Contaminated Superfund Sites" (EPA 1988a) provides the general discussion of methods available for radiological control and remediation. Specific methods applicable at Mound Plant have been discussed in the Preinvestigation Evaluation of Remedial Action Alternatives for Operable Units 4 (DOE 1991d) and Operable Unit 5 (DOE 1991a). For D&D activities, a more limited set of options can be identified.

As a activity under the authority of the AEA, D&D does not literally have to comply with CERCLA removal action criteria that do not prejudice the selection of a final remedy. However, the set of options must be compatible with the long-term program goals for remediation and ultimate delisting of the site. Therefore, much of the guidance developed for the Superfund program can be useful for developing D&D activities. The options also need to be compatible with the D&D goals of putting land into a condition where it can be safety reused for other purposes, as the Mound mission changes in the time frames. Administrative controls are not an effective method for reducing environmental and public health risks due to the long half-life of the plutonium-238 contamination prevalent at Mound Plant. For the areas to be reused effectively and efficiently, the available cleanup methods must be amenable to acceptable methods for expediting or accelerating the cleanup activity as required for reuse or new use. Level of contamination is also a selection factor, and this information is not available early in site characterization. These methods, as described in "Accelerated Response at NPL Sites Guidance (Superfund Management Review: Recommendation No. 22)" (EPA 1989b) and the EPA Memorandum dated 22 January 1988, Subject: The Role of Expedited Response Actions, require management consistency with DOE Order 4700.1, "Project Management System."

The usually evaluated alternatives include

- no action;
- institutional action including monitoring, restrictive land use, and alternative water supplies;
- containment actions including capping, vertical barriers, bottom sealing, and surface controls;
- collection Actions including soil excavation or dredging, *in situ* solution mining of soils, and vapor extraction of soils;
- treatment action including *in situ* biological treatment, *in situ* chemical treatment, *in situ* physical treatment, *in situ* thermal treatment, onsite treatment of soils, onsite treatment of surface water, and offsite treatment of soil; and

- disposal options including on-plant and off-plant disposal of soil and surface water.

Evaluation criteria include

- the amount of expected waste reduction and the expected hazard associated with the cleanup-generated waste;
- the hazards associated with the method itself including those to the remediation personnel;
- the radioactivity of the clean factions or remaining material;
- the combination and variability of contaminating substances, the potential for mixed wastes, and the operability of the method used on each contaminating substance;
- technological uncertainty of the method;
- site characteristics;
- organizational site needs;
- public reaction and acceptance;
- the potential to construct mobile or transportable units for both the operating equipment and the wastes generated;
- the total cost of remediation; and
- the availability of a disposal site.

Options available for plutonium-contaminated lands are discussed by Smith and Lambert in "Technology and Costs for Cleaning Up Land Contaminated with Plutonium" (Smith and Lambert 1978). Although this paper was aimed at the cleanup of farm land, the conclusion for available technology is much the same as that reached by Mound Plant.

and time frames for decontamination or remediation. These activities require discussion at the same level of detail and planning as the main sampling activity.

The main sampling activity requires information for the justification and rationale for the sampling. This includes the types of samples, individual or composite; the total number of samples and the rationale for this decision; sample locations; and frequency. The sample plan geometry, grid nodes, identification of random samples locations within the grid areas, and grid intervals are to be described. Planning must also include consideration of tank sites transferred to Operable Unit 6. Tank site identification and information is given in Appendix D (DOE 1991a). Any impacts from the sampling methods chosen need to be discussed. This material should include applicable field quality assurance planning information and field health and safety information. Applicable SOPs must be referenced and must be attached to the sample and analysis plan if not part of the associated QAPP and Health and Safety Plan. Specific methods of sample collection must be identified along with the equipment to be used. Sample handling requirements must also be identified. Cost factors impacting the choice of sampling methods should be discussed. The identification of proposed analytical methods and rationale for the choices must be presented. This provides the connections to both history and process knowledge for the area and the DQOs presented in the QAPP. Any cost rationale or impacts associated with the analysis should be discussed. Laboratory quality assurance/quality control needs are to be addressed as well as data validation strategies. The data package material requested from the laboratory is to be identified. The intended use of the data must be described. The emphasis should be how the data support the short-term and long-term program goals and are intended to be used in the verification process.

5.1.2. Verification Sampling and Analysis Plan Format

An annotated outline of the preferred format for the SAP is as follows:

1. Introduction

   Include site description and general background. It is assumed that this Verification Work Plan provides a source of material for the site and area and that this should provide a main reference. In the future, areas may be added to Operable Unit 6 as the need for D&D is established. In these cases, full area descriptions, including history, geology, and other information needed to plan the verification sampling and interpret the resulting analytical data, must be included in the Verification SAP. The Work Plan will not be revised for these areas. Specific material on source of contaminants and history should be included so that the planning sections of the SAP can be properly evaluated. Sufficient process information should be given to be able to evaluate the potential uses of process knowledge. A discussion of existing available data and their quality should be included. The cleanup criteria that the area is expected to meet must be identified and discussed. The removal or remedial actions performed prior to the verification sampling should also be discussed.

2. Sampling Objectives

The purposes of the sampling and analysis activity and their relationship to short-term and long-term project goals are to be discussed. A scope of the activity provides the connection between the radionuclide and chemical analysis needs. Limitations of the use of any existing data should be discussed so that technical gaps that need to be closed are understood. Planned use of the data to support the goals presented in section 1 are discussed in this section.

3. Sample Locations and Sample Frequency

A statistical justification is needed for sample strategy tradeoff decisions regarding

- systematic and judgmental sampling,
- random and node-based sampling, and
- grid size if use requires justification.

This justification and calculation must be included for each analyte in the verification. The calculation is to follow methods described in "Methods for Evaluating the Attainment of Cleanup Standards" (EPA 1989a). This calculation requires knowledge of the cleanup standard and statistical distribution information on the analyte in the area of interest. Based on calculated numbers of samples needed for verification, the sampling strategy is identified and justified.

Decisions on the area sampled, the strategy selected, and the methods used to evaluate the attainment of the cleanup standards will be made and justified. Advantages and disadvantages of the approach will be discussed.

Use of methods such as compositing will be justified, and analysis of the data from these samples will be discussed.

4. Sample Designations

Sample identifiers for samples collected at Mound Plant are numbered using a three-letter, ten-digit identifier with the format MNDXX-YYYY-ZZZZ. For MNDXX, XX is a two digit identifier assigned for an area. The next portion of the identifier, YYYY, designates a sample location. This is a unique identifier and continues sequentially from one sample activity to another. The location description, along with technical sample description and any other notes, is made in a field notebook entry. The section, ZZZZ, is a sequential numerical identifier for the sample location. Sample 0001 is the surface or shallowest sample for the location, and the numbers usually increase sequentially with depth for that location. A full description of the sample identification system is found in the Operable Unit 6 and Operable Unit 9 QAPPs, section 4.

The total number of samples and a summary of sample analyses planned may be included in the text or in tables. Field quality control samples should be identified. These include rinsate, trip blanks, matrix spike, and matrix spike duplicate samples and their analyses.

5. Sampling Equipment and Procedures

Procedures and any planned changes or other pertinent information should be identified. When choices are made for sampling methods, sufficient background should be presented for the reader to understand the choice of action and the expected field conditions. Information that addresses the quality of the sampling activity needs to be addressed. This includes sample bottle size requirements, preservation, decontamination methods, and

rinsate sampling instructions. References to the requirements in the Health and Safety Plan should be reiterated, and that plan should be referenced. Activity-specific information needed to supplement the information found in the SOPs must be contained in the Verification SAP for the activity. Training must also include this information. If any of the information alters the way the activity is described in the procedures, deviation forms must be completed and logged. EG&G Mound Plant procedures will be attached to the SAP if, during planning, it is determined that these procedures will be used during the activity.

6. Sample Handling and Analysis

Sampling handling includes instructions for chain-of-custody documentation, instructions for shipment, and the information required for shipment beyond that given in the referenced procedures. Onsite analysis for radionuclides must be completed and reported for samples taken at Mound Plant. Analyte lists may be area-specific. The QAPP may require amendment for area-specific reasons. These include changes to analyte lists, analytical methods, and detection limits. Analyte lists must appear in the SAP as well as the QAPP amendment. Laboratory analysis and data package requirements for the specific activity planned need to be presented in sufficient detail to allow for independent evaluation and review. Specifics of the planned analyses must be discussed in relation to the governing QAPP. Data validation procedures and methods need to be identified as an aid to planning and evaluation of the sampling effort and as a check on the decisions of the quality assurance activities that are part of the sampling effort.

7. Data Evaluation

This section discusses the methods that will be used to determine that the data fill the stated data needs from the sampling episode. "Methods for Evaluating the Attainment of Cleanup Standards - Volume 1: Soils and Solid Media" (EPA 1989a) provides a basis for the discussion. The cleanup criteria and the statistical methods to be used should be identified.

A full description of how the derived data will be compared to the cleanup standards will be given and justified. Planned statistical methods will be identified and discussed in sufficient detail to complete the activity.

8. References

This is self-explanatory.

9. Appendix Sections

These include background information, as needed, for evaluation of the material in the body of the Verification SAP. Any material that is the work of other organizations must be credited to that organization. The section should be identified as being "not subject to change via the comment and review process."

10. Figures and Tables

Suggestions for Figures and Tables include

- location maps and tables;
- information on surface lithologies;
- process information associated with the cause of the contamination;
- known contamination;
- location of samples planned for the study;

- sampling and analysis summary;
- sample designation for the study;
- preservation and container requirements;
- analytical methods, parameters, and quantitation limits for samples;
- field and laboratory quality control measurements such as matrix spike, matrix spike duplicate, surrogate spike samples; and
- statistical methods planned for use.

11. Reference Materials

This section should contain the references to be used as a bases for the evaluation of the proposed sampling and analysis activity along with other statistical references, site-specific information, and other reference material.

5.2. VERIFICATION REPORT AND REPORT FORMAT

5.2.1. Purpose of the Verification Report

The verification report is the document that provides the data interpretation and the information concerning the defensibility of a verification sampling activity for support of the ROD, to support the action for delisting of the site, or to demonstrate near-term usability of the area for any ongoing or planned activities at Mound. In this later case, the report may be used to help determine if the use of the property should be restricted or unrestricted.

The verification report may be for total verification of both radionuclides and chemicals, verification for an entire area, or partial verification. Partial verification includes activities that have a scope that is limited to a part of the area undergoing D&D or for an area that is being verified for only a portion of the analysis required for complete verification. In the cases where partial verification is being reported, the last verification report must summarize the previous activities and provide information on traceability among the activity and report parts.

5.2.2. Verification Report Content

The following annotated outline is suggested for Verification Reports. The content is mandatory. If a topic is not applicable for a partial verification activity, then the material must be included in the last or final report.

1. Introduction

1.1. Purpose of the Verification Activity

1.2. Scope of the verification Activity

This section is to include a discussion of any limitations or areas where the work does not meet or is not intended to meet full verification requirements.

1.3. Introductory Background

1.3.1. Area Description

1.3.2. Area History

2. Sampling Activity Summary

3. Summary of the DQOs

Summary of the sampling activity is as described in the SAP. This is to include sample identifications and locations, the results of any audit or surveillance activities carried out during the sampling activity, and any other information associated with an evaluation of the defensibility of the sampling activity.

3.1. References to the Procedures and Revisions used

3.2. Reference to the QAPP

3.3. Identification of notebooks and records for the activities

3.4. Descriptions of Deviations From the Activities As Planned

This is to include the reasons for deliberate changes and descriptions of inadvertent changes or any deficiencies identified. The impact on the quality of the above changes shall be discussed.

4. Summary of the Analytical Work

Identification of the time frame of work done by the laboratory or laboratories involved in the analytic work. The results of any audits or surveillances of the laboratory done by the project during the time frame of the analysis.

4.1. Data Validation

4.1.1. Description of Data Validation Methods.

This should include references to any procedures used in the activity.

4.1.2. Summary of the Case Narratives and Usability Statements

4.1.3. Summary of All Validated Data

5. Data Analysis

This section is the demonstration that established cleanup criteria have been attained.

5.1. Data Interpretation

Including graphics representing the data.

5.2. Statistical Analysis

Include methods used and their references, including EPA 1989a as an example. This section is to include the methods used. Any changes from the approaches identified in the area-specific SAP will be discussed and justified. Guidance documents or references will be identified.

5.3. Discussion

Based on the material presented in the SAP, showing that the area is clean to the pre-agreed levels. Sample calculations should be presented. Calculation sets are to be made appendix sections.

6. Conclusions

Recommendations for further work are to be made if the verification is partial or if the cleanup criteria have not been met or if the analysis is indeterminate.

Appendix sections are expected to include data summaries and samples of full calculations. If computer software is used in the analysis this must be identified and computer input and output must be shown following good software quality assurance practices

Sections of Audit Reports or identification of pertinent deficiencies or observations must be included; positive points, as well as negative items, should be identified.

5.3. SCHEDULES

Current D&D Program schedules are included in Appendix E.

6. REFERENCES

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APPENDIX A

CERCLA, NEPA, AND RCRA Integration
and
Mound UST - FFA Integration

Includes

Mound ER Program Compliance
December 5, 1990
EES-14, ERG-TSO
and
UST - FFA Integration from the Draft Inactive Underground Tanks Program Plan

OVERVIEW

The NEPA (National Environmental Policy Act) strategy for Mound presented here is based on the DOE Albuquerque Office Environmental Restoration (DOE AL ER) program NEPA Strategy Draft Document (DOE 1990a). In addition, this document is consistent with the proposed DOE NEPA Implementing Procedures (10 CFR 1021) as published in 55 CFR 46444 on November 2, 1990. The Mound ER Program NEPA compliance strategy encompasses DOE's policy to integrate NEPA with the CERCLA process, use of Categorical Exclusions (CX), and use of the interim EM (Office of Environmental Restoration and Waste Management) procedures for processing NEPA actions.

Whenever EIS or EA level documentation is required for CERCLA activities for Mound, the RI/FS will include all the components necessary to satisfy EIS or EA requirements. These components are identified in the DOE AL NEPA Compliance Strategy along with generic integrated CERCLA document outlines. It is the intent of Mound to follow these documents to the maximum extent possible.

Responsibility for preparing NEPA documents resides in the Department's line organizations, as stated in the Secretary of Energy Notice (SEN-15-90). Therefore, for the DOE AL ER Program, this responsibility rests with the DOE Dayton Area Office ER Program Manager. However, at Mound, either TSO or EG&G is responsible for generating all information necessary for completing accurate descriptions of the projects and is responsible for filling out environmental checklists and/or preparing Action Description Memorandums (ADMs) that accurately describe the impact that ER activities will have on the environment.

Diligent efforts will be made by Mound to involve the public in preparing and implementing NEPA procedures and provide public notice of NEPA-related hearings, public meetings, and the availability of environmental documents. It is intended that all Mound NEPA documents will be made available to other federal agencies, States, local governments, Indian tribes, workers, and the general public, except as provided in 10 CFR 1021.310 Subpart D (DOE 1990b). The technical terms and measurements used in NEPA documents will be defined in terms understandable to the general public and decision makers, in accordance with 40 CFR 1502.8.

Within the DOE AL ER Program, each major task is defined by the Five-Year Plan Activity Data Sheet (ADS). Each major task or Operable Unit will have two ADSs; one for assessment activity and one for remediation activity. Using ADS identifiers for NEPA documentation will lock the NEPA process to the Five-Year Plan and produce a truly integrated approach with a minimum of effort.

Much of the assessment work and Interim Remedial Actions to be performed at Mound will be categorically excluded from EA or EIS requirements under section D of 10 CFR 1021. However, for the purposes of schedules and planning, the Mound ER program assumes that Assessments and Interim Actions will require enough documentation to defend the categorical exclusion. Final Remedial Actions and Corrective Measures will require documentation at the EA level. The authority to determine the level of NEPA documentation required resides at DOE, not the installation. Schedules and budgets will have to be revised when these assumptions are not valid.

At Mound there are three levels of documentation necessary to comply with both the letter and spirit of NEPA. First, DOE HQ will prepare a Programmatic Environmental Impact Statement (PEIS) as a policy and strategy-level document that evaluates broad programmatic alternative approaches to resolving DOE's ER/WM (Waste Management) problems, including decisions on modernization of the WM complex, establishes a framework for decision-making, and informs the public how DOE will implement the ER/WM program. Second, the updated Installations EIS will cover the issues of cumulative impacts, off-site and on-site transportation of wastes (radioactive, hazardous chemical, or mixed), and the treatment, storage, and/or disposal of wastes (radioactive, hazardous chemical, or mixed) into appropriately permitted facilities. Third, when DOE mandates EA or EIS level documentation for individual activities, these activities will be fully integrated with CERCLA documents.

The Mound ER Program NEPA compliance strategy can be conceptually broken into four parts. Each part requires an action or multiple actions on the part of the installation. The Dayton Area Office/Mound will submit a description of the proposed action to DOE AL ER Program Manager. This submission will be in the form of an environmental checklist and/or an ADM. The documentation submitted will include potential risk (human and environmental) from the proposed activity; any anticipated releases (air, water, or ground pathways), disposal and/or treatment options, and other perturbations that may result. The Albuquerque Operations office will then submit the required paperwork to Headquarters.

1. Categorical Exclusion requests (Attachment 1) and Environmental Checklists (Attachment 2) for assessment activities will be submitted by the Dayton Area Office/Mound to the DOE AL ER Program Manager for each operable unit at the earliest practical time or as soon as RI tasks have been sufficiently defined. These requests will include the largest practical envelope of all ER Program assessment (site characterization) activities to be performed. This envelope will include multimedia sampling, disposal of generated wastes, and other activities as appropriate. No work will be performed on the described task until the installation has a final decision regarding these activities.

2. Categorical Exclusion request (Attachment 1) and Environmental Checklists (Attachment 2) for interim removal actions that do not result in final corrective action will be submitted by the Dayton Area Office/Mound to the DOE AL ER Program Manager at the earliest practical time or as soon as the Interim Actions are well enough defined for this purpose. These requests will include the largest practical envelope of activities to be performed. No work will be performed on the described task until the installation has a final decision regarding these activities.

3. An Environmental Checklist/ADM describing Remedial Action alternatives which result in final corrective action at a Mound will be submitted by the Dayton Area Office/Mound to the DOE AL ER Program Manager as soon after Remedial Action alternatives have been identified as possible. These requests will include the largest practical envelope of activities to be performed. After consideration by DOE HQ, the DOE AL ER Program Manager will direct the Dayton Area Office/Mound to prepare either an EA or EIS. The appropriate integrated RI/FS documents will then be prepared. No actions will be performed until the installation has either a CX, FONSI, or a Record of Decision (ROD) concerning the activity described as appropriate.

4. Environmental checklists and/or ADMs will be prepared for all activities at Mound that do not fall into one of the above three categories. For example, new construction of incinerators, waste storage, treatment complexes, or other major projects funded by the ER Program that do not require an RI/FS. Based on this information, DOE HQ will direct the Dayton Area Office/Mound to prepare either an EA or EIS. The appropriate integrated RI/FS documents will then be prepared. No actions will be performed until the installation has either a CX, FONSI, or a Record of Decision (ROD) concerning the activity described as appropriate.

IMPLEMENTATION

The DOE AL ER RCRA/CERCLA/NEPA Integrated Flow Chart (Attachment 4) and the Operable Unit 2 Baseline Schedule (Attachment 5) illustrate the relationship between NEPA and ER Program CERCLA activities. The flow chart has been specifically designed to illustrate the relationship between NEPA and CERCLA in the most general terms so as to guide the process rather than constrain it. The baseline schedule has been roller up to show the relationship between NEPA activities an field work.

Requests for CX or EA/EIS determinations as well as NEPA public participation requirements are built into the flow chart and into the baseline schedules. An attempt has been made to identify the earliest possible time to initiate NEPA documentation and still provide DOE with the information necessary for making a knowledgeable NEPA determination. Once a clear definition of an RI/FS task has been formulated, the

NEPA process can be initiated for that task. If possible, all assessment activities should be packaged into one request for CX and all interim actions into another. The "packaging" for these requests will depend on site specific variables and timing.

Many of the activities presented on the flow chart and on the baseline schedules occur in parallel. NEPA actions will be initiated at the same time as work plans are being developed and interim measures are being planned. However, no field work related to these work plans may proceed until a NEPA determination has been received. Failure to initiate NEPA documentation early may delay both interim measures and the final corrective remedial action.

The NEPA process will be initiated any time work not covered by a previous NEPA document is being proposed. This could result from identification of data needs during the course of ER program activities for which additional work is necessary. No work may proceed pertaining to the "new" activities until the activity is covered by a NEPA document.

DOCUMENT DESCRIPTIONS

The Dayton Area Office/Mound and TSO are responsible for preparing ADMs, Environmental Checklists (Attachment 2), Requests for Categorical Exclusion (Attachment 1), EA/EIS determination sheets (Attachment 3), Environmental Assessments, and Environmental Impact Statements.

The ADM is expected to be a short document (a few pages) that describes the proposed action and the potential environmental issues. It need only contain sufficient information to permit a reasonable determination of the required level of NEPA documentation. As stated in the DRAFT DOE NEPA Compliance Guide, an ADM should include:

1. An explanation of the purpose and need for the proposed action, stating the type and class of action (e.g., program or project, legislative or administrative) and indicating its scope and estimated cost.

2. The proposed location of the action, if site specific, should be identified clearly by naming the closest city or metropolitan area and the county and state in which the action is to take place. Other characteristics such as rural or urban qualities, environmental setting (forested, desert, outer continental shelf, grasslands, etc.) and economic conditions of the areas should be included, as appropriate.

3. Any known or potential environmental issues should be briefly presented. These may include such issues as presence of endangered species, possible conflict with historic areas, Indian lands or religious sites, involvement of floodplains or wetlands, known air or water quality problems, or worker impacts.

The ADM will be transmitted by the area office to the DOE AL ER Program Manager, who in turn will submit the ADM for Headquarters determination of whether to prepare an EA or EIS level RI/FS. Attachment 3 is a suggested submittal sheet for this determination.

An Environmental Checklist (Attachment 2) is the fundamental device used by the Area Office to help determine the level of NEPA documentation that will be required for the described activities. An Environmental Checklist will be submitted by TSO or EG&G to the Dayton Area Office.

Environmental Assessment Determination form will be filled out by EG&G or TSO and transmitted to the Dayton Area Office Program Manager. Headquarters may decide that EA level documentation is appropriate for the proposed RI/FS activities. An EA has three defined functions:

(1) to determine whether a proposed action requires preparation of an EIS.

(2) to aid an agency's compliance with NEPA when no EIS is necessary, that is to provide an interdisciplinary review of proposed actions and to help identify better alternatives and mitigation measures, and

(3) to facilitate preparation of an EIS when one is necessary. If an agency determines on the basis of an EA not to prepare an EIS, a FONSI is issued (40 CFR 1501.4 and 1508.9).

PUBLIC PARTICIPATION

Public review and/or scoping occurs in specific places on the flow chart. There are circumstances when public review/scoping may be advisable in addition to what is presented on the chart. Whenever this is the case, the same format that is followed with the EIS procedure should be followed. Publish a NOI in the appropriate media (the Federal Register and/or locally). Conduct at least one public meeting not earlier than 15 days after publishing the NOI. A public comment period of at least 30 days should follow the last of the meeting(s). Public comments should be considered and/or incorporated into the final document or action discussed in the meeting(s).

Public Participation Requirements for EA level activities. Prepare an EA to give to the Area Office. The host state (and adjacent states, if appropriate), will have the opportunity to review and comment on the EA prior to its approval. The review period should be from 14 to 30 days as determined by DOE.

Public Participation Requirements for EIS level activities. Prepare EIS Implementation Plan and make this plan available to the public.

Produce the Draft EIS and publish a Notice of Availability (NOA) of the draft EIS. At a minimum the NOA should appear in the Federal Register and at the discretion of DOE, announce the NOA in the local media.

Subsequent to a public comment period, Prepare and distribute the final EIS. The final EIS must respond to the comments generated during the public comment period.

REFERENCES

DOE 1990a. "DRAFT NEPA Strategy Document," DOE Albuquerque Operations Office, Albuquerque, New Mexico, November 11, 1990

DOE 1990b. "National Environmental Policy Act Implementing Procedures," 10 CFR 1021.310 (55 FR 46444), November 2, 1990.

ATTACHMENTS

CATEGORICAL EXCLUSION SUGGESTED SUBMITTAL FORM
ENVIRONMENTAL CHECKLIST SUGGESTED SUBMITTAL FORM
EA/EIS DETERMINATION SUGGESTED SUBMITTAL SHEET
DOE AL ER RCRA/CERCLA/NEPA INTEGRATED FLOW CHART
MOUND BASELINE SCHEDULE, OPERABLE UNIT ~~1~~ 2 - SEEPS

CATEGORICAL EXCLUSION (CX) DETERMINATION

Proposed action: _____

_____

_____

_____

Location: _____

Proposed by (if other than DOE): _____

Description of the proposed action: _____

_____

_____

_____

_____

CX to be applied (from Section D, DOE NEPA Guidelines):

_____

_____

_____

I have determined that the proposed action meets the requirements for the CX referenced above. Therefore, I have determined that the proposed action may be categorically excluded from further NEPA review an documentation.

Signature: _____

Title: _____

Date: _____

EH-25 has reviewed this determination and has no objection.

Signature: _____

Date: _____

Attachment 1

U.S. DEPARTMENT OF ENERGY
Albuquerque Operations Office
ENVIRONMENTAL CHECKLIST

Subject/Activity Title:	Project/Activity Number:	Date:
AO/Contractor:	AL Tracking Number:	
AO/Contractor Contact Name:	Signature:	

A. BRIEF PROJECT/ACTIVITY DESCRIPTION: Include category (experiment, test, modification, maintenance, etc.), location, schedule, cost, etc.

B. ENVIRONMENTAL CONCERNS: Will the project/activity, either during construction or operation, result in changes and/or disturbances in the following entities? Provide brief explanations where appropriate. If the proposed project/activity represents a commitment to a course of actions that would ultimately require a positive response to one or more of the questions below, identify question numbers and provide explanation.

	YES	NO		YES	NO
1. Air Emissions	___	___	12. Sewage system	___	___
2. Liquid effluents	___	___	13. Clearing or excavation	___	___
3. Solid Waste	___	___	14. Activity outside area fence/ wildlife	___	___
4. Radioactive waste/soil	___	___	15. Archaeological/cultural resources	___	___
5. Hazardous waste	___	___	16. Noise levels	___	___
6. Mixed waste (rad & haz)	___	___	17. Radiation/toxic chemical exposures	___	___
7. Chemical storage/use	___	___	18. Pesticide/herbicide use	___	___
8. Petroleum storage/use	___	___			
9. Asbestos waste	___	___			
10. Water use/diversion	___	___			
11. Drinking water system	___	___			

Explanation and qualification of specific responses of "yes."

Number	Explanation
_____	_____
_____	_____
_____	_____

C. Does the proposed project/activity require any local, state, or federal permits/notifications?
_____ Yes _____ No Explain _____

D. DETERMINATION CLASSIFICATION: _____

Signature: _____ Date: _____
Title: _____

E. EH Objection: _____ Yes _____ No

Signature: _____ Date: _____
Title: _____

Attachment 1

ENVIRONMENTAL ASSESSMENT (EA) DETERMINATION

Name of project: _____

Location: _____

Proposed by (if other than DOE): _____

Description of the proposed action: _____

_____

_____

_____

_____

Action Description Memorandum attached: [ ] yes [ ] no

Class of action to be applied (from Section D, DOE NEPA Guidelines):

_____

_____

I have determined that the proposed action is within the class of actions normally requiring an EA but not necessarily requiring an environmental impact statement (EIS), as listed in the above-referenced class of actions defined in Section D of the DOE NEPA Guidelines. Therefore, I have determined that an EA may be prepared to assess the impacts of the proposed action. Based on the analysis in the EA, DOE will either prepare a Finding of No Significant Impact and proceed with the action, or will prepare an EIS if the EA reveals the potential for significant environmental impacts.

Signature: _____

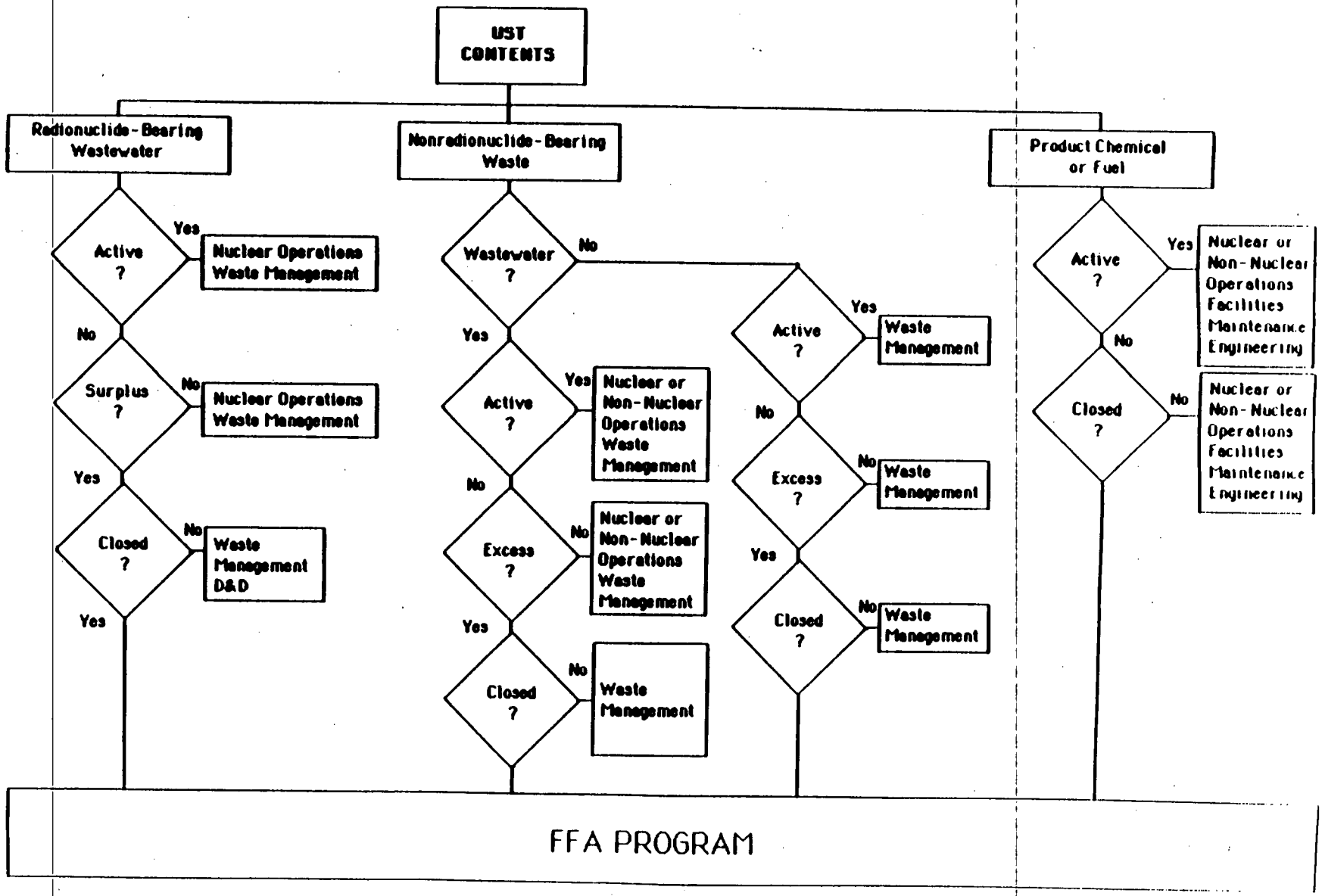
Title: _____

Date: _____

EH-25 has reviewed this determination and has no objection.

Signature: _____

Date: _____


UST CONTENTS
Radionuclide-Bearing Wastewater
Nonradionuclide-Bearing Waste
Product Chemical or Fuel
Active ?
Yes
Nuclear Operations Waste Management
No
Surplus ?
No
Nuclear Operations Waste Management
Yes
Closed ?
No
Waste Management D&D
Yes
Wastewater ?
No
Yes
Active ?
Yes
Nuclear or Non-Nuclear Operations Waste Management
No
Excess ?
No
Nuclear or Non-Nuclear Operations Waste Management
Yes
Closed ?
No
Waste Management
Active ?
Yes
Waste Management
No
Excess ?
No
Waste Management
Yes
Closed ?
No
Waste Management
Active ?
Yes
Nuclear or Non-Nuclear Operations Facilities Maintenance Engineering
No
Closed ?
No
Nuclear or Non-Nuclear Operations Facilities Maintenance Engineering
FFA PROGRAM

APPENDIX B

HISTORICAL BACKGROUND INFORMATION

April 26, 1991

D&D/RA INTER PROGRAM AGREEMENT

This inter program agreement defines the soil activities responsibilities between the Decontamination and Decommissioning (D&D) Programs and the Remedial Action (RA) (CERCLA 120 FFA Program) Programs. These responsibilities where designated, include funding responsibility.

The Decontamination and Decommissioning (D&D) Program has the primary responsibility for assessment and cleanup of radioactively contaminated soils on the Mound Plant site. These soils are those suspected to be above Mound's current remedial action guidelines (see attachment).

Areas suspected to be below these guidelines for radioactive contamination will be assessed by the Remedial Action (RA) Program along with areas of hazardous chemical contamination.

Areas onsite that are suspected to contain both radioactive (above Mound's current remedial action guidelines) and hazardous chemical contamination are also the prime responsibility of the D&D Program for both assessment and cleanup. If hazardous chemical contamination is still present in an excavated area after the radioactive contamination has been removed, D&D will continue the cleanup as appropriate.

For past projects where D&D has already completed the excavation of the radioactively contaminated soil, the RA Program will have the responsibility for assessment and any needed remediation for hazardous chemical contamination.

For D&D projects currently underway, D&D will sample excavated areas and analyze for hazardous chemicals using a sampling plan designed to meet CERCLA criteria. This CERCLA characterization responsibility includes application of the generic sampling plan, preparing the Quality Assurance Project Plan, performing sampling and generating the final report. Unless a safety hazard or major program impact is present, D&D will not backfill the excavation until the results of this sampling and analysis phase are reviewed. If any radioactive or hazardous constituents are detected in the assessment (characterization) sampling phase, cleanup standards will be included in the site specific verification sampling plan. If this sampling occurs prior to the sampling plan receiving EPA approval, the RA Program may have to resample these areas at a later date.

If hazardous chemical contamination that causes the generation of mixed waste is found during a D&D soils project, the project will stop in an orderly fashion until a review and decision of the mixed waste disposal options are resolved.

For future D&D projects initial assessment (characterization) of the soil will include radioactive and hazardous chemical contamination sampling. D&D will be responsible for assuring that at the conclusion of radioactive contamination remediation the residual soil is free of both radioactive and hazardous chemical contamination within current release criteria.

The D&D Program also has the responsibility for future cleanup of radioactive contamination for any onsite location that may be found to have radioactive contamination above Mound's current action guidelines.

D&D will generate a schedule that will be incorporated into the FFA schedule. The primary focus of the FFA to D&D is to assure that residual contamination, i.e. contamination left in soil after D&D, meets the CERCLA requirements.

Ralph R. Jaeger
Manager, D&D Program Management
Engineering Department

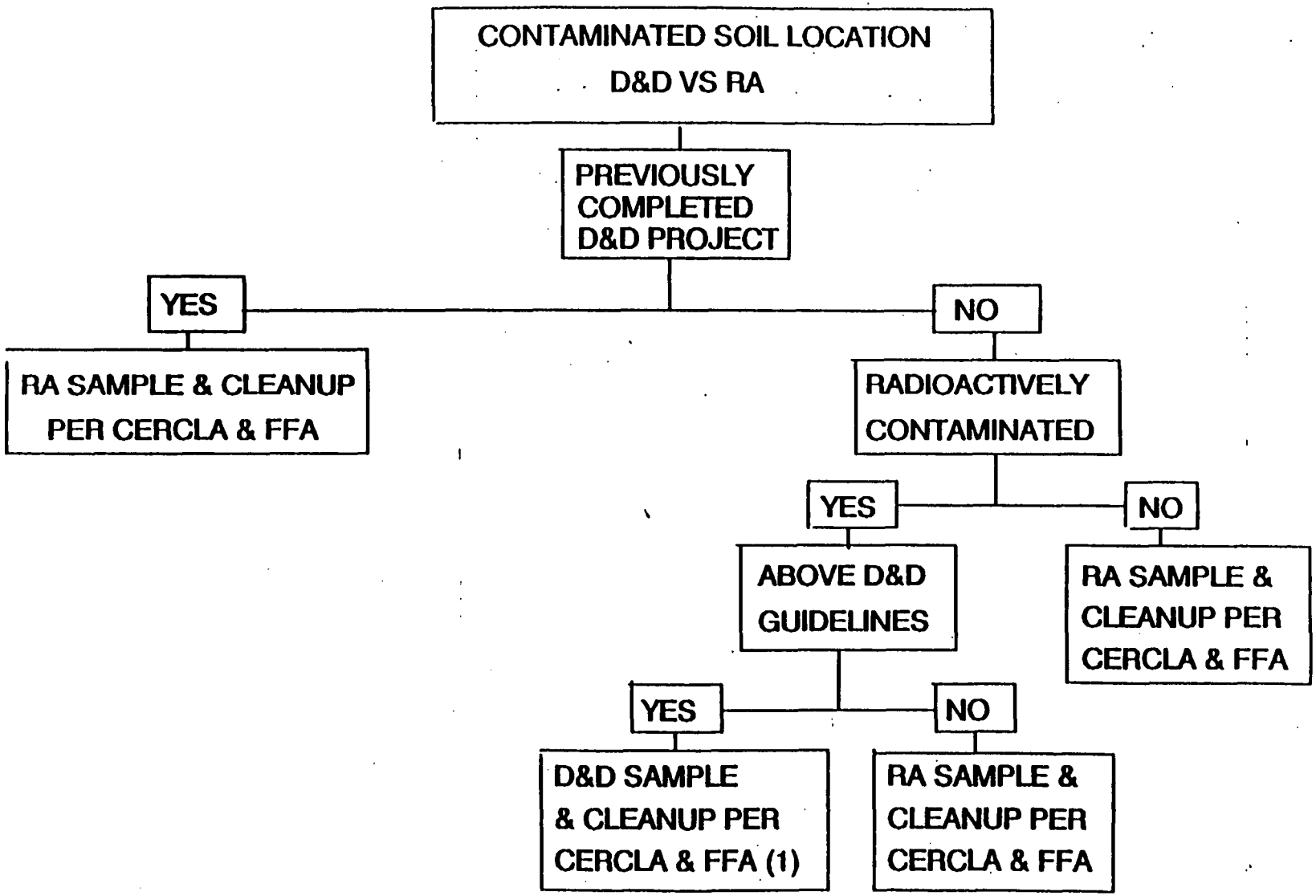
Richard A. Neff
Manager, ES&H Compliance and
Remedial Action
ES&H Department

CURRENT MOUND PLANT RADIOACTIVELY CONTAMINATED SOIL REMEDIAL ACTION GUIDELINES*

Plutonium-238 (pCi/g)	Thorium (pCi/g)	Colbalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)	Actinum-227 (pCi/g)
100 + ALARA	5 Surface 15 Subsurface	80	80	5 Surface 15 Subsurface	20	25

*Current remedial action guidelines are subject to change, pending additional pathway analysis and risk assessment.

Source:

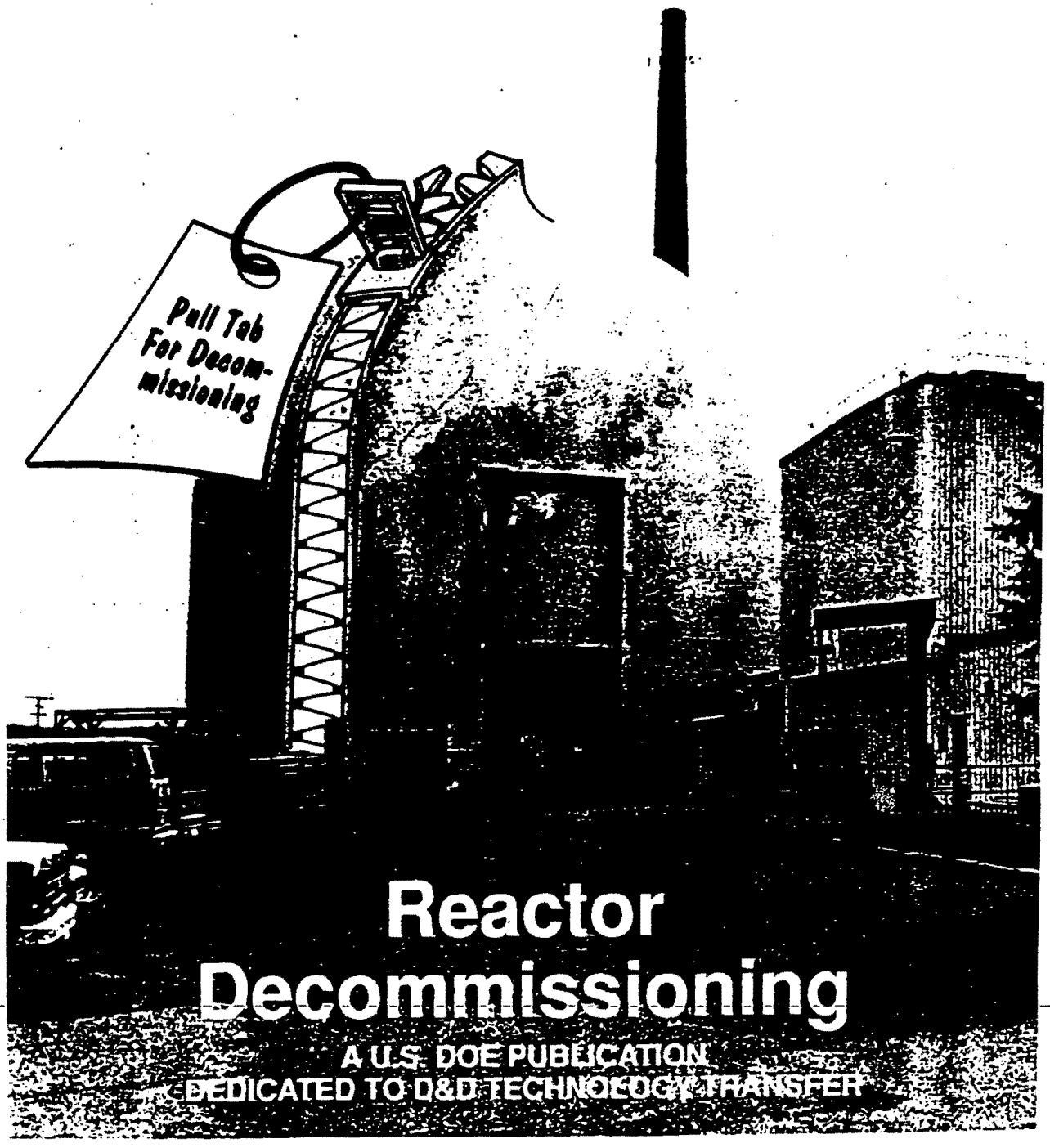


(1) INCLUDES INITIAL CHARACTERIZATION OF SOIL FOR RADIOACTIVE & HAZARDOUS CONSTITUENTS, REMOVAL, APPLICATION OF GENERIC VERIFICATION PLAN, DEVELOPMENT OF THE QAPP, PERFORMING SAMPLING AND GENERATING THE FINAL REPORT.

D&D BULLETIN

DOE DECONTAMINATION AND DECOMMISSIONING PROGRAMS

Bulletin No. 89-1
July 1989



Reactor Decommissioning

A U.S. DOE PUBLICATION
DEDICATED TO D&D TECHNOLOGY TRANSFER

RAPID SCREENING OF SOIL FOR RADIOACTIVITY

D. G. Draper

Decommissioning and decontamination (D&D) work, in which radioactive contamination is "cleaned up" to release buildings or equipment for nonradioactive work, is an ongoing project at Mound. In 1985, as part of a D&D program, soil contaminated with ^{238}Pu was designated for removal from the plant site. But the portable field instrumentation available could detect with accuracy only ten times the level of radioactivity that had been set as a release limit, while radiochemical analysis in the laboratory would have required nearly three days. Mound, therefore, designed an intermediate detection system that provides adequate sensitivity below the guideline value and rapid turnaround time.

INTRODUCTION

When health physicists at Mound developed a plan for removing soil that had been contaminated with ^{238}Pu, a radioisotope that decays primarily by emitting an alpha particle, a release limit of 100 picocuries per gram (pCi/g) was established. Based on technical evaluation, this limit was determined to be adequate to protect personnel and cost-effective. Above this guideline, the soil would be removed from the plant site.

A review of available instrumentation revealed that portable field instrumentation could detect ^{238}Pu concentrations down to ~1000 pCi/g, not sensitive enough by a factor of ten. The alternative, subjecting soil samples to radiochemical analysis in the laboratory, had one advantage: the sensitivity of the bench test was 1 X 10^4 times better (~0.01 pCi/g) than required for the D&D guideline. There were, however, two disadvantages: radiochemical analysis of a routine sample would require nearly three days and the capacity of Mound's analytical laboratories would prohibit the processing of the large number of samples associated with this screening project. Thus, a system with adequate sensitivity below 100 pCi/g and rapid turnaround time was urgently needed. Additional features that were highly desirable were ease of operation, low cost, and dependability.

WHAT IS A PICOCURIE?

Radioactive contamination in soil is usually measured in picocuries. The basic unit, the curie, is defined as the radioactivity of one gram of radium, based on pioneer work in radiation by Marie and Pierre Curie. A picocurie (pCi) is one trillionth of a curie (Ci).

In terms of ^{238}Pu, the most common alpha-emitting radionuclide encountered at Mound, 1 pCi of radioactivity is emitted by approximately five hundredths of one trillionth of a gram. This 1 pCi of ^{238}Pu equates to 2.22 nuclear transformations per minute, each transformation resulting in the emission of one alpha particle. Approximately 10% of the alpha particles create a low-energy X ray that is useful in the detection of ^{238}Pu.

HOW MUCH SOIL CONTAMINATION IS ALLOWABLE?

Mound has determined that less than 100 pCi/g of ^{238}Pu in soil does not pose a risk to people who work with, dig in, or build on the soil. This guideline has been approved by the U. S. Department of Energy and is the one Mound adheres to when removing contaminated soil. In keeping with the principle of maintaining all exposures to radiation As Low As Reasonably Achievable (ALARA), however, Mound pursues 25 pCi/g as the design goal in cleaning any surface or subsurface soil.

AN ALPHA COUNTING APPROACH

A search for systems that might be altered to meet these requirements turned up an alpha counting system with the potential for providing the required sensitivity. Calculations indicated that a lower detection limit of ~25 pCi/g was possible. An alpha scintillation probe with a large surface area was fixed in a light retardant chamber and connected to a scaler. Early tests with soil standards made from ^{238}Pu solution homogeneously mixed with low background Ottawa sand proved highly encouraging, with an estimated lower limit of detection of 5 pCi/g. This system met the requirements of the D&D guideline, and, in addition, it provided the capability for screening soil samples collected at Mound for reasons other than D&D. Prescreening all soil samples before submission to an analytical laboratory became routine procedure, thus reducing the potential for alpha contamination of a laboratory.

Initially, radiochemical verification of duplicate samples of sandy backfill from around underground lines indicated close agreement between radiochemical analysis and alpha counting. Later, however, routine verification analyses of surface and subsurface soil samples indicated that some samples were being reported an order of magnitude lower than the actual radioactivity. After a thorough evaluation, it was concluded that the problem was the result of matrix effects. Sand samples adsorbed the contamination and retained it on the outside of the particle, whereas clay type soils adsorbed contamination within the particle as well as on the surface of the particle. In the latter case, screening missed the nonpenetrating alpha particles entrapped inside the clay particle. Without a method to determine the particle size and soil composition, the system would not provide reliable results. A refinement or a new technique was needed.

MEASURING LOW-ENERGY GAMMA AND X-RAY EMISSIONS

Because the alpha detection system proved to be inappropriate for some soil types, it was decided to measure a different type of radiation. Although ^{238}Pu decays by emission of an alpha particle, some of the decays simultaneously produce a characteristic X ray. This X ray could potentially be used in the assay of soil samples. A review of the literature revealed that Los Alamos National Laboratory had developed a system based on this principle. Their system screened soil samples for high levels of ^{241}Am using a portable phoswich detector configured into a counting system. Using a portable phoswich detector that had been under field evaluation at Mound, we determined a lower limit of detection of ~100 pCi/g for ^{238}Pu in preliminary tests. Although this met the D&D objective, the uncertainty connected with the lower limit made the system only marginally adequate for the program and it was abandoned.

During an evaluation of the portable Fidler (Field Instrument for the Detection of Low-Energy Radiation) system, it was discovered that these field instruments could be modified to provide analog output, which could then be routed to a multichannel analyzer. The voltage of the output pulse is directly proportional to the energy of the radiation, and the multichannel analyzer can sort the signal according to energy. In this way, a low-energy gamma or an X-ray source can be identified and quantified by the number of "events" that occur in a channel or group of channels during a specified counting period, which would typically be under 10 minutes. Plutonium-238 with its X rays at 17 keV was a candidate for use with this type instrument.

A laboratory procedure based on the Fidler system was developed and was then evaluated for accuracy and precision. The lower limit of detection was ~25 pCi/g with an estimated error of 35% in the range of 25 to 100 pCi/g. Comparative analysis of different soil types, including dried and undried soils, showed that matrix effects were not significant using the Fidler system.

The energy range that was established for the system was roughly 10 to 100 keV. This range is effective for the thin (0.063 in.) sodium iodide

detector found in the Fidler, and it provides the capability to detect thorium X rays in the 85 to 93 keV range. Thorium had been used in many previous projects at Mound, and this extended capability provided additional, valuable information. It was found, however, that higher levels of thorium could interfere with the measurement of the lower energy X rays from ^{238}Pu, so that, for samples in which both radionuclides were found, the confidence level of the ^{238}Pu determination was low.

For these cases, a different system with better energy resolution was necessary. Figure 1 compares energy resolution for three different detectors. A reverse electrode hyperpure germanium detector with a portable multichannel analyzer was chosen for the mixed radionuclides cases. Although the resolution is significantly better with this instrument than with the Fidler, and thorium interference is minimized, the counting efficiency is much lower, resulting in longer counting times for the same level of detection. This trade-off is acceptable, however, in view of the fact that, of the total number of samples, only a few are found to contain both ^{238}Pu and thorium.

Environmental personnel analyzed 888 samples that had been screened on the Fidler system. The results, summarized in Table 1, showed that the system provided good capability to distinguish ^{238}Pu contamination at the 25 pCi/g level. The Fidler tended to overestimate the number of samples contaminated with more than 25 pCi/g of ^{238}Pu - an error on the conservative side, which is desirable from an environmental protection viewpoint. Continued improvements in managing the data from the Fidler counting system have included interfacing the multichannel analyzer directly to a personal computer, compiling the spectral data into a data base, and initiating computer generated reports.

CONCLUSION

Now a proven system, the soil screening facility has processed approximately 15,000 soil samples since 1984, almost 6000 of them in 1987 alone. Because all excavations at Mound require a soil assessment, the facility has become important in the screening of all soil samples. Thus, although it was designed for D&D work, only 50% of its samples now originate from D&D.

The Fidler counting system, used in our facility for ^{238}Pu, could easily be adapted for use with other low-energy gamma-emitting radionuclides. The original alpha counting system is sometimes used to screen high-volume air samples, which do not exhibit the matrix effects found in soil samples.

BIBLIOGRAPHY

Casella, V. R., Environmental Science Report, MLM-MU-85-63-0001 (Fourth Quarter, 1984), pp. 14-15.

Umbarger, C. J., "Soil Monitoring Instruments," CONF-791234 (February 1981), pp. 41-45.

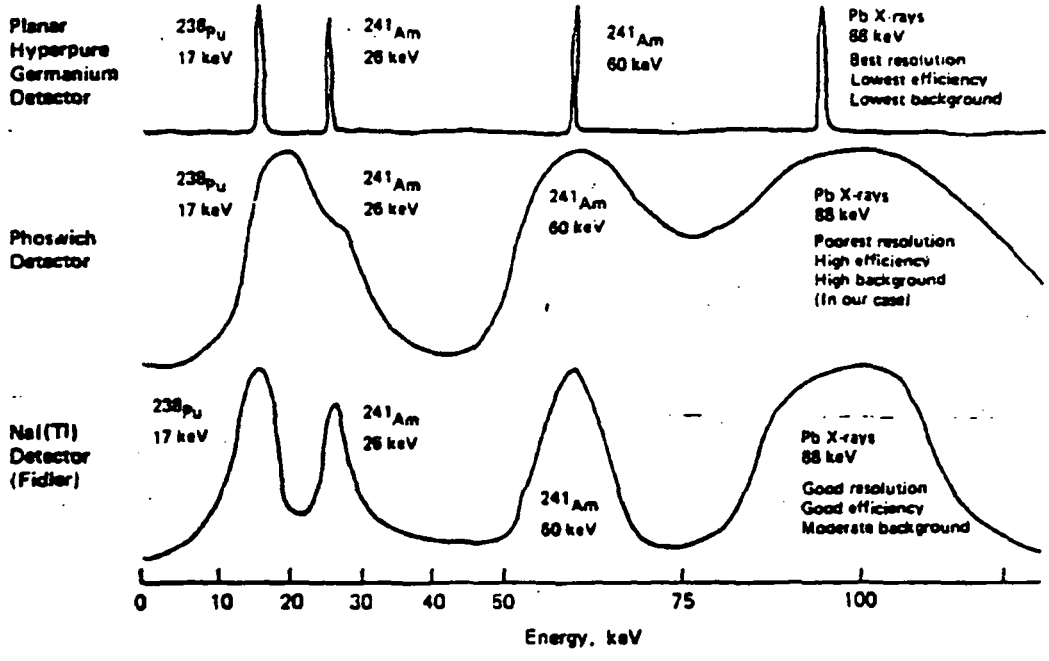


Figure 1 - A comparison of energy resolution in low-energy gamma and X-ray detectors. Both the plannar germanium and the Fidler detectors are used in Mound soil screening.

Table 1. Agreement of Fidler System with Radiochemical Analysis for 888 Samples of Soil contaminated with ^{238}Pu.

		No. of Samples			No. of Samples
Fidler reported <25*		816	Fidler reported >25		72
Radiochemical results	<25	807	Radiochemical results	>25	50
	>25	9		<25	22

*Values indicated are in pCi/g.

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APPENDIX C

(This paper was presented at the ERDA Conference on Decontamination and Decommissioning (D&D) of ERDA Facilities, Idaho Falls, Idaho, August 19-21, 1975)

A SUMMARY REVIEW OF MOUND LABORATORY'S EXPERIENCE IN D&D OF RADIOACTIVE FACILITIES 1949-1973

J. M. Garner & W. P. Davis
Mound Laboratory*
Miamisburg, Ohio 45342

ABSTRACT

The objective of Mound Laboratory's Decontamination and Decommissioning (D&D) projects has been the effective termination of radioactive material processing facilities with no significant personnel exposures or environmental releases. This objective must be met with available resources and manpower.

Mound has effectively decontaminated and/or decommissioned four major facilities in the 1949 through 1973 time period. Many minor areas were also decontaminated and/or decommissioned during this period. The major D&D projects involved the following isotopes: polonium-210, radium-226, actinium-227, and plutonium-238.

To achieve a D&D status, Mound has employed several control and decontamination techniques such as: "Navy Cocooning," entombment, removal, foaming, bagging, tents, chutes, portable exhausters, dry ice, vents, bubble suits, three-zones, fire watches, painting and sealing, in-line cleaning, high pressure water blaster, and chemical cleaning.

*Mound Laboratory is operated by Monsanto Research Corporation for the U.S. Energy Research and Development Administration under Contract No. E-33-1-GEN-53.

A SUMMARY REVIEW OF MOUND LABORATORY'S EXPERIENCE IN D&D OF RADIOACTIVE FACILITIES, 1949-1973

J. M. Garner & W. P. Davis

Introduction - Mound Laboratory has completed four major Decontamination and Decommissioning (D&D) projects of ERDA facilities over the years in addition to several minor D&D projects.

The four major D&D projects were:

1. Two polonium-210 processing facilities.
2. A radium-226 and actinium-227 processing and waste disposal facility.
3. A plutonium-238 processing facility.
4. A third polonium-210 processing facility.

The details of these four major projects are described in the following sections.

Polonium-210 Facilities - Units III and IV were used to process polonium-210 from 1944 through 1949[1,2]. Unit III contained approximately 35,000 ft.^{2} of contaminated floor space and was decontaminated and decommissioned from 1949 to 1950 under the direction of AEC/Oak Ridge by conventional scrubbing and removal techniques. The main building was returned to the original owners (The Dayton Board of Education) in 1950. The outer smaller buildings were removed (including footer), and the area was backfilled.

Unit IV was approximately 16,000 ft.^{2}. The building was decontaminated as much as possible by conventional scrubbing and removal techniques. The structure and footer were then removed, and the area was backfilled. The site was returned to the original owner (The Talbott Family) in 1950.

Monitoring included air samples, wipe and direct contamination surveys, water and urine samples. End results of D&D was N/D (nondetectable) removable alpha and less than 5×10^3 dis/min/100 cm^2 fixed alpha (5×10^4 on Unit IV). Followup surveys shows N/D due to the short (138-day) half-life.

Personnel protection included clothing and respiratory (half and full face masks) protection. Clothing was basically two-piece whites, coveralls, gloves, control shoes, shoecovers, and booties.

Radium-226 and Actinium-227 Facility - The "Cave" and associated waste disposal facilities were used to process radium-226 and actinium-227 from 1952 to 1954. The Cave and associated facilities contained approximately 4,000 $ft.^2$ of contaminated floor space and was D&D'd under the direction of the AEC/DAO by conventional scrubbing, removal, "Navy Cocooning," and entombment techniques. The D&D was performed during the 1955 through 1957 time period (equipment in "Navy Cocoons" was on hold until 1957) with available manpower. A portion of the Cave structure (where high level material was processed) was entombed in 12 in. of concrete. The remainder of the facility was decontaminated to N/D removable and less than 400 dis/min/100 cm^2 fixed alpha contamination. This portion is now used for other programs.

Monitoring included air samplers, radon sampling, wipe and direct contamination surveys, gamma surveys, and urine samples.

Personnel protection included clothing and respiration protection (half and full face supplied-air masks, bubble suit). The Mound-Synder supplied-air bubble suit was developed and used on this project.

Plutonium-238 Facility - The SM Facility was used to process plutonium-238 for space programs from 1961 to 1968.

The SM Facility contained approximately 15,000 ft.^{2} of contaminated floor area (585 linear feet of gloveboxes) and was D&D'd under the direction of the AEC/DAO office by employing several control and decontamination techniques such as: removal, foaming, bagging, tents, chutes, portable exhausters, dry ice, vents, bubble suits, three-zones, fire watches, painting and sealing, in-line cleaning, high pressure water blaster, and chemical cleaning. The Facility is now awaiting final disposition by ERDA. The D&D was performed during the 1968 through 1972 time period (work emphasis on later years).

Monitoring included air samplers, wipe and direct contamination surveys, γ-n surveys, soil and water samplers, nosewipes, urine samples, WBC, film badges, etc. The current contamination level inside the facility is less than 10,000 dis/min/100 cm^2 removable alpha and less than 400,000 dis/min/60 cm^2 fixed alpha. (Painting was not used.)

Personnel protection included clothing and respiratory protection. This protection included: two-piece whites, coveralls, two-piece plastic suits, two-piece supplied-air bubble suits, shoecovers, booties, control shoes, head covers, and filtered and supplied-air respiratory protection.

A Third Polonium-210 Facility - The "T" Facility was used to process polonium-210 for commercial sale and space programs to 1972.

The radioactive processing section was approximately 32,000 ft.^{2} for two floors (236 linear ft. of gloveboxes) and was D&D'd under the direction of the AEC/DAO office by conventional scrubbing and removal techniques. The D&D was performed during the 1971 through 1973 time period. The facility is now used for both radioactive and nonradioactive work.

Monitoring included air samples, wipe and direct contamination surveys, γ-n surveys, soil and water samplers, urine samples, WBC, film badges, etc. The area was decontaminated to N/D removable alpha and N/D fixed. Painting was allowed only on surfaces less than 4,000 dis/min (decayed to N/D by end of project).

Personnel protection included clothing and respiratory (filtered and supplies air) protection.

Special Techniques - Several techniques were found to be effective in controlling and reducing the spread of contamination during decontamination and decommission work.

Equipment and structures contaminated with short half-life material were removed for storage at a controlled area until decay had reduced contamination levels to N/D.

Sealing equipment and structures were used for containment purposes. The Navy Cocooning method was used in the earlier days, but has now been replaced with foaming. Other materials such as asphalt, concrete, and paint can be used on items that are to be discarded or are contaminated with a short half-life material.

Containment can be achieved by using plastic bags and enclosures. These enclosures were especially helpful when working outside the building.

Temporary access methods such as a chute improved efficiency.

Portable exhausters such as Spencer turbines and large industrial vacuum cleaners with absolute filters provided added negative differential to small work areas.

The use of dry ice to remove tile minimized the spread of contamination.

Small respirator filters were used as vents when equipment was foamed.

The Mound-Synder supplied-air bubble suit provided personnel with maximum respiratory and contamination protection.

The use of three separate zones of contamination levels proved to be effective in contamination control.

A 24-hr, seven-days a week, "fire watch" was provided on occasion to increase ability (in addition to automatic alarms) to detect potentially hazardous conditions.

In-line glovebox cleaning and separation of equipment proved to be very successful. Even high pressure washing can be used if the gloveboxes are not deteriorated.

A variable high pressure water blaster was used to reduce decontamination time. Wet sandblasting was used on a limited basis because of problems with lines and drains plugging.

Chemical cleaning such as paint removers and acid solutions also reduced decontamination time. Mechanical paint chippers were used only on a limited basis because they were time consuming.

The exact methods used for D&D work will depend on an evaluation of several factors: half-life of contaminants, type, specific activity, quantity of contamination, the presence of other radioactive and nonradioactive contaminants, location, and desired end result.

Summary - In conclusion, Mound Laboratory has completed four major Decontamination and Decommissioning projects. These projects were accomplished in an effective manner by use of these contamination control techniques, procedures, and decontamination techniques. As a result, there were no significant personnel exposures and no significant impact on the environment as verified by data from the following monitoring programs: stack sampling, on-site and off-site monitoring stations, bioassay sampling, and dosimetry data.

The D&D projects were also completed with minimum impact on operational resources and manpower.

References

1. Report No. 3 of Steering Committee for Disposal of Units III and IV, MLM-461, Mound Laboratory, April 17, 1950.

2. Completion Report for Disposal of Unit III, MLM-393, Mound Laboratory, October 31, 1949.

April 11, 1986
Revised June 13, 1986

PLUTONIUM 238/239 CONTAMINATED SOIL CLEANUP OPERATIONAL GUIDELINES FOR CONDITIONAL RELEASE

MOUND'S DECONTAMINATION AND DECOMMISSIONING (D&D) PROGRAM

Below are the operational guidelines to be used in evaluating whether plutonium-238/239 contaminated soil within the Mound restricted fence line requires additional remedial action. The objective of remedial action on soil is to primarily eliminate potential exposure health hazards from highly contaminated soil (TRU or >100nCi/g).

A secondary goal is to reduce contamination levels to "as low as reasonably achievable" (ALARA) levels based on a cost versus benefit analysis.

Based on an evaluation of regulatory guidance, work done at other DOE sites, field measurement and analysis capabilities, and a site specific pathways analysis a level of 100 pCi/g has been chosen as a goal of D&D remedial action of near surface (first 12 inches) soil.

However, this goal (and action levels for soil deeper than 12 inches) is dependent on several factors and exemptions will be granted by the D&D Management Team and Environmental section based on an evaluation of several parameters:

- Availability for migration, resuspension, or disturbance
- Cost versus benefit of additional remedial action
- Risk to personnel and the environment for further remedial action
- Potential for recontamination by other operations
- Physical location, level, extent and depth of contamination

June 13, 1986

PLUTONIUM 238/239 CONTAMINATED SOIL CLEANUP OPERATIONAL GUIDELINES FOR CONDITIONAL RELEASE BASIS OF 100 PCI/G GOAL

In May, 1981 W. P. Davis, Mound's D&D Project Leader for the WTS project recommended to MRC's Environmental and Waste Management supervision a goal of 100 pCi/g be used for D&D soil remedial action projects for conditional release of soil. This recommendation was accepted.

This goal of 100 pCi/g was chosen based on both the Project Leader's previous 11 years and the Project Health Physicist's (J. M. Garner) 33 years experience with remedial action of contaminated soil on site and with contact with other DOE sites.

The level of 100 pCi/g was chosen as the most optimum (cost/benefit) level for remedial action of the restricted (from public access) Mound site contaminated soil areas for conditional release.

A level an order of magnitude higher (1000 pCi/g) was considered to be unacceptable because it would unnecessarily leave high levels of surface soil contamination and restrict many Mound areas from potential conditional reuse.

A level an order of magnitude lower (10 pCi/g) was considered unnecessarily restrictive and costly. Although this level could be considered unrestricted*, the Mound site is still a restricted site with continuing radioactive operations.

The level of 100 pCi/g was chosen as the most optimum level for remedial action for several reasons:

- Approaches unrestricted release levels*
- Minimizes potential future remedial action
- Minimizes impact to Mound site operations
- Field detection capabilities at this level existed within DOE
- Consistent with DOE's ALARA philosophy

In 1982 Mound developed a soil screening facility to measure plutonium 238/239 levels down to 25 pCi/g with reasonable accuracy with an approximately 30 minutes turn around on samples from the field. This level of 25 pCi/g was then chosen as the lower limit for ALARA evaluations.

In 1984 Mound performed a very conservative pathways analysis (see attached memo) based on NUREG 0707 "A Methodology for Calculating Residual

*In 1981 DOE had no one definite unrestricted release level for plutonium. A range of 1 pCi/g (State of Colorado) to 100 pCi/g (Healy, J. W., "An Examination of the Pathways from Soil to Man for Plutonium", LA-6741-MS, 1977, Los Alamos Scientific Laboratory, Los Alamos, NM) was being considered as unrestricted at that time.

Radiation Levels Following Decommissioning", October, 1980, program which was modified to correct errors in the original program (see attached modified NUREG 0707 program). The very conservative dose estimate at 100 pCi/g yielded approximately 1250 mrem/year if the employee was involved in digging, construction, and moving uniformly contaminated soil 2000 hours per year without any respiratory protection.

June 11, 1986

PLUTONIUM 238/239 CONTAMINATED SOIL CLEANUP OPEATIONAL GUIDELINES FOR ALARA EVALUATIONS

MOUND'S DECONTAMINATION AND DECOMMISSIONING (D&D) PROGRAM

Below are the operational guidelines to be used in evaluating whether plutonium-238/239 contaminated soil within the Mound restricted fence line requires additional remedial action. The objective of ALARA (as low as reasonably achievable) remedial action is to reduce soil contamination levels to as low as reasonably achievable based on a cost versus benefit analysis.

A level of 100 pCi/g is the goal of remedial action of near surface (first 12 inches) soil. A lower limit of 25 pCi/g is the goal of ALARA evaluations.

The following are the cost versus benefit parameters to be evaluated:

- Availability for migration, resuspension, or disturbance
- Cost versus benefit of additional remedial action
- Risk to personnel and the environment for further remedial action
- Potential for recontamination by other operations
- Physical location, level, extent and depth of contamination

AVAILABILITY FOR MIGRATION, RESUSPENSION, OR DISTURBANCE:

Consider the availability for migration (rain, ground water, aquifer), resuspension (wind), or disturbance (future excavation, construction).

COST VERSUS BENEFIT OF ADDITIONAL REMEDIAL ACTION:

Consider if prior removal efforts have been successful (reasonable decontamination factor), accessibility for additional excavation (depth location), shoring requirements, feasibility (undermining permanent structures and utilities), and impact on plant operations.

RISK TO PERSONNEL AND THE ENVIRONMENT FOR FURTHER REMEDIAL ACTION:

Consider if the risk to personnel (deep excavations) and the environment (length of exposure) is being minimized.

POTENTIAL FOR RECONTAMINATION BY OTHER OPERATIONS:

Consider the risk and level of recontamination by ongoing radioactive operations.

PHYSICAL LOCATION, LEVEL, EXTENT AND DEPTH OF CONTAMINATION:

Consider the location (near structures/areas that require D&D in the future, in bedrock), level (25-100, 100-1000, 1000-10,000, 10,000 - 100,000 pCi/g), extent (spot versus area, potential for greater contamination deeper), and depth (near surface vs. deep).

All exceptions must be approved by the D&D Program Management Team (Program Manager - Nuclear Operations; Supervisor - Engineering; Supervisor (second level) - Health Physics).

June 11, 1986

WTS D&D SOIL EXEMPTION (>100 pCi/g)
OPERATIONAL GUIDELINES

Below are the operational guidelines to be used in evaluating whether plutonium-238/239 contaminated soil within the Mound restricted fence line can be left if greater than 100 pCi/g.

- When the project engineer and project health physics supervisor determine it is not cost beneficial to continue soil removal to reduce remaining soil contamination lower than 100 pCi/g he requests an exemption review by the D&D Program Management Team.

- The D&D Program Management Team (Program Manager - Nuclear Operations; Supervisor - Engineering; Supervisor (2nd Level) - Health Physics) reviews the recommendation and basis.

- The Environmental Supervisor then reviews the recommendation and grants a temporary field approval to exempt.

- The location of the contaminated area is measured and located on site drawing by the project engineer and final records are maintained by the Environmental Section.

- The contaminated area is then sealed with a minimum four-inch layer of Bentonite clay. A second layer of Bentonite clay may also be installed within two to three feet of the original surface.

- The exemption is communicated within 30 days to the following organizations:

  - Directors of MRC Nuclear Operations, Engineering, and Administrative Services (Environmental and Health Physics)

  - DOE/DAO D&D Program Engineer

  - DOE/SFMP and AL (via monthly report)

- Before completion of the D&D project:

  - Each exemption area will be independently radiologically verified by a non Mound contractor (currently Battelle Columbus Laboratories) and their report issued to DOE/DAO, AL, RL.

  - Final radiological levels are noted on the Master Mound Site Contaminated Areas map which is included in "The Mound Site Development and Facilities Utilization Master Plan" MLM-ML-85-44-0002 and is updated at least annually and issued to DOE.

June 12, 1986

WTS D&D SOIL EXEMPTIONS (>100 pCi/g)

EXEMPTION 1 - October 30, 1985:

Area 1 (see attached map) was excavated (15 ft wide by 15 ft long) to a depth of approximiately 7 feet to remove the two underground lines and their cleanouts. The cleanouts had previously leaked (being on the pressure side of the Building 41 pumps) and the soil was contaminated under the lines. Excavation continued in one foot increments and the soil was rechecked. Excavation was halted at the 11 feet depth level and an exemption to abandon futher excavations was granted. The bottom of the excavation was sealed with a four inch layer of Bentonite clay and refilled/compacted with clean fill from offsite. A second layer of Bentonite was placed approximately three feet from the top of the excavation.

Discussion of Exemption:

Area 1 is located adjacent (see attached map) to the Waste Disposal (WD) Building. The WD Building receives and processes low level radioactive liquid contaminated waste from other radioactive buildings on site. There is a potential (although low) for Area 1 to become recontaminated (up to 10 nCi/g) from future operations. Also eventual removal of the WD building when it becomes surplus would remove any remaining contamination. The current D&D excavation has removed soil contamination to less than 10 nCi/g. DOE/DAO,AL,RL representatives were notified of the decision.

The excavation beginning at the 8 feet depth level was in bedrock and, because of the hillside on the north side and structures surrounding the Area 1, had vertical sides. It was felt that any remaining contamination was primarily falling off the vertical sides (that couldn't be reasonably excavated because of surrounding structures and the hillside above the excavation). Any further excavation would have required extensive shoring and replacement and relocation of plant services.

Soil contamination was reduced from approximately 100 nCi/g to less than 5 nCi/g. Note that final contamination levels were on soil only after rocks (approximately 90% of sample) were removed.

Upper side walls	all	samples	< 0.1 nCi/g
Lower side walls	all	samples	< 1.0 nCi/g
Bottom	5	samples	< 1.0 nCi/g
	1	sample	3.0 nCi/g

June 12, 1986

WTS D&D SOIL EXEMPTIONS (>100 pCi/g)

EXEMPTION 2 - November 27, 1985:

Area 2 was immediately adjacent to Area 1 (see attached map). Area 2 was excavated (15 ft wide by 30 ft long) to a depth of approximiately 7 feet to remove the two underground lines and their cleanouts. The cleanouts had also previously leaked (being on the pressure side of the Building 41 pumps) and the soil was contaminated under the lines. Excavation continued in one foot increments and the soil was rechecked. Excavation was halted at the 12 feet depth level and an exemption to abandon futher excavations was granted. The bottom of the excavation was sealed with a four inch layer of Bentonite clay and refilled/compacted with clean fill from offsite. A second layer of Bentonite was placed approximately three feet from the top of the excavation.

Discussion of Exemption:

Area 2 is located adjacent (see attached map) to the Waste Disposal (WD) Building. The WD Building receives and processes low level radioactive liquid contaminated waste from other radioactive buildings on site. There is a potential (although low) for Area 2 to become recontaminated (up to 10 nCi/g) from future operations. Also eventual removal of the WD Building when it becomes surplus would remove any remaining contamination. The current D&D excavation has removed soil contamination to less than 10 nCi/g. DOE/DAO,AL,RL representatives were notified of the decision.

The excavation beginning at the 8 feet depth level was in bedrock and because of structures surrounding the Area 2, had vertical sides. It was felt that any remaining contamination was primarily falling off the vertical sides (that couldn't be reasonably excavated because of surrounding structures and the hillside above the excavation). Any further excavation would have required extensive shoring and replacement and relocation of plant services.

Soil contamination was reduced from approximately 100 nCi/g to less than 1 nCi/g. Note that final contamination levels were on soil only after rocks (approximately 90% of sample) were removed.

Excavation	all samples < 0.6 nCi/g

AN OVERVIEW OF PLUTONIUM-238 DECONTAMINATION & DECOMMISSIONING (D&D) PROJECTS AT MOUND

W. H. Bond
W. P. Davis
D. G. Draper
J. R. Geichman
J. C. Harris
R. R. Jaeger
R. L. Sohn

Monsanto Research Corporation
Mound*
Miamisburg, Ohio, U.S.A.

ABSTRACT

Monsanto Research Corporation (MRC), which operates the Mound Site (in suburban Dayton, Ohio) for the Department of Energy (DOE), has been decommissioning radioactively contaminated facilities since 1949. Mound is currently decontaminating (for restricted reuse) and/or decommissioning (for conditional release) four major plutonium-238 contaminated facilities (approximately 75,000 ft^2) that contained 1700 linear feet of gloveboxes and associated equipment and services. In addition, several thousand linear feet of external underground piping, associated tanks and contaminated soil are being removed. Two of the facilities contain ongoing operations and will be reused for both radioactive and nonradioactive programs. Two others will be completely demolished and the land area will become available for future DOE building sites. Currently, over 30,000 Curies of plutonium-238 have been removed in waste and scrap residues.

An overview of the successful techniques and equipment used in the decontamination and decommissioning of individual pieces of equipment, gloveboxes, services, laboratories, sections of buildings, entire buildings, and external underground piping, tanks, and soil in a highly populated residential area will be described and pictorially presented.

*Mound is operated by Monsanto Research Corporation for the U.S. Department of Energy under Contract No. DE-AC04-76-DP00053.

INTRODUCTION

Mound is a Department of Energy installation located in Miamisburg, Ohio. The site (306 acres) is located in a residential/agricultural area of suburban Dayton, Ohio. The facility is operated by Monsanto Research Corporation for the DOE in support of weapons and nonweapons programs.

Monsanto has been involved with radioactive operations since 1944 and the resulting decommissioning operations since 1949. We are currently decommissioning four facilities that were used primarily for the processing and encapsulation of plutonium-238 heat sources for various programs, such as the heat sources used in space applications (SNAP, PIONEER, TRANSIT, VIKING, and VOYAGER).

The current multimillion/multiyear project involves the extensive decontamination and decommissioning (D&D) of inactive areas of four facilities: Plutonium Processing (PP) Building, Research (R) Building, Special Metallurgical (SM) Building, and Waste Transfer System (WTS). The project was initiated in 1978 and is expected to be completed in 1996.

The PP Building is a two-floor (42,000 ft^2) reinforced concrete and concrete block building built in 1967 to process plutonium-238. Approximately 90% of the building will be decommissioned for potential future reuse with the remaining 10% staying operational.

The R Building is a one-floor (54,000 ft^2) concrete block and brick building built in 1948 to research, develop, and process various isotopes. Approximately 10% of the building is being decommissioned for current and potential reuse with the remaining 90% staying operational.

The SM Building is a one-floor (17,300 ft^2) steel-frame-with-curtain-walls building built in 1960. A one-floor (5,700 ft^2) concrete block addition was built in 1965. The building was used for process development, processing, and recovery of plutonium-238. Complete removal of the building, auxiliary buildings, and surrounding contaminated soil is planned.

The WTS was an underground liquid waste transfer system built in 1967 and consisted of two underground lines (2,565 ft each) buried from 6 to 17 ft below ground and a one-level 600 ft^2 concrete block lift station (Building 41) with two underground tanks. Complete removal of the building, tanks, underground piping, and surrounding contaminated soil is in progress.

The total project (PP, R, SM and WTS) involves the removal of 1,700 linear ft of gloveboxes; 930 linear ft of conveyor housing; 2,565 linear ft of dual underground liquid waste lines; and associated contaminated piping, services, equipment, structures, and soil. Estimated waste volumes generated by the decommissioning project are: 1,256,000 ft^3 100 nCi/g of Pu-238 and 111,000 ft^3 100 nCi/g of Pu-238.

Extensive D&D includes cleaning and removal of internal glovebox equipment and services, removal of gloveboxes, removal of associated laboratory equipment and services, structural decontamination, and disposal of wastes from the PP and R Buildings. Contamination in the inactive areas is reduced to an "as low as reasonable achievable" (ALARA) level, and remaining contamination is permanently sealed so that the areas can be reused with minimal restrictions (restricted release).

The final exposed average contamination levels in these facilities after decontamination and sealing will be:

Wipe	- $\leq$20 dis/min/100 cm^2
Direct	- $\leq$1500 dis/min/100 cm^2
External Radiation	- $\leq$1 mr/hr at surface

These levels are being normally met (except for cracks and crevices) before sealing. Unrestricted release was not considered since this would require demolition of the PP and R Buildings which are used for ongoing programs and could be reused for future DOE programs. Demolition would be required because of known and potential contamination (in structural members, underneath the facilities, and in cracks and crevices) and the inability to detect and remove this contamination without destroying the integrity of the structure. However, complete D&D was considered the only feasible approach for the Waste Transfer System, which is unusable because of previous leaks, and SM, which is not reusable because of below-floor contamination and the curtain-wall construction.

As complete removal is planned for SM and WTS and respective surrounding contaminated soil, the soil contamination level should be able to be reduced to near unrestricted levels* (conditional release).

*A level of 100 pCi/g is the goal of remedial action of near surface (first 12 inches) soil. A lower limit of 25 pCi/g is the goal for ALARA evaluations. DOE Order 6430 "General Design Criteria Manual".

To date, all (1,700 linear ft) gloveboxes (with associated external glovebox equipment, piping, and services) have been cleaned, stripped of piping and equipment, sectioned if required, packaged, and removed from the site. Also, laboratory areas have been completed and are being reused by other DOE programs. In accomplishing this, there have been no significant radiation exposures or environmental releases.

There are several unique characteristics of the current project.

- The site is in a residential/agricultural area; thus outside decommissioning activities are restricted. (Site boundary is as close as 300 ft).

- Normal operations continue in the PP and R Buildings, and in close proximity to SM and WTS; thus decommissioning activities are restricted.

- Most gloveboxes were two-level (operating level and equipment level) and are larger than a standard 4 ft x 4 ft x 7 ft shipping container.

- Although oversized shipping containers were used, some large gloveboxes required sectioning before packaging.

- All equipment, piping, and services must be removed from the gloveboxes before packaging (burial storage facility requirement).

- Three separate funding agencies within DOE (weapons and nonweapons) require coordinated funding and planning.

- Contamination involved is primarily plutonium-238, a high-specific-activity transuranic isotope (16.8 Ci/g) requiring special personnel protection and waste packaging.

- The WTS underground lines (and associated contaminated soil) were located up to 17 ft below the surface on hilly (up to 140-ft elevation change within a distance of 600 feet) terrain which required special excavation procedures.

- Weather conditions (wind, rain, snow) and temperatures (typically -10°F to 100°F) restrict outside decommissioning activities.

- All radioactive waste must be shipped for off-site burial.

As a result of these unique characteristics and our previous experience in decommissioning facilities, several techniques were developed in each of the following areas: planning, exposure control, contamination control, equipment removal, structural decontamination, and waste packaging.

PLANNING

Direct management involvement and commitment in the decommissioning project starts at the director level and continues down to the D&D Management Team. The interdepartment Management Team consists of a representative from each of the major D&D functions: Program Management, Operations, Project Engineering, Maintenance, Technical Support, and Environmental, Safety and Health Physics. This matrix Management Team formally meets with the involved Directors on a monthly basis to discuss status, accomplishments, problems, and plans. The Team also meets quarterly with the DOE Area Manager and his staff. This is in addition to the normal weekly and monthly written reports sent to management and the DOE.

In addition to the formal monthly, quarterly, semiannual, and annual reviews of D&D plans by MRC directors and DOE management, plans are formally reviewed weekly in each of the major D&D areas by direct supervisors; as well as special planning sessions held for unusual decommissioning activities along with prejob conferences with the personnel who will be performing the work.

Decommissioning activities are controlled by using special work permits such as the "Radiation Control Area Maintenance Permit." This permit requires interdepartmental review and approval to ensure that jobs are thoroughly preplanned, adequate training and safety analysis have been performed, and proper precautions are being taken.

Special procedures are required for any unusual decommissioning operation not covered by existing work procedures. These procedures require interdepartmental review and approval. In addition, special training is required for any new complex techniques employed. For critical operations, a "mock-up", or nonradioactive test, is made prior to actual operations.

The D&D planning efforts include quality assurance and other control methods to ensure adequacy, consistency, change approval, and reporting. Operations are routinely audited by Environmental, Health and Safety, Quality, Financial, and Management representatives within the company, by an independent DOE contractor, by DOE Area and Field Offices, and by DOE Headquarters.

The use of computerized project management and scheduling programs ("Quicknet" and Project/2") facilitate activity and resource scheduling for complex projects.

Another planning aid has been the use of exception and trend reporting to increase management awareness and response to potential problem areas. These reports cover such areas as radiation exposures, effluents, safety performance, milestone status, and cost versus budget.

One area of planning has been personnel resources. Whenever possible, use is made of personnel with prior operations experience, personnel experienced with decommissioning operations (including consultants and offsite contracts), and personnel experienced with plutonium-238 and other radioisotopes. For new personnel, intensive training and certification are required. Frequent retraining orientations and seminars are presented to operations personnel to reaffirm established techniques and demonstrate new techniques.

EXPOSURE CONTROL

Again, as in planning, direct management involvement and commitment in exposure control start at the director level in the Executive Safety Committee's commitment to keeping exposures and effluents "as low as reasonably achievable" (ALARA). ALARA goals are set yearly after an interdepartmental review and evaluations. Monthly trend and exception reports indicate potential problem areas for management review and follow-up.

A key part of planning for any D&D activity is exposure control. This planning for exposure control includes training and selection of experienced personnel for critical activities, communication of known or suspected hazards, analysis of hazards, procedure review, contamination control precautions, work permits, adequate monitoring, and reporting.

Specific exposure control equipment and techniques include remote operations (including long-handled or remotely operated tools and equipment); portable and personnel shielding (including lead-loaded gloves and aprons); respiratory protection (full-face mask and supplied-air suits); protective equipment (clothing, portable enclosures, local exhausters, contamination fixatives); and special techniques for contamination control, equipment removal, structural decontamination, and waste packaging (see appropriate section for additional details).

Exposure monitoring is accomplished with both in situ and personnel Thermoluminescent Dosimetry (TLD) (including extremities), industrial hygiene monitors, selective plutonium-238 air monitors, fixed position and personnel air samples, alpha/gamma/neutron instrumentation and measurements, and personnel bioassay samples (nosewipes, urine, blood, sputum, fecal, and whole-body counting).

CONTAMINATION CONTROL

After as much of the radioactive material as possible is removed from gloveboxes, equipment, and piping by standard cleaning and flushing techniques; temporary enclosures, fixation, and ventilation become the primary means of contamination control during subsequent removals.

Temporary enclosures are constructed for containment around all separations of gloveboxes, equipment, and piping with a high potential for contamination release. These enclosures range in size from a sealed plastic bag to a series of large rooms or a building with separate HEPA (high efficiency particulate air) filtered exhaust systems (when personnel access is required). The large enclosures are constructed with either fire retardant wood or sheet metal framing covered by heavy clear plastic. In some cases, permanent airlocks are added to building corridors to increase contamination containment and increase air pressure differentials.

Contamination fixation is used during glovebox, equipment, and piping removal after conventional decontamination methods cease to further reduce contamination levels. The fixation agent used depends on the application and includes light water misting, strippable paint, and urethane foam.

A light water misting is used to contain dusting or to clean in areas which could not be cleaned prior to breaching.

Strippable paint is used primarily on contaminated building structures as a temporary fixation until final decontamination can be accomplished.

Fire-retardant urethane foam is used as a fixative inside gloveboxes after equipment, piping, and services are removed, and the interior surfaces are cleaned. This fixative minimizes potential contamination spread during later glovebox separation, packaging, and shipment. Strippable paint is not used because of potential long-term radiolysis of the paint inside gloveboxes. In addition, only a thin layer (1-2 in.) of foam is used to minimize future potential waste-reprocessing problems at the burial, or storage, facility.

Urethane foam is also inserted at separation points in large diameter piping to provide a contamination barrier during subsequent cutting.

A third use for urethane foam is as a shoring material in waste packages (primarily at the four corners, middle of the side, and top). Again, a small amount of urethane foam is used to minimize future potential waste-reprocessing problems at the burial, or storage, facility.

Existing building and/or portable ventilation systems are used to contain contamination. Portable HEPA-filtered ventilation systems are used primarily for temporary enclosures and range in size from 25 to 1500 ft^3/min.

A minimum three-zone concept is also used in contamination control. Each zone represents a certain level of contamination and resulting protection. The first zone is the immediate work area that needs the highest level of protection (air flow, personnel, and controls). The second zone is a buffer zone or airlock, and the third zone is the noncontaminated or low-potential zone. The first zone is normally the enclosure being breached, and the second and third zones are plastic enclosures with the room area being an additional zone.

Administrative control levels are set for airborne and removable contamination, and gamma/neutron radiation in work areas. If the control levels are exceeded, then work is stopped until the levels have been reduced.

EQUIPMENT REMOVAL

Equipment, piping, and services must be removed from the inside of all gloveboxes (burial facility requirement). Because most of the gloveboxes contained two levels (standard operating level and an isolated lower equipment level in the glovebox well), equipment removal required personnel to enter the glovebox well (a highly contaminated atmosphere) from the rear to clean, disconnect, and remove equipment. A plasma cutting technique was developed to cut out sections of the operating glovebox floor to gain access to the equipment well to eliminate the need for initial personnel entrance. All plasma cutting was performed using the standard glovebox gloves.

Plasma was chosen for cutting because the resulting smoke generation is much less than that generated by a standard cutting torch (thereby reducing the particulate accumulation and eventual plugging of the glovebox exhaust HEPA filters). In addition, there is not as much heating of surrounding metal (because of the faster cutting), and the resulting cut edges are not as jagged.

Once access is gained to the equipment well, piping and services are disconnected using long-handled tools, and equipment is moved (with glovebox hoists) in order to clean the equipment and glovebox well. Personnel then enter the well (via a ventilated enclosure) to remove the equipment.

The equipment is then loaded and secured on a wooden platform (pallet) outside the glovebox (and inside a plastic ventilated enclosure which is collapsed around the platform for containment, thus eliminating the need for bagging). The equipment pallet is then loaded into a waste container. This precludes personnel from having to physically carry equipment to the waste container.

After the equipment is removed from the glovebox, the glovebox itself is loaded into a waste container. Occasionally, however, a glovebox is larger than the waste container and must be reduced in size by sectioning. Initially a foam wall was applied where the glovebox was to be sectioned, isolating contamination during the cutting operation. In addition, the safety plate glass glovebox windows were replaced with Plexiglas (methyl acrylate plastic) in areas where the cut was to be made. The outside was cut with a reciprocating saw (inside a temporary enclosure), and the foam wall was cut with a piano wire. The exposed end pieces of the glovebox were capped with sheet metal, and the individual glovebox sections were then packaged into the waste container.

This sectioning technique was very successful, but time consuming. In a modified technique, the foam wall was eliminated from sectioning. The interior surfaces of the glovebox are coated with a 1 to 2 in. layer of urethane foam while the normal glovebox exhaust is maintained. Then, before the stainless steel glovebox is cut, a layer of decontamination soap foam is applied to the cut area and cutting blade to contain metal filings. As the cut is made, the area previously cut is cleaned with a damp rag and sealed with a plastic sleeve and tape. The glovebox is then turned on its side to complete the cut. After cutting is completed, the sections are separated within the plastic sleeve, and the sleeve is crimped, cut, and sealed. Then sheet metal caps are placed over the cut and bagged ends. Replacement of the safety plate glass glovebox windows in the cutting area was also unnecessary, as development showed there is no breakage if the outside of the window is taped with plastic tape, the inner surface is foamed, and a special glass cutting blade is used.

To separate piping external to the glovebox, several techniques are used depending on the potential for the spread of contamination. In low-potential cases, the pipes are cut, with damp rags and/or plastic bags used for containment. In high-potential cases, copper pipes less than 1 in. and stainless steel pipes less than 1/2 in. are cut, using a crimping tool, and capped. For larger pipes, a small hole is drilled, urethane foam is injected into the hole, and then the pipe is cut after the foam has cured. The cut ends can then be capped. Piping and other materials are reduced in length to fit in standard 4 ft x 4 ft x 7 ft waste packages. The internal surfaces of larger ductwork are painted (to contain contamination), separated, and cut in half (diagonally, usually) to efficiently fit inside standard waste containers (boxes).

For transporting equipment, a variety of lifting devices, moving dollies, and hoists is used. In addition, the previously discussed equipment platform is used for transporting glovebox equipment to the waste container.

STRUCTURAL DECONTAMINATION

In the first step of structural decontamination, all unnecessary services (pipes, ducts, conduit) are removed (back to operating headers), and the resulting wall or ceiling opening is monitored, decontaminated, and sealed. In contaminated areas, false ceilings are removed, and concrete ceilings are sandblasted.

In decontaminating walls, the first choice is removal because of void spaces. For poured concrete walls (especially bearing walls), the paint is removed using paint remover, general contamination can be mechanically removed, and isolated spots can be scabbled.

In decontaminating floors, removal of the floor covering (and mastic) or paint removes most of the contamination. If the floor is still generally contaminated, a floor scabbler is used. If it is highly contaminated, removal of 1 to 2 in. of concrete is usually more efficient. Isolated contamination spots are then removed with a hand scabbler and vacuum sweeper. Total removal of the floor is used as a last resort.

Door frames and doors are removed in highly suspect areas. If there is not a double door into large areas, a temporary one is installed to allow waste containers to be moved in and out. Floor drains are also removed.

Since this type of work is very dusty, contaminated dust control is important. This dust is controlled using local exhausters, light water sprays, and immediate vacuum cleaning.

Core samples of soil under first floors are taken to verify the condition of soil and remaining underground drain systems.

If isolation of remaining contamination in cracks, crevices, and structural members is permitted, the first step is the documentation of the levels and location. The surface is permanently sealed, and a sign is posted on the exterior surface; again as a future reminder.

A remotely-controlled, electrically-powered, robotic excavating machine (Brokk 250 "Mini-Max") was used to remove a reinforced concrete room in the SM Building and to remove the below-ground soil and concrete from Building 41.

The use of an independent contractor to verify remaining contamination provides assurance of Mound's monitoring results and documentation for future reference and questions.

WASTE PACKAGING

A variety of waste containers is being used for the estimated 1,367,000 ft^3 of waste to be generated by the project. Low level (LSA) waste is packaged in either 55-gal steel drums or plywood boxes. Most plywood boxes are 4 ft (W) x 4 ft (H) x 7 ft (L). If the waste has a high density, a half-box 4 ft (W) x 2 ft (H) x 7 ft (L) is used to lower the package weight.

For transuranic (TRU) waste, a 20-yr retrievable package is used. Again, either boxes or 55-gal steel drums are used. The TRU 55-gal drum is fabricated of thicker steel than the LSA drum and contains a 90-mil high-density polyethylene liner (with a press-fit lid sealed with adhesive).

The boxes used prior to 1986 were fiberglass-coated, heavy-construction, plywood boxes. In 1985, the use of steel boxes with a bolted lid, was initiated.

The standard fiberglass/plywood boxes were 4 ft (W) x 4 ft (H) x 7 ft (L). However, a limited number of larger boxes were previously used to preclude the size reduction of many large gloveboxes. Three larger sizes were used with the largest being slightly less than 6 ft (W) x 9 ft (H) x 12 ft (L).

A gamma scan and final fiberglassing facility (with a common turntable) was constructed to determine isotopic content and apply the final fiberglass seal on the box lid or sections of the box that were used for loading access.

CONCLUSION

Progress to date on the project has verified the importance of adequate planning (with flexibility for the unexpected), matrix organization for effective implementation and control, experienced and trained personnel with innovative abilities, frequent communications at all levels of management, management commitment to safety and ALARA exposures, contamination control techniques and equipment, variety of waste container sizes, adequate dollar and time contingency and independent verification of radiological conditions.

APPENDIX C

THE DECONTAMINATION AND DECOMMISSIONING PROCESS

C.1. THE DECONTAMINATION AND DECOMMISSIONING PROCESS

The engineering and construction for D&D activities at Mound Plant are formalized and described in the "Mound D&D Program Management Systems Manual 820" (EG&G 1991a). This process is initiated by the management decision for a D&D actions. The total process is shown in Figure C.1, D&D Program Flow Chart.

This chart identifies the phases of the process as

- Assessment,
- Planning and Engineering,
- Implementation, and
- Closeout.

C.1.1. ASSESSMENT

During assessment, an application for acceptance into the DOE ERWM is initiated. This application is processed through EG&G and DOE channels to the D&D branch of the Southwestern Area Programs (EM-453). Once the facility is accepted, the process shown in Figure C.1 is followed. The surveillance and maintenance plan is composed of the facility description, security requirements, surveillance measurements, maintenance activities, and the cost and schedule. During the assessment of risks associated with the facility, the following factors are considered:

- assessed level of risk,
- basis for assessment,
- elements contributing to risk,
- implications of risk,
- activities planned to minimize risk, and
- stage of the project where the risk will be highest.

Environmental baseline data are collected and used as part of the preparation of the environmental review document.

The project work scope and the conceptual costs and schedule are prepared from the work scope. If the initial site characterization data are insufficient for design input needs or for project evaluation, additional site characterization is required.

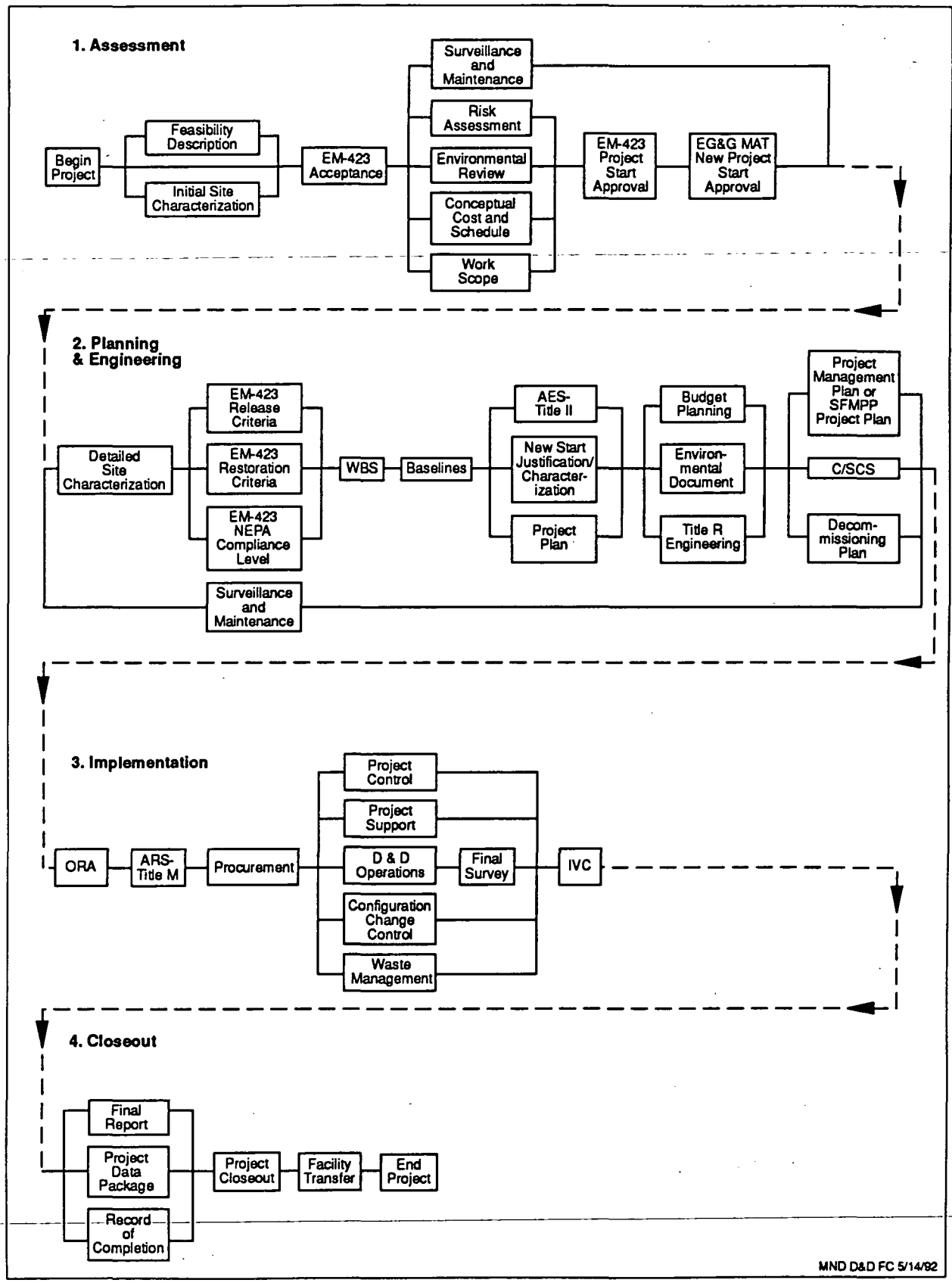

Figure C.1. D&D Program flow chart.

C.1.2. PLANNING AND ENGINEERING

DOE approval is required to start the planning/ engineering phase of the project. When this permission is acquired, a Mound request for a new project is prepared. Planning and engineering activities include the typical engineering associated with the project such as the establishment of a Work Breakdown Structure. The options study, required as part of Title I Engineering, is discussed in subsection 4.3.

Following DOE systems and engineering management guidelines, technical, budget schedule, and environmental baselines are prepared for the project.

The planning and engineering phase also includes the analysis and decision for what is the required level of NEPA compliance. This decision is made by DOE Headquarters and concerns the level of documentation required. The required level must be identified in a time frame that allows for the collecting of any needed environmental baseline data. The environmental (NEPA/RCRA/CERCLA) compliance process requirements are established. Appendix A discusses the various regulatory processes. The normal sequence for NEPA compliance begins with the preparation of an Action Description Memorandum; this is the basis for the decision on the need for an environmental assessment or an environmental impact statement. If an environmental impact statement is required, it is prepared and submitted for review. Based on the results of the review process, DOE Headquarters will issue a NEPA ROD. The ROD may change the proposed action or deny it.

This phase includes the formal design activity. The completed design is prepared and forwarded to DOE Dayton Area Office for review and approval. Before implementation, a project management plan/ ERWM project plan and a decommissioning plan are prepared. If the activity is a major project or major systems acquisitions, then a project management plan is prepared and the other requirements for those activities are complied with.

C.1.3. IMPLEMENTATION

The following activities are included in the construction or implementation phase of the project:

- operational readiness reviews;
- authorization of engineering services Title III activities;
- procurement of equipment, material, and subcontractors;
- project control and support;
- configuration/change control;

- waste Management; and
- independent verification surveys.

C.1.4. CLOSEOUT

The closeout phase consists of preparing

- a final report
- a project data package and
- a record of completion.

The final report is prepared to include an overview of the project activities, the project accomplishments, and the final facility status. The report will be prepared by EG&G Mound and submitted through channels to DOE Headquarters. This report will be made available to the public through the Office of Scientific and Technical Information, in accordance with DOE Order 1430.2A.

The record of completion is the formal record of completion of the decommissioning project. At a minimum, the record of completion will include a final radiation survey, a final hazardous chemical survey, independent verification surveys, and any other pertinent site release information.

Within this major, high level structure, smaller scope activities can be identified. These follow the same systems engineering processes at a more detailed level. Individual D&D cleanup activities fall into this structure. These are identified with specific areas within the facility and may be identified with specific phases of the activity. The Mound internal document that plans and documents activities is the Engineering Work Package (see subsection C.2). For verification sampling and analysis, a SAP is used that has specific requirements established under the FFA. If the risk warrants it, a D&D activity-specific quality assurance plan is written as part of the work package. A QAPP always provides the controls for a SAP.

C.2. MOUND WORK PACKAGES FOR D&D

C.2.1. OUTLINE AND GUIDANCE FOR D&D WORK PACKAGES

Two sets of documents are used to plan and control the DDCA: the first covers the engineering activities, and the second covers the verification of cleanup and includes the SAP. The engineering document is made up of the internal Mound engineering planning records that follow Mound design and

construction procedures. This document is the D&D Work Package that includes the quality assurance plan, if required, for the activity. The D&D Work Package is described below. The second set of documents is the area-specific SAP (for verification) and the D&D QAPP. The overall Mound quality assurance program applies to both areas, and Mound may take the option of providing review in such areas as audit and deficiency reporting.

Verification is done by outside entities, and each organization operates under its own health and safety plans. Mound Plant does provide services for the sampling and analysis activities such as providing field monitoring for materials and workers, waste disposal for material generated during the sampling activity, and general site security. Activity support for services such as surveying may be provided by Mound Plant or by the organization doing the sampling. Records are generally maintained separately.

Work Packages are written for D&D engineering activities concerning partial or complete areas. This is the planning and cost estimate document for the cleanup activity. An AES Work Package transmittal sheet accompanies the package and identifies the content requirements. If the activity is done in phases, this, along with the quality assurance level assignment for the activity, is identified on the transmittal sheet. The quality assurance level is based on the risk established in the analysis of consequence of failure. If the activity is identified as Level 1 or 2, a written quality assurance plan is required at the activity level for the Work Package. A preconstruction meeting may also be requested on the form. The Work Package is signed and dated on the transmittal sheet. A full D&D Work Package, with example sketches and screening data, is included in this appendix.

The body of the work package contains the following information:

1. Introduction

   The introduction states the amount of material involved and identifies the hazardous materials involved in the area. Information regarding use of Mound or contractor staff is also included.

2. Job Description

   The job scope or description identifies the actions to be taken in general terms. It also identifies utilities involved and actions to be taken involving underground and above ground utilities.

3. Work Sequence

   The work sequence breaks the work scope into steps and adds the equipment to be used. This section also plans the field and laboratory screening to be used

during the cleanup activity and identifies how the cleanup criteria will be met. Sufficient maps and sketches need to be included to make the activity clear.

4. Digging Guidelines

Digging guidelines include the how inclement weather conditions will be handled and the soil contamination criteria. Contaminated soil removal, water removal, and shutdown instructions are also part of this section.

5. Safety Analysis

The section on safety analysis covers hazards and general safety instructions.

6. Project Schedule

Self explanatory.

7. Digging Permit

Self explanatory.

8. D&D Work Permit

Self explanatory.

9. D&D Work Permit Checklist

Self explanatory.

10. Cost Estimate

Self explanatory.

11. Quality Assurance Plan

See subsection C.2.1.1. for a discussion on the quality assurance plan.

12. Material List

Self explanatory.

C.2.1.1. Quality Assurance Plan

The D&D quality assurance plan for the activity is a document with separate approvals that is indexed to the AES and maintenance service request numbers for the activity. An analysis to determine the risk associated with the activity elements is made. Based on the results of the analysis, a risk level of 1, 2, or 3 is assigned. Levels 1 or 2 assignments require a quality assurance plan to be written. This quality assurance plan becomes a section of the D&D quality assurance plan and becomes part of Mound Technical Manual MD-10241. This quality assurance plan includes the following information:

1. Description and Scope of Project

The description and scope are abbreviated forms of those found in the body of the main portion of the work package.

2. Purpose of the Quality Assurance Plan

The purpose of the quality assurance plan is to assure that objectives of the project activity, with respect to health and safety, radiological and environmental protection, reliability and continuity of operations, and documentation of quality efforts, are met. The quality assurance plan identifies the activities and responsibilities that are necessary in the design, procurement, fabrication, installation, and start-up of the project.

3. Applicable Documents

The section on applicable documents calls out the control documents (quality assurance-based technical manuals) that are applicable to the activity. If applicable, the quality assurance plan requires the use of a "Deficiency Evaluation Corrective Action Report" described in the Mound Technical Manual MD-10165 (EG&G 1991b).

4. Analysis of Consequence of Failure

The section on the analysis of consequence of failure describes the results of the graded approach defined in Appendix B of the Mound Technical Manual MD-10165 (EG&G 1991b). Written quality assurance plans are generated for Levels 1 or 2 consequence of failure activities.

5. Quality Elements and Quality Assurance Efforts.

The quality elements discussed in section 4 are the 18 elements identified in the NQA-1 program that complies with DOE Order 5700.6B. A 19th element has been added for software quality assurance. The elements used at Mound are

- Organization;
- Quality Assurance;
- Design Control;
- Procurement Document Control;
- Instruction, Procedures, and Drawings;
- Document Control;
- Control of Purchases Items and Services;
- Identification and Control of Items;
- Control of Processes;
- Inspection;
- Test Control;
- Control of Measuring and Test Equipment;
- Handling, Storage, and Shipping;
- Inspection, Test, and Operating Status;
- Control of Nonconforming Items;
- Corrective Action;
- Quality Assurance Records;
- Audits; and
- Software Quality Assurance.

This section of the quality assurance plan identifies the elements of the quality assurance program that are applicable to the activity and what controls, such as specific records, inspections, corrective actions, and audits, are to be used as management tools in the activity. The DOE has recently issued DOE Order 5700.6C, which describes new organization and emphasis for quality assurance programs. This Order states that NQA-1-based programs (ASME 1989) are acceptable. There has been no formal decision to fully reorganize the quality assurance program into the new structure; however, the Mound quality assurance program may change in response to the new Order, and this section of the D&D activity-specific quality assurance plan would change to correspond to the changes in the overall program.

C.3. FIELD CONTROL DURING EXCAVATION FOR RADIONUCLIDE CONTAMINANTS

For activities that include the movement or removal of soil, methods have been developed to provide immediate and quick turnaround of contaminant levels in the soil, to allow field decisions concerning what soil requires excavation. These methods are relevant to the verification of cleanup because they provide additional assurance about cleanup.

The areas to be excavated are gridded in 10-ft x 10-ft squares and surveyed with a FIDLER. Because the lower practical detection limit for a FIDLER is approximately 350 pCi/g and the Mound DDCA is 100 pCi/g, any indicator of activity on the FIDLER indicates that excavation is required. Lack of a response on the FIDLER requires that surface soil samples be taken for analysis by the Mound Soil Screening Facility, which has the capability of a lower detection limit of 25 pCi/g. A FIDLER response of greater than 50,000 units also requires samples to determine if the soil is at or above the 100 nCi/g limit for TRU waste. Soil sample locations are marked so that the location can later be correlated with the analysis results from the Mound Soil Screening Facility.

The Mound Soil Screening Facility uses a modified FIDLER system to detect and count the self-induced 17 keV L x-ray band emitted by the plutonium-238. Plutonium decays by the emission of an alpha particle from the nucleus. This is sufficiently energetic to displace an L shell electron from the atom. This produces the characteristic x-rays detected by the FIDLER. This system has a lower limit of detection of 25 pCi/g with an estimated error of 35% in the range of 23 to 100 pCi/g.

The energy range established for the system is roughly 10 to 100 keV, which provides the capability to detect thorium x-rays in the 85 to 93 keV range. Thorium is a common contaminant at Mound Plant and is found both by itself and with plutonium. High levels of thorium will interfere with the detection of plutonium. For these cases, a separate system, incorporating a reverse electrode hyperpure

germanium detector, is used to determine the plutonium content. Thorium interference is minimized, but the counting efficiency is much lower. This results in longer counting times for the same level of detection. This situation is acceptable because only a few samples are found that require the use of this system.

During soil sampling, five samples are taken from each 10-ft x 10-ft grid. One sample is taken approximately 1 ft in from each corner, and the fifth sample is removed from the center of the square. If the site is known to be contaminated, the pre-excavation survey does not need to be performed, but the grid is still laid for future survey.

Generally, surveys are performed after each foot of soil is excavated. When a foundation may be undermined, when bedrock is encountered, or in other such instances, samples are taken at smaller intervals. In addition, each scoopful of soil is surveyed before being placed in a waste box.

When a site is believed to be decontaminated, a final survey is performed by Mound Health Physics. Any "hot" spots found are decontaminated and resurveyed. Finally, a contractor performs a sampling and analysis of the site using statistical methods and random sampling to confirm that the site has been decontaminated. This is the first verification survey.

Mound's data objective for soil is a plutonium-238 contamination level of 100 pCi/g or less and a thorium-232 contamination level of 5 pCi/g or less. The contamination levels are normally based on a 10-ft x 10-ft square from which five samples are taken. If the average of those samples is less than 100 pci/g of plutonium-238, and no sample is greater than 300 pCi/g, then that square is considered to be decontaminated. Mound's ALARA goal is 25 pCi/g of plutonium-238, which is determined by the lower detection limit of the Mound Soil Screening Facility FIDLER system.

As an example of the actual cleanup achieved by the application of these protocols, Argonne National Laboratory, during their confirmation survey following the decontamination of the WTS D&D project, concluded that the mean surface contamination was no greater than 13 pCi/g and the subsurface contamination was no greater than 29 pCi/g of plutonium-238.

The same criteria and work practices that were used on the WTS excavation are being used on current soil projects and are expected to be used on future projects.

In the absence of risk assessment-based cleanup levels for Mound Plant, the previously determined levels continue to be used. The value of 100 pCi/g of plutonium-238 is a Mound remediation goal limit for conditional release that was chosen in 1981. This goal was chosen because it approached

unrestricted release levels, it minimized potential future remedial action, it minimized impact on Mound Plant operations, field detection capabilities at this level existed within DOE, and it was consistent with DOE's ALARA philosophy.

In 1984, a very conservative pathways analysis, based on NUREG-0707, "A Methodology for Calculating Residual Radiation Levels Following Decommissioning," was run and yielded 1,250 mrem/yr for an employee involved in digging and moving uniformly contaminated soil at 100 pCi/g of plutonium for 2,000 hours a year without respiratory protection.

In 1990, RESRAD computer code was used to determine the applicability of this value. RESRAD was developed by a DOE contractor for application in the Formerly Utilized Sites Remedial Action Program (FUSRAP) ERWM Sites. It is used to establish site-specific guidelines for residual radioactive material contamination on soil by calculating the radiation dose that the maximally exposed individual (i.e. an onsite resident) would receive. The residual concentration guidelines are acceptable for unrestricted release if the annual radiation dose received due to residual contamination is averaged over 50 years and does not exceed 100 mrem/year for the maximally exposed individual. The result of this computer analysis at the 100 pCi/g criterion indicated that constant exposure to an area remediated to that level would result in an exposure of less than 100 mrem/year. In fact, the actual exposure should approximate less than 40 mrem/year.

APPENDIX D

SUMMARY OF TANK DESCRIPTION

FROM

DRAFT MOUND UST PROGRAM PLAN

APPENDIX A
SUMMARY OF TANK DESCRIPTIONS AND REGULATORY APPLICATIONS

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
1	1.3-1 #1	900	Bldg. 62	Stack deluge tank	Stainless-steel-lined concrete tank intended to contain fire control water. Never used.	In service	Nuclear Operations/ Waste Management	AEA
2	1.3-1 #2	500[c]	Room H-131	Radioactive laundry water tank	Stainless-steel-lined concrete tank used to collect alpha wastewaters primarily from laundry operations.	In service	Nuclear Operations/ Waste Management	AEA
3	1.3-1 #3	30,000	WD Bldg.	Alpha wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
4	1.3-1 #4	30,000	WD Bldg.	Alpha wastewater influent tank	Fiberglass-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
5	1.3-1 #5	30,000	WD Bldg.	Alpha wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
6	1.3-1 #6	30,000	WD Bldg.	Alpha wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
7	1.3-1 #7	30,000	WD Bldg.	Alpha wastewater effluent tank	Epoxy-lined concrete tank used to collect treated alpha wastewaters prior to discharge.	In service	Nuclear Operations/ Waste Management	AEA

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
8	1.3-1 #8	30,000	WD Bldg.	Alpha wastewater effluent tank	Epoxy-lined concrete tank used to collect treated alpha wastewaters prior to discharge.	In service	Nuclear Operations/ Waste Management	AEA
9	1.3-1 #9	30,000	WD Bldg.	Alpha wastewater effluent tank	Epoxy-lined concrete tank used to collect treated alpha wastewaters prior to discharge.	In service	Nuclear Operations/ Waste Management	AEA
10	1.3-1 #10	30,000	WD Bldg.	Alpha wastewater influent tank	Epoxy-lined concrete tank used to collect treated alpha wastewaters prior to discharge.	In service	Nuclear Operations/ Waste Management	AEA
11	1.3-1 #11	600	WD Bldg. Annex	Wash sump	PVC-lined steel tank used to collect alpha wastewater from floor and sink drains in WD Annex Building.	In service	Nuclear Operations/ Waste Management	AEA
12	N/A	600	WD Bldg.	Wash sump	Steel-lined concrete tank used to collect alpha wastewater from floor and sink drains in the WD Building.	In service	Nuclear Operations/ Waste Management	AEA
13	1.3-1 #12	3,750	WD Bldg. Annex	Beta wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent beta wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
14	1.3-1 #13	3,750	WD Bldg. Annex	Beta wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent beta wastewaters.	In service	Nuclear Operations/ Waste Management	AEA

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
15	1.3-1 #14	3,750	WD Bldg. Annex	Alpha wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
16	1.3-1 #15	3,750	WD Bldg. Annex	Alpha wastewater influent tank	PVC-lined double concrete/steel tank used to collect influent alpha wastewaters.	In service	Nuclear Operations/ Waste Management	AEA
17	1.3-1 #20	500[c]	Room R-128	Alpha wastewater collection tank	Double fiberglass tank set in concrete used to collect alpha wastewater.	In service	Nuclear Operations/ Waste Management	AEA
18	1.3-1 #21	200	Room SW-8	Beta wastewater collection tank	Stainless-steel-lined steel tank used to collect beta waste-waters.	In service	Nuclear Operations/ Waste Management	AEA
19	1.3-1 #22	100	Room SW-125	Beta wastewater collection tank	Stainless-steel-lined steel tank used to collect beta waste-waters.	In service	Nuclear Operations/ Waste Management	AEA
20	1.3-1 #23	100	Room SW-143	Beta wastewater collection tank	Stainless-steel-lined steel tank used to collect beta waste-waters.	In service	Nuclear Operations/ Waste Management	AEA

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
21	N/A	200[c]	SW-137	Alpha wastewater sump	Stainless steel[c] sump used to collect radioactive wastewaters from drains, sinks and processes in SW Building hot cell operations.	In service	Nuclear Operations/ Waste Management	AEA
22	--	200[c]	HH Building West-Outside	Beta wastewater sump	Sump used to collect beta wastewater from process area sinks and floor drains.	In service	Nuclear Operations/ Waste Management	AEA
23	1.2-1 #16	5,000	Water Tower	Drum storage pad sump	Concrete tank used to collect precipitation and, potentially, spills for a radiological waste drum storage pad.	In service	Nuclear Operations/ Waste Management	AEA
24	1.3-1 #17	400	A Bldg.	Decon shower collection tank	PVC-lined[c] steel tank used to collect wastewater from medical decon shower.	In service	Nuclear Operations/ Waste Management	AEA
25	1.3-1 #18	400	A Bldg.	Decon shower collection tank	PVC-lined[c] steel tank used to collect wastewater from medical decon shower.	In service	Nuclear Operations/ Waste Management	AEA
26	1.3-1 #19	500	Bldg. 37	Sanitary waste tank	Unlined steel sanitary waste collection tank.	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
27	N/A	7,500[c]	Bldg. 57	Grit chamber	Concrete tank	In service	Nuclear or Non-Nuclear Operation*/ Waste Management	CWA (NPDES)
28	N/A	1,870[c]	Bldg. 57	Comminutor	Concrete tank	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)
29 30 31 32	N/A	10,770[c] 10,770[c] 10,770[c] 10,770[c]	Bldg. 57	Equalization basins	Four tanks	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)
33 34	N/A	59,840[c] 59,840[c]	Bldg. 57	Aeration basins	Two tanks	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)
35 36	N/A	14,960[c] 14,960[c]	Bldg. 57	Clarifiers	Two metal tanks	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)
37 38	N/A	673[c] 673[c]	Bldg. 57	Chlorine contact chambers	Two tanks	In service	Nuclear or Non-Nuclear Operations*/ Waste Management	CWA (NPDES)

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
39	1.3-2 #1	25,000	P.Bldg.	Fuel oil storage tank	Cathodically protected steel tank used to store fuel oil.	In service	Facilities Maintenance Engineering	BUSTR
40	1.3-2 #2	25,000	P.Bldg.	Fuel oil storage tank	Cathodically protected steel tank used to store fuel oil.	In service	Facilities Maintenance Engineering	BUSTR
41	1.3-2 #3	25,000	P.Bldg.	Fuel oil storage tank	Externally coated, cathodically protected steel tank used to store fuel oil.	In service	Facilities Maintenance Engineering	BUSTR
42	1.3-2 #4	25,000	P.Bldg.	Fuel oil storage tank	Externally coated, cathodically protected steel tank used to store fuel oil.	In service	Facilities Maintenance Engineering	BUSTR
43	1.3-2 #5	5,000	R/SW/T Buildings Stack	Diesel fuel storage tank	Unlined steel tank used to supply diesel fuel to emergency generator No. 1.	In service	Facilities Maintenance Engineering	BUSTR
44	1.3-2 #7	850	Bldg. 57	Diesel fuel storage tank	Fiberglass-reinforced-plastic tank used to supply diesel fuel to an emergency generator.	In service	Facilities Maintenance Engineering	BUSTR
45	1.3-2 #9	250	Room M-108	Metal plating rinse-water tank	Epoxy-lined concrete tank used to collect metal plating rinsewater prior to discharge.	In service	Non-Nuclear Operations/ Waste Management	CWA (NPDES)
46	1.3-2 #10	500	R. Bldg.	Sanitary waste tank	Unlined, stainless-steel[c] tank used to collect sanitary waste.	In service	Nuclear or Non-Nuclear Operations/ Waste Management	CWA (NPDES)

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
47	1.3-2 #11	4,000	Bldg. 38	Diesel fuel storage tank	Unlined steel tank used to supply diesel fuel to Emergency Generator No. 2.	In service	Facilities Maintenance Engineering	BUSTR
48	1.3-3 #16	N/A	Bldg. TF2	Diesel fuel storage tank	No such tank existed. Actually aboveground propane tank.	N/A	Facilities Maintenance Engineering	BUSTR
49	1.3-3 #20	N/A	Bldg. 27	Diesel fuel storage tank	No such tank existed. Actually aboveground propane tank.	N/A	Facilities Maintenance Engineering	BUSTR
50	N/A	350	T-1	Cooling water sump	Steel-lined concrete[c] sump used to collect single pass non-contact cooling water.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
51	N/A	350	T Building Corridor 2	Sanitary wastewater sump	Steel-lined concrete[c] sump used to collect sanitary wastewaters from restrooms.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
52	N/A	350	T-11F	Sanitary wastewater sumps	Steel-lined concrete[c] sump used to collect sanitary wastewaters from sinks and floor drains.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
53	N/A	350	T-15	Sanitary wastewater sump	Steel-lined concrete[c] sump used to collect sanitary wastewaters from restrooms and floor drains.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
54	N/A	200[c]	T Building Stair 3	Cooling water sump	Steel-lined concrete[c] sump used to collect single pass cooling water in air handling area.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
55	N/A	350	T-78	Steam condensation sump	Steel-lined concrete[c] sump used to collect steam condensate from heating system in air handling area.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
56	N/A	350	T Building Corridor 8	Sanitary wastewater sump	Steel-lined concrete[c] sump used to collect sanitary wastewater from restrooms and sinks.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
57	N/A	350	T-78A	Sanitary wastewater sump	Steel-lined concrete sump used to collect sanitary wastewater from restrooms.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
58	N/A	350	T-90	Cooling system condensation sump	Steel-lined concrete[c] sump used to collect condensate from cooling units in air handling area.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
59	N/A	350	T-99	Sanitary wastewater sump	Steel-lined concrete[c] sump used to collect sanitary wastewater from restrooms.	In service	Nuclear Operations/ Waste Management	CWA (NPDES)
60	N/A	[c]	Bldg. 1	Settling basin	Concrete basin used to filter and settle out explosive elements in an explosive production process wastewater stream.	Unknown (i/i)	Waste Management	RCRA
61	--	500	Bldg. 43	Settling basin	Concrete basin used to filter and settle out explosive elements in an explosive production process wastewater stream.	Unknown (i/i)	Waste Management	RCRA

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
62	1.3-3 #1	4,000	G Bldg.	Gasoline storage tank	Unlined steel tank used to supply gasoline.	Unknown (c/r summer 1986)	ER Program (O.U.2)	FFA
63	1.3-3 #2	4,000	G Bldg.	Gasoline storage tank	Unlined steel tank used to supply gasoline.	Unknown (c/r summer 1986)	ER Program (O.U.2)	FFA
64	1.3-3 #3	5,000	G Bldg.	Gasoline storage tank	Fiberglass-reinforced-plastic tank used to supply gasoline.	Unknown (c/r summer 1986)	ER Program (O.U.2)	FFA
65	1.3-3 #4	7,500	Old SD Plant	Sanitary waste treatment tank	Unlined concrete tank used in sanitary waste treatment.	1975 (i/i)	Waste Management D&D	AEA
66	1.3-3 #5	30,000	Old SD Plant	Sanitary waste treatment tank	Unlined concrete tank used in sanitary waste treatment.	1975 (i/i)	Waste Management D&D	AEA
67	1.3-3 #6	7,500	Old SD Plant	Sanitary waste treatment tank	Unlined concrete tank used in sanitary waste treatment.	1975 (i/i)	Waste Management D&D	AEA
68	1.3-3 #7	3,466	Bldg. 41	Alpha wastewater pumping station tank	Stainless-steel-lined steel tank used to collect alpha wastewaters and pump them to WD Building.	Unknown (c/r October 1987)	Waste Management D&D	AEA
69	1.3-3 #8	3,466	Bldg. 41	Alpha wastewater pumping station tank	Stainless-steel-lined steel tank used to collect alpha wastewaters and pump them to WD Building.	Unknown (c/r October 1987)	Waste Management D&D	AEA
70	1.3-3 #9	5,000	SM Bldg.	Alpha wastewater collection tank	Unlined steel tank used to collect alpha wastewaters.	1972 (c/r June 1986)	Waste Management D&D	AEA

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
71	1.3-3 #10	3,000	SM Bldg.	Alpha wastewater collection tank	Unlined steel tank used to collect alpha wastewaters.	1972 (c/r June 1986)	Waste Management D&D	AEA
72	1.3-3 #11	1,000	SM Bldg.	Alpha wastewater collection tank	Bituminous-lined steel tank used to collect alpha wastewaters.	1972 (c/r November 1987)	Waste Management D&D	AEA
73	1.3-3 #12	1,000	SM Bldg.	Alpha wastewater collection tank	Bituminous-lined steel tank used to collect alpha wastewaters.	1972 (c/r November 1987)	Waste Management D&D	AEA
74	1.3-3 #13	3,750	WD Bldg. Annex	Alpha wastewater effluent tank	PVC-lined steel tank used to collect treated alpha wastewaters prior to discharge.	1975[c] (i/i)	Waste Management D&D	AEA
75	1.3-3 #14	3,750	WD Bldg. Annex	Alpha wastewater effluent tank	PVC-lined steel tank used to collect treated alpha wastewaters prior to discharge.	1975[c] (i/i)	Waste Management D&D	AEA
76	1.3-3 #15	3,750	WD Bldg. Annex	Alpha wastewater effluent tank	PVC-lined steel tank used to collect treated alpha wastewaters prior to discharge.	1975[c] (i/i)	Waste Management D&D	AEA
77	N/A	100[c]	Bldg. 27	Waste flume sump	Concrete flume used to collect wastes from an explosives production process.	October 1991 (i/i)	Waste Management	RCRA[d]
78	--	500[c]	Bldg. 27	Settling sump	Concrete basin used to filter and settle out explosive elements in an explosive production process waste stream.	October 1991 (i/i)	Waste Management	RCRA[d]

APPENDIX A (continued)

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
79	1.3-3 #17	5,000	Bldg. 34	Aviation fuel storage tank	Unlined steel tank used to supply aviation fuel for container burn testing.	1975 (c/r November 1990)	ER Program (O.U.3)	FFA
80	1.3-3 #18	1,000	Bldg. 51	Waste solvent storage tank	Unlined steel tank used to supply incinerator with waste solvents.	1972 (c/r December 1990)	ER Program (O.U.3)	FFA
81	1.3-3 #19	1,000	Bldg. 43	Product solvent storage tank	Stainless steel tank constructed to store solvent for use in Building 43. Never used.	(c/r December 1990)	Facilities Maintenance Engineering	BUSTR
82	1.3-2 #6	3,000	Bldg. 58	Diesel fuel storage tank	Unlined steel tank used to supply diesel fuel to Emergency Generator No. 6.	Unknown (c/r December 1989)	ER Program (O.U.2[f])	FFA
83	1.3-2 #8	825	Bldg. 56	Diesel fuel storage tank	Unlined steel tank used to supply diesel fuel to an emergency generator.	Unknown (c/r December 1989)	ER Program (O.U.2[f])	FFA
84	--	275[c]	M-38	Metal plating rinse sump	Concrete[c] sump sanitary waste line, used for NPDES sampling.	1984[c](i/i)	Non-Nuclear Operations/ Waste Management	CWA (NPDES)
85	--	100[c]	SW-10	Beta wastewater sump	Stainless steel[c] sump used to collect beta wastewater from floor drains in SW-10.	Unknown (i/i)	Nuclear Operations/ Waste Management	AEA
86	--	350	T-23	Beta wastewater sump	Steel-lined concrete[c] sump used to collect beta wastewaters.	Unknown (c/i 1985[c])	ER Program (O.U.2[f])	FFA

Tank #	NUS#[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
87	--	350	T-3	Floor drain sump	Steel-lined concrete[c] sump used to collect nonradiological wastewater from floor drains.	Unknown (c/i 1985[c])	ER Program (O.U.2[f])	FFA
88	--	350	T-40	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect alpha waste waters from process area floor drains.	Unknown (c/i)	ER Program (O.U.2[f])	FFA
89	--	350	T-41	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect alpha waste waters from process area floor drains.	Unknown (c/i)	ER Program (O.U.2[f])	FFA
90	--	60[c]	T-50	Alpha wastewater sump	Sump used to collect process alpha wastewaters.	Unknown (c/i 1975[c])	ER Program(2) (O.U.2[f])	FFA
91	--	350	T-50	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect process alpha wastewaters.	Unknown (c/i 1985[c])	ER Program (O.U.2[f])	FFA
92	--	350	T Building Corridor 8 (historic)	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect alpha wastewaters from process area floor drains.	Unknown (c/i 1982[c])	ER Program (O.U.2[f])	FFA
93	--	350	T Building Corridor 7	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect alpha wastewaters from process area floor drains.	Unknown (c/i 1982[c])	ER Program (O.U.2[f])	FFA
94	--	350	T-63	Alpha wastewater sump	Steel-lined concrete[c] sump used to collect alpha wastewaters from process area floor drains.	Unknown (c/i 1982[c])	ER Program (O.U.2[f])	FFA
95	--	100[c]	HH-15	Beta wastewater sump	Steel-lined concrete sump used to collect beta wastewater from restrooms and floor drains in process areas.	November 1975 (i/i)	Nuclear Operations/ Waste Management	AEA

APPENDIX A (continued)

Tank #	NUS #[a]	Capacity (gallons)	Location	Purpose	Comments	Last date used[b]	Mound Program Assignment	Primary Regulatory Jurisdiction
96	–	100[c]	HH-6	Beta wastewater sump	Steel-lined concrete[c] sump used to collect beta wastewater from process area floor drains.	Unknown (c/i 1961[c])	ER Program (O.U.2[f])	FFA

[a] References "Mound Underground Storage Tank Management Plan and Preliminary Cost Estimate," April 14, 1989, NUS Corporation (NUS 1989), Tables 1.3-1, 1.3-2, and 1.3-3, pp. 1-6 through 1-10.
[b] (i/i) denotes inground and inactive; (c/r December 1989) indicates tank was closed by removal and the date such closure took place; (c/i) indicates tank was closed in place.
[c] Denotes data is estimated or uncertain.
[d] The Building 27 waste flume and sump site is currently being addressed by both the ER Program under the FFA and the Waste Management Program under RCRA.
[e] Nuclear or Non-Nuclear Operations are assigned responsibility for this tank, dependent on the Mound Plant process supported by the tank.
[f] Tank is proposed for assignment to this Operable Unit in the ER Program.

N/A not applicable.

APPENDIX E

SCHEDULES

Department of Energy
Field Office, Albuquerque
Dayton Area Office
P.O. Box 66
Miamisburg, Ohio 45343-0066

APR 22 1992

Diana Mally
U.S. Environmental Protection Agency
5-HS-11
77 W. Jackson
Chicago, IL 60604

Dear Ms. Mally:

This letter is to request an extension to the OU6 verification work plan response to comments originally due April 27, 1992. This extension is requested under the FFA due to the extensive revisions required by the comments from both regulators and DOE Headquarters. The new due date will be May 17, 1992.

If you have any questions, call Art Kleinrath of my staff on 513/865-3597.

Sincerely,

Michael A. Reker
Chief, ESH&C Branch

cc:
Dave Flynn, ER, AL
Tom Farmer, TSO, LANL
Jose Mora, OCC, AL
Dick Neff, EG&G Mound
Art Kleinrath, DAO
John Sands, EM, HQ
John Price, Weston
Jerry Ioanedes, OEPA, Columbus
Shari Koslowsky, OEPA, Columbus
Bill Kury, U.S. F&WS

RECEIVED
APR 30 1992
GEN

Department of Energy
Field Office, Albuquerque
Dayton Area Office
P.O. Box 66
Miamisburg, Ohio 45343-0066

APR 22 1992

Martha Hatcher
Ohio Environmental Protection Agency
Southwest District Office
40 South Main Street
Dayton, OH 45402-2086

Dear Ms. Hatcher:

This letter is to request an extension to the OU6 verification work plan response to comments originally due April 27, 1992. This extension is requested under the FFA due to the extensive revisions required by the comments from both regulators and DOE Headquarters. The new due date will be May 17, 1992.

If you have any questions, call Art Kleinrath of my staff on 513/865-3597.

Sincerely,

Michael A. Reker
Chief, ESH&C Branch

cc:
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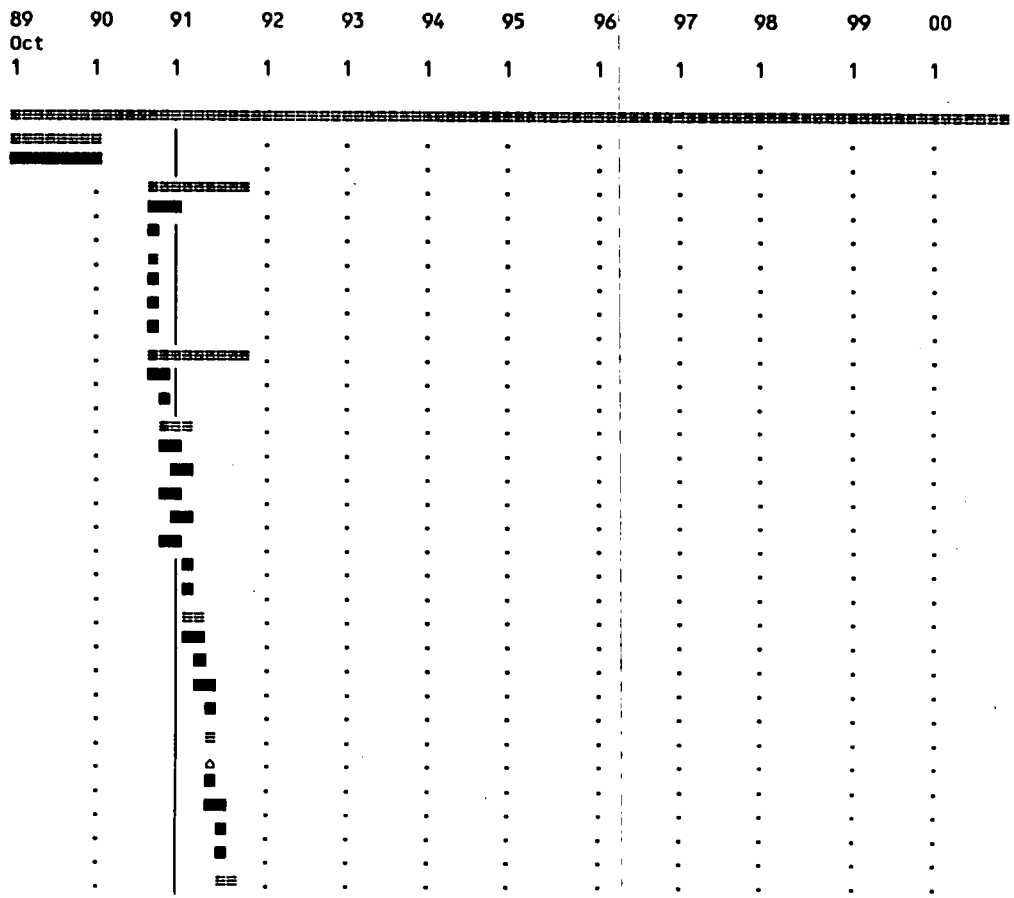
Art Kleinrath, DAO
John Sands, EM, HQ
John Price, Weston
Jerry Ioanedes, OEPA, Columbus
Shari Koslowsky, OEPA, Columbus
Bill Kury, U.S. F&WS

RECEIVED
APR 30 1992
CEN

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
1163 AL-MD-6 MOUND D&D	1-Oct-89	4,303	12-Jul-01
PRE-FY91 EFFORT	1-Oct-89	365	30-Sep-90
FY90 EFFORT	1-Oct-89	365	30-Sep-90
DEVELOP VERIFICATION WORK PLAN	20-May-91	401	23-Jun-92
FY91 BCWS	20-May-91	134	30-Sep-91
ESTIMATE SOW & COST	20-May-91	14	2-Jun-91
EVALUATION OF EXISTING PLANS	3-Jun-91	26	28-Jun-91
STATISTICAL EVALUATION OF DATA	3-Jun-91	21	23-Jun-91
REVIEW CLEANUP CRITERIA	3-Jun-91	21	23-Jun-91
REVIEW SCHEDULES FOR SITES	19-Jun-91	10	28-Jun-91
PREP OF VERIF WORK PLAN	29-Jun-91	361	23-Jun-92
REVIEW NEPA CONCERNS	29-Jun-91	10	8-Jul-91
DEVELOP OUTLINE FOR PLAN	9-Jul-91	8	16-Jul-91
SAMPLING & ANALYSIS PLAN	17-Jul-91	108	1-Nov-91
DRAFT QA PROJECT PLAN-FY91	17-Jul-91	76	30-Sep-91
DRAFT QA PROJECT PLAN-FY92	1-Oct-91	19	19-Oct-91
DRAFT FIELD SAMPLING PLAN-FY91	17-Jul-91	76	30-Sep-91
DRAFT FIELD SAMPLING PLAN-FY92	1-Oct-91	32	1-Nov-91
DRAFT HEALTH & SAFETY PLAN	17-Jul-91	60	14-Sep-91
PRODUCTION/REVIEW	2-Nov-91	14	15-Nov-91
DELIVER	16-Nov-91	3	18-Nov-91
DOE REVIEW CYCLE	19-Nov-91	62	19-Jan-92
DOE REVIEW	19-Nov-91	28	16-Dec-91
RESPOND TO COMMENTS	17-Dec-91	34	19-Jan-92
PRODUCTION/REVIEW	20-Jan-92	14	2-Feb-92
DISTRIBUTE TO EPA	3-Feb-92	3	5-Feb-92
REGULATORY REVIEW CYCLE	6-Feb-92	30	6-Mar-92
DELIVER DRAFT VERIF. WORK PLAN	6-Feb-92	0	6-Feb-92
REGULATORY REVIEW	6-Feb-92	30	6-Mar-92
RESPOND TO COMMENTS	7-Mar-92	34	9-Apr-92
PRODUCTION/REVIEW	10-Apr-92	8	17-Apr-92
DISTRIBUTE TO EPA	18-Apr-92	3	20-Apr-92
REGULATORY REVIEW CYCLE	21-Apr-92	20	10-May-92



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(Slack) ≡≡≡— (Slack) Resource delay
Progress shows Spaces on Baseline ▵ Milestone
---------- Scale: 50 days per character ----------

TIME LINE Gantt Chart Report, Strip 1, Page 1

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
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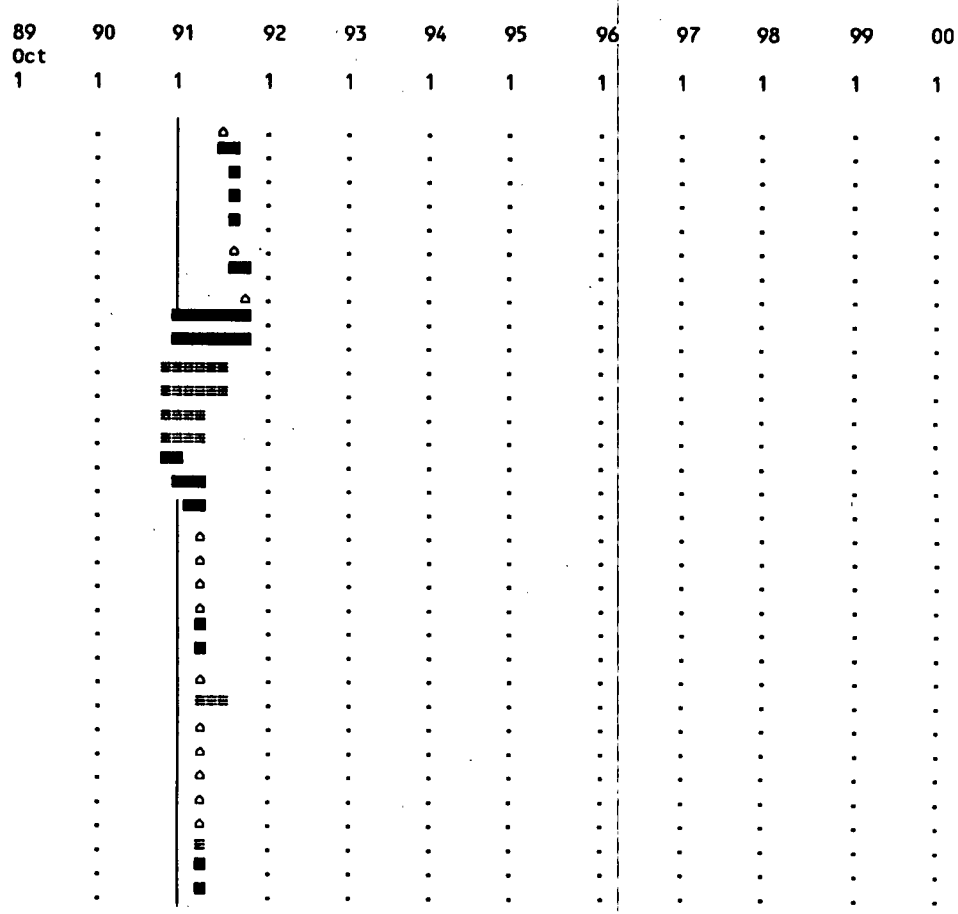
TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
DELIVER DRAFT VERIF. WORK PLAN	21-Apr-92	0	21-Apr-92
REGULATORY REVIEW	21-Apr-92	20	10-May-92
RESPOND TO COMMENTS	11-May-92	19	29-May-92
PRODUCTION/REVIEW	30-May-92	8	6-Jun-92
DAO DISTRIBUTION/DRAFT FINAL	7-Jun-92	3	9-Jun-92
DRAFT FINAL RESPONSE COMPLETE	10-Jun-92	0	10-Jun-92
REGULATORY APPROVAL	10-Jun-92	14	23-Jun-92
REGULATORY APPROVAL RECEIVED	24-Jun-92	0	24-Jun-92
FY92 LANL MAT D.I. COSTS	1-Oct-91	267	23-Jun-92
FY92 LANL OTHER I.I. COSTS	1-Oct-91	267	23-Jun-92
RECONN SAMPLING REPORT	29-Jul-91	259	12-Apr-92
PREPARE RECONN SAMPLING REPORT	29-Jul-91	259	12-Apr-92
PREPARATION STEP	29-Jul-91	141	16-Dec-91
PREPARE SAMPLING REPORT	29-Jul-91	130	5-Dec-91
PREPARE SAMPLING REPORT-FY91	29-Jul-91	64	30-Sep-91
PREPARE SAMPLING REPORT-FY92	1-Oct-91	66	5-Dec-91
CONTR. SENIOR REVIEW	22-Nov-91	14	5-Dec-91
CONTRACT MANAGER REVIEW	6-Dec-91	0	6-Dec-91
DELIVER TO CONTRACT MGR.	6-Dec-91	0	6-Dec-91
REVIEW	6-Dec-91	0	6-Dec-91
RESPOND TO COMMENTS	6-Dec-91	0	6-Dec-91
PRODUCTION	6-Dec-91	8	13-Dec-91
DISTRIBUTE WORKING DRAFT	14-Dec-91	3	16-Dec-91
DELIVER WORKING DRAFT RSR	17-Dec-91	0	17-Dec-91
REVIEW STEP	17-Dec-91	118	12-Apr-92
INSTALLATION/AO REVIEW	17-Dec-91	0	17-Dec-91
REVIEW	17-Dec-91	0	17-Dec-91
RESPOND TO COMMENTS	17-Dec-91	0	17-Dec-91
PRODUCTION	17-Dec-91	0	17-Dec-91
DELIVER	17-Dec-91	0	17-Dec-91
DOE AL/HQ REVIEW	17-Dec-91	32	17-Jan-92
REVIEW	17-Dec-91	28	13-Jan-92
RESPOND TO COMMENTS	14-Jan-92	4	17-Jan-92



Detail Task ≡≡≡≡≡ Summary Task °°°°° Baseline
(Progress) ==≡≡≡ (Progress) ▸▸▸ Conflict
(Slack) ≡≡≡— (Slack) Resource delay
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Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
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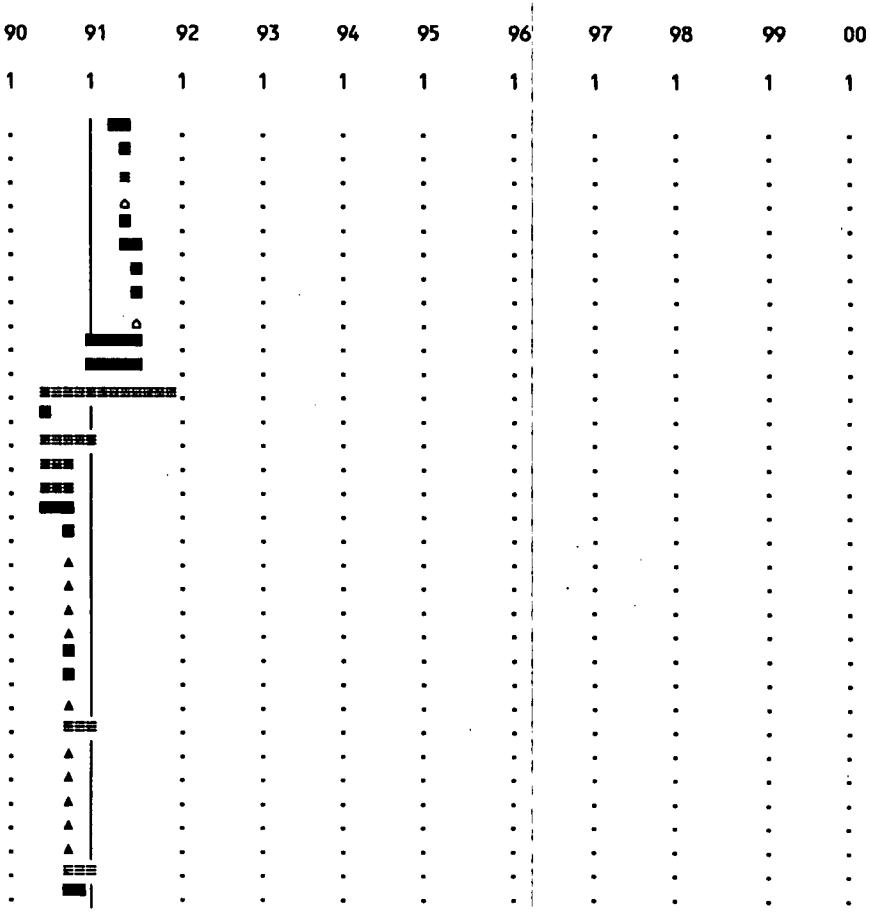
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
PRODUCTION	18-Jan-92	8	25-Jan-92
DISTRIBUTE TO EPA	26-Jan-92	3	28-Jan-92
REGULATORY REVIEW CYCLE	29-Jan-92	30	27-Feb-92
DELIVER DRAFT RSR	29-Jan-92	0	29-Jan-92
REGULATORY REVIEW	29-Jan-92	30	27-Feb-92
RESPOND TO COMMENTS	28-Feb-92	34	1-Apr-92
PRODUCTION/REVIEW	2-Apr-92	8	9-Apr-92
DAO DIST COMMENT RESP	10-Apr-92	3	12-Apr-92
RSR COMMENT RESP COMPLETE	13-Apr-92	0	13-Apr-92
FY92 LANL MAT D.I. COSTS	1-Oct-91	195	12-Apr-92
FY92 LANL OTHER I.I. COSTS	1-Oct-91	195	12-Apr-92
AREA 14, TANK SAMPLING	11-Mar-91	533	24-Aug-92
PROJECT INITIATION	11-Mar-91	14	24-Mar-91
TM1 SAMPLING PLAN	11-Mar-91	194	20-Sep-91
PREPARATION STEP	11-Mar-91	100	18-Jun-91
PREPARE TM1 SAMPLING PLAN	11-Mar-91	89	7-Jun-91
PREPARE TM1 SAMPLING PLAN	11-Mar-91	89	7-Jun-91
CONTR. SENIOR REVIEW	25-May-91	14	7-Jun-91
CONTRACT MANAGER REVIEW	8-Jun-91	0	8-Jun-91
DELIVER TO CONTRACT MGR.	8-Jun-91	0	8-Jun-91
REVIEW	8-Jun-91	0	8-Jun-91
RESPOND TO COMMENTS	8-Jun-91	0	8-Jun-91
PRODUCTION	8-Jun-91	8	15-Jun-91
DISTRIBUTE WORKING DRAFT	16-Jun-91	3	18-Jun-91
DELIVER WORKING DRAFT TM1	19-Jun-91	0	19-Jun-91
REVIEW STEP	16-Jun-91	97	20-Sep-91
INSTALLATION/AO REVIEW	19-Jun-91	0	19-Jun-91
REVIEW	19-Jun-91	0	19-Jun-91
RESPOND TO COMMENTS	19-Jun-91	0	19-Jun-91
PRODUCTION	19-Jun-91	0	19-Jun-91
DELIVER	19-Jun-91	0	19-Jun-91
DOE REVIEW	19-Jun-91	69	26-Aug-91
REVIEW	19-Jun-91	56	13-Aug-91

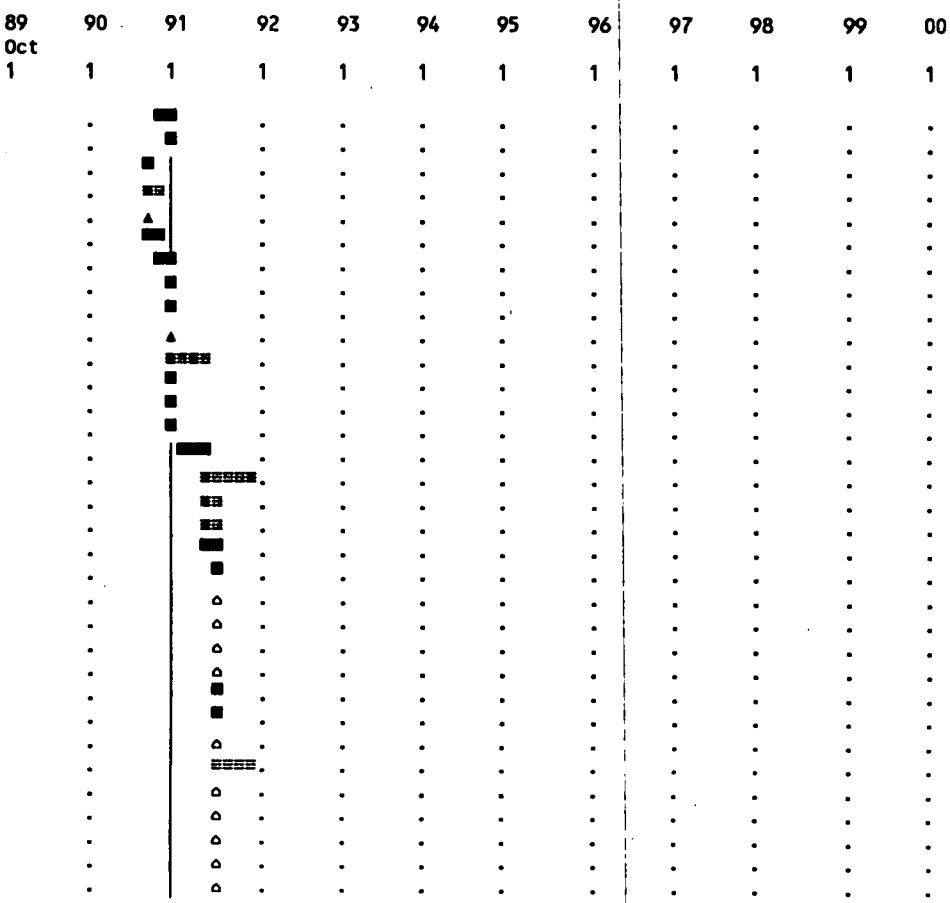


Detail Task Summary Task Baseline
(Progress) (Progress) Conflict
(Slack) (Slack) Resource delay
Progress shows Spaces on Baseline Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
RESPOND TO COMMENTS	19-Aug-91	8	26-Aug-91
PRODUCTION	27-Aug-91	8	3-Sep-91
DISTRIBUTE TO EPA	16-Jun-91	3	18-Jun-91
REGULATORY REVIEW CYCLE	19-Jun-91	56	13-Aug-91
DELIVER DRAFT TM1	19-Jun-91	0	19-Jun-91
REGULATORY REVIEW	19-Jun-91	56	13-Aug-91
RESPOND TO COMMENTS	19-Aug-91	22	9-Sep-91
PRODUCTION/REVIEW	10-Sep-91	8	17-Sep-91
DAO DIST COMMENT RESP	18-Sep-91	3	20-Sep-91
TM1 COMMENT RESP COMPLETE	21-Sep-91	0	21-Sep-91
VERIFICATION SAMPLING/ANALYSIS	28-Aug-91	155	29-Jan-92
PERFORM VERIFICATION SAMPLING	28-Aug-91	23	19-Sep-91
VERIF SAMPLE ANALYSIS-FY91	28-Aug-91	34	30-Sep-91
VERIF SAMPLE ANALYSIS-FY92	1-Oct-91	10	10-Oct-91
DATA VALIDATION	1-Nov-91	90	29-Jan-92
TM2 VERIFICATION REPORT	30-Jan-92	208	24-Aug-92
PREPARATION STEP	30-Jan-92	86	24-Apr-92
PREPARE TM2 VERIF. REPORT	30-Jan-92	75	13-Apr-92
PREPARE TM2 VERIF. REPORT	30-Jan-92	75	13-Apr-92
CONTR. SENIOR REVIEW	31-Mar-92	14	13-Apr-92
CONTRACT MANAGER REVIEW	14-Apr-92	0	14-Apr-92
DELIVER TO CONTRACT MGR.	14-Apr-92	0	14-Apr-92
REVIEW	14-Apr-92	0	14-Apr-92
RESPOND TO COMMENTS	14-Apr-92	0	14-Apr-92
PRODUCTION	14-Apr-92	8	21-Apr-92
DISTRIBUTE WORKING DRAFT	22-Apr-92	3	24-Apr-92
DELIVER WORKING DRAFT TM2	25-Apr-92	0	25-Apr-92
REVIEW STEP	25-Apr-92	122	24-Aug-92
INSTALLATION/AO REVIEW	25-Apr-92	0	25-Apr-92
REVIEW	25-Apr-92	0	25-Apr-92
RESPOND TO COMMENTS	25-Apr-92	0	25-Apr-92
PRODUCTION	25-Apr-92	0	25-Apr-92
DELIVER	25-Apr-92	0	25-Apr-92

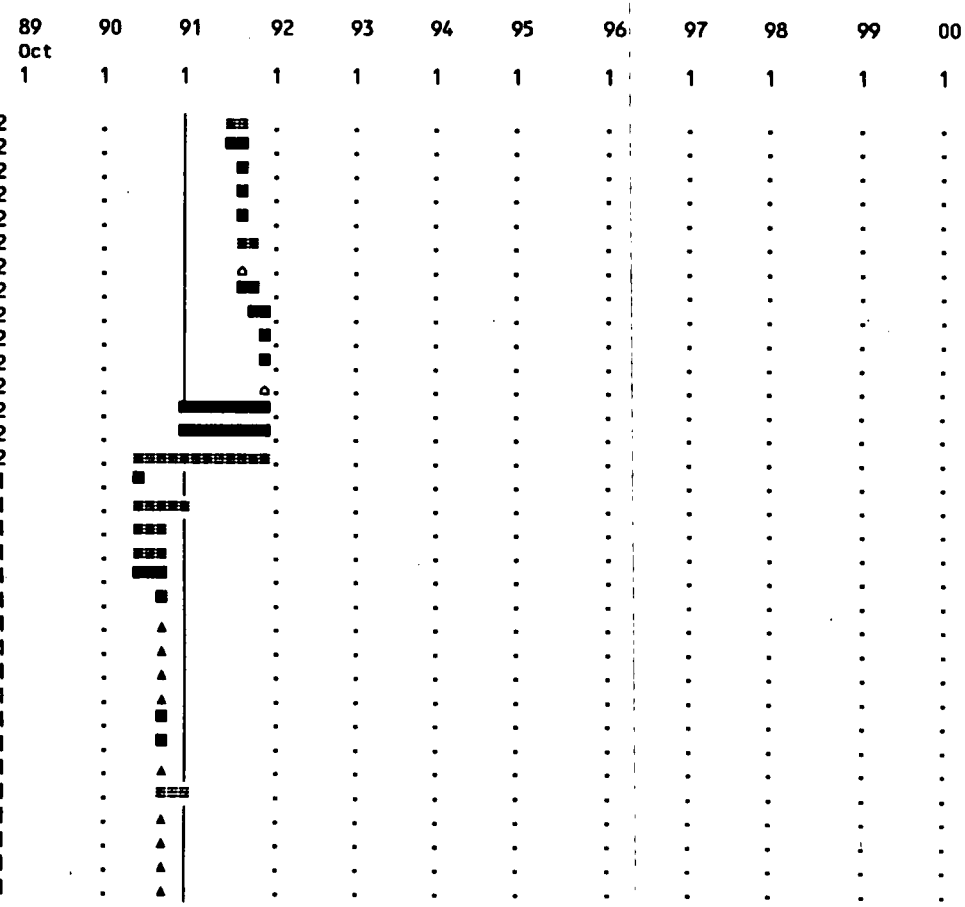


Detail Task | Summary Task | Baseline
(Progress) | (Progress) | Conflict
(Slack) | (Slack) | Resource delay
Progress shows Spaces on Baseline | Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
DOE REVIEW	25-Apr-92	36	30-May-92
REVIEW	25-Apr-92	28	22-May-92
RESPOND TO COMMENTS	23-May-92	8	30-May-92
PRODUCTION	31-May-92	8	7-Jun-92
DISTRIBUTE TO EPA	8-Jun-92	3	10-Jun-92
REGULATORY REVIEW CYCLE	11-Jun-92	30	10-Jul-92
DELIVER DRAFT TM2	11-Jun-92	0	11-Jun-92
REGULATORY REVIEW	11-Jun-92	30	10-Jul-92
RESPOND TO COMMENTS	11-Jul-92	34	13-Aug-92
PRODUCTION/REVIEW	14-Aug-92	8	21-Aug-92
DAO DIST COMMENT RESP	22-Aug-92	3	24-Aug-92
TM2 COMMENT RESP COMPLETE	25-Aug-92	0	25-Aug-92
FY92 LANL MAT D.I. COSTS	1-Oct-91	329	24-Aug-92
FY92 LANL OTHER I.I. COSTS	1-Oct-91	329	24-Aug-92
AREA 17, SM BUILDING	11-Mar-91	533	24-Aug-92
PROJECT INITIATION	11-Mar-91	14	24-Mar-91
TM1 SAMPLING PLAN	11-Mar-91	194	20-Sep-91
PREPARATION STEP	11-Mar-91	100	18-Jun-91
PREPARE TM1 SAMPLING PLAN	11-Mar-91	89	7-Jun-91
PREPARE TM1 SAMPLING PLAN	11-Mar-91	89	7-Jun-91
CONTR. SENIOR REVIEW	25-May-91	14	7-Jun-91
CONTRACT MANAGER REVIEW	8-Jun-91	0	8-Jun-91
DELIVER TO CONTRACT MGR.	8-Jun-91	0	8-Jun-91
REVIEW	8-Jun-91	0	8-Jun-91
RESPOND TO COMMENTS	8-Jun-91	0	8-Jun-91
PRODUCTION	8-Jun-91	8	15-Jun-91
DISTRIBUTE WORKING DRAFT	16-Jun-91	3	18-Jun-91
DELIVER WORKING DRAFT TM1	19-Jun-91	0	19-Jun-91
REVIEW STEP	16-Jun-91	97	20-Sep-91
INSTALLATION/AO REVIEW	19-Jun-91	0	19-Jun-91
REVIEW	19-Jun-91	0	19-Jun-91
RESPOND TO COMMENTS	19-Jun-91	0	19-Jun-91
PRODUCTION	19-Jun-91	0	19-Jun-91

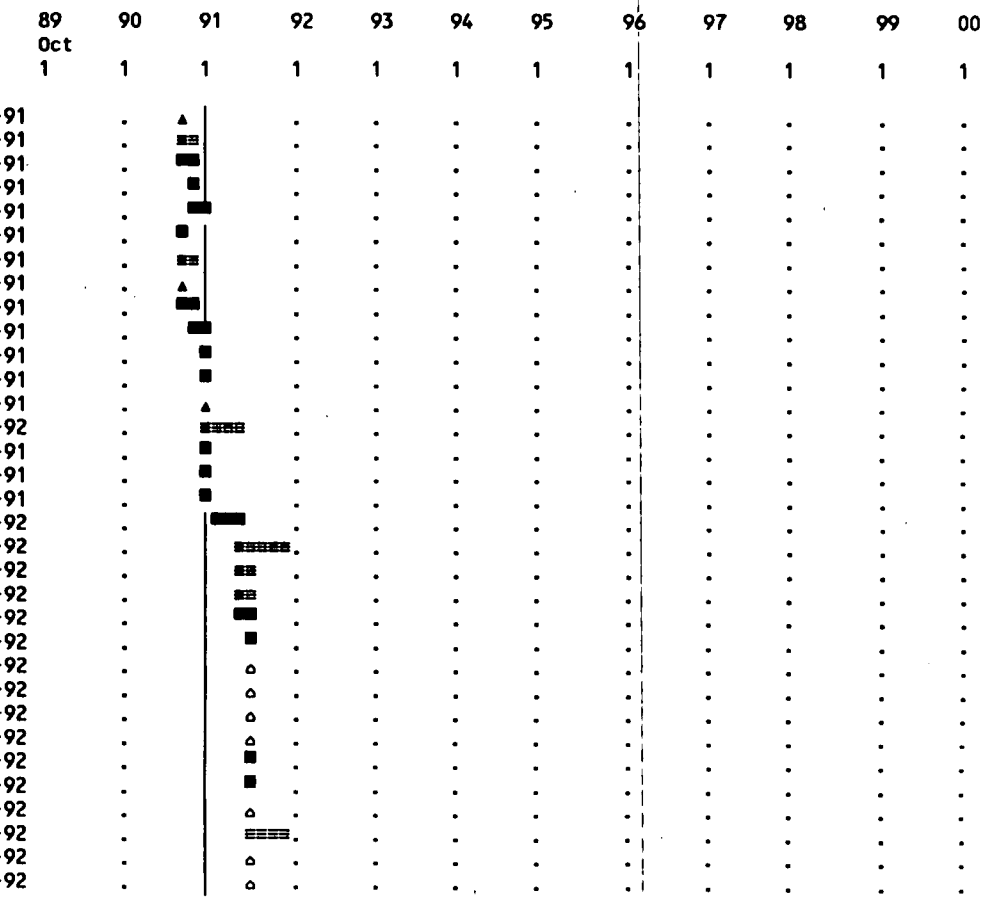


Detail Task | Summary Task | Baseline
(Progress) | (Progress) | Conflict
(Slack) | (Slack) | Resource delay
Progress shows Spaces on Baseline | Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
DELIVER	19-Jun-91	0	19-Jun-91
DOE REVIEW	19-Jun-91	64	21-Aug-91
REVIEW	19-Jun-91	56	13-Aug-91
RESPOND TO COMMENTS	14-Aug-91	8	21-Aug-91
PRODUCTION	22-Aug-91	8	29-Aug-91
DISTRIBUTE TO EPA	16-Jun-91	3	18-Jun-91
REGULATORY REVIEW CYCLE	19-Jun-91	56	13-Aug-91
DELIVER DRAFT TM1	19-Jun-91	0	19-Jun-91
REGULATORY REVIEW	19-Jun-91	56	13-Aug-91
RESPOND TO COMMENTS	19-Aug-91	22	9-Sep-91
PRODUCTION/REVIEW	10-Sep-91	8	17-Sep-91
DAO DIST COMMENT RESP	18-Sep-91	3	20-Sep-91
TM1 COMMENT RESP COMPLETE	21-Sep-91	0	21-Sep-91
VERIFICATION SAMPLING/ANALYSIS	28-Aug-91	155	29-Jan-92
PERFORM VERIFICATION SAMPLING	28-Aug-91	23	19-Sep-91
VERIF SAMPLE ANALYSIS-FY91	28-Aug-91	34	30-Sep-91
VERIF SAMPLE ANALYSIS-FY92	1-Oct-91	10	10-Oct-91
DATA VALIDATION	1-Nov-91	90	29-Jan-92
TM2 VERIFICATION REPORT	30-Jan-92	208	24-Aug-92
PREPARATION STEP	30-Jan-92	86	24-Apr-92
PREPARE TM2 VERIF. REPORT	30-Jan-92	75	13-Apr-92
PREPARE TM2 VERIF. REPORT	30-Jan-92	75	13-Apr-92
CONTR. SENIOR REVIEW	31-Mar-92	14	13-Apr-92
CONTRACT MANAGER REVIEW	14-Apr-92	0	14-Apr-92
DELIVER TO CONTRACT MGR.	14-Apr-92	0	14-Apr-92
REVIEW	14-Apr-92	0	14-Apr-92
RESPOND TO COMMENTS	14-Apr-92	0	14-Apr-92
PRODUCTION	14-Apr-92	8	21-Apr-92
DISTRIBUTE WORKING DRAFT	22-Apr-92	3	24-Apr-92
DELIVER WORKING DRAFT TM2	25-Apr-92	0	25-Apr-92
REVIEW STEP	25-Apr-92	122	24-Aug-92
INSTALLATION/AO REVIEW	25-Apr-92	0	25-Apr-92
REVIEW	25-Apr-92	0	25-Apr-92

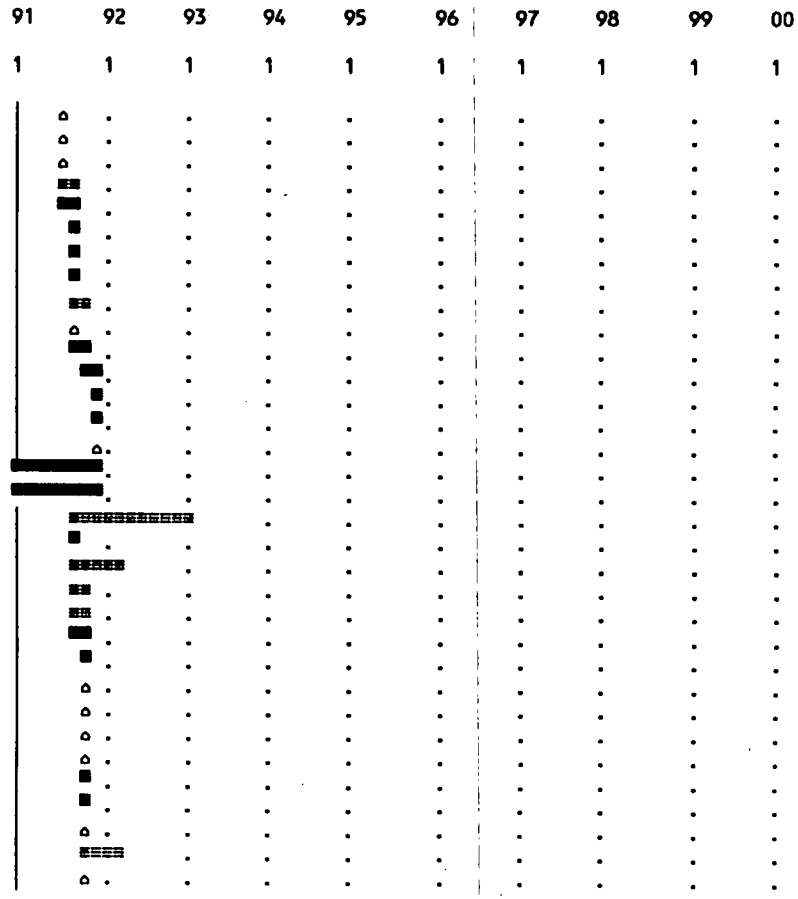


Detail Task ≡≡≡≡≡ Summary Task °°°°° Baseline
(Progress) ==≡≡≡ (Progress) ▸▸▸ Conflict
(Slack) ≡≡≡— (Slack) Resource delay
Progress shows Spaces on Baseline △ Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
RESPOND TO COMMENTS	25-Apr-92	0	25-Apr-92
PRODUCTION	25-Apr-92	0	25-Apr-92
DELIVER	25-Apr-92	0	25-Apr-92
DOE REVIEW	25-Apr-92	36	30-May-92
REVIEW	25-Apr-92	28	22-May-92
RESPOND TO COMMENTS	23-May-92	8	30-May-92
PRODUCTION	31-May-92	8	7-Jun-92
DISTRIBUTE TO EPA	8-Jun-92	3	10-Jun-92
REGULATORY REVIEW CYCLE	11-Jun-92	30	10-Jul-92
DELIVER DRAFT TM2	11-Jun-92	0	11-Jun-92
REGULATORY REVIEW	11-Jun-92	30	10-Jul-92
RESPOND TO COMMENTS	11-Jul-92	34	13-Aug-92
PRODUCTION/REVIEW	14-Aug-92	8	21-Aug-92
DAO DIST COMMENT RESP	22-Aug-92	3	24-Aug-92
TM2 COMMENT RESP COMPLETE	25-Aug-92	0	25-Aug-92
FY92 LANL MAT D.I. COSTS	1-Oct-91	329	24-Aug-92
FY92 LANL OTHER I.I. COSTS	1-Oct-91	329	24-Aug-92
AREA D	27-May-92	520	28-Oct-93
PROJECT INITIATION	27-May-92	14	9-Jun-92
TM1 SAMPLING PLAN	10-Jun-92	163	19-Nov-92
PREPARATION STEP	10-Jun-92	41	20-Jul-92
PREPARE TM1 SAMPLING PLAN	10-Jun-92	30	9-Jul-92
PREPARE TM1 SAMPLING PLAN	10-Jun-92	30	9-Jul-92
CONTR. SENIOR REVIEW	3-Jul-92	7	9-Jul-92
CONTRACT MANAGER REVIEW	10-Jul-92	0	10-Jul-92
DELIVER TO CONTRACT MGR.	10-Jul-92	0	10-Jul-92
REVIEW	10-Jul-92	0	10-Jul-92
RESPOND TO COMMENTS	10-Jul-92	0	10-Jul-92
PRODUCTION	10-Jul-92	8	17-Jul-92
DISTRIBUTE WORKING DRAFT	18-Jul-92	3	20-Jul-92
DELIVER WORKING DRAFT TM1	21-Jul-92	0	21-Jul-92
REVIEW STEP	21-Jul-92	122	19-Nov-92
INSTALLATION/AO REVIEW	21-Jul-92	0	21-Jul-92

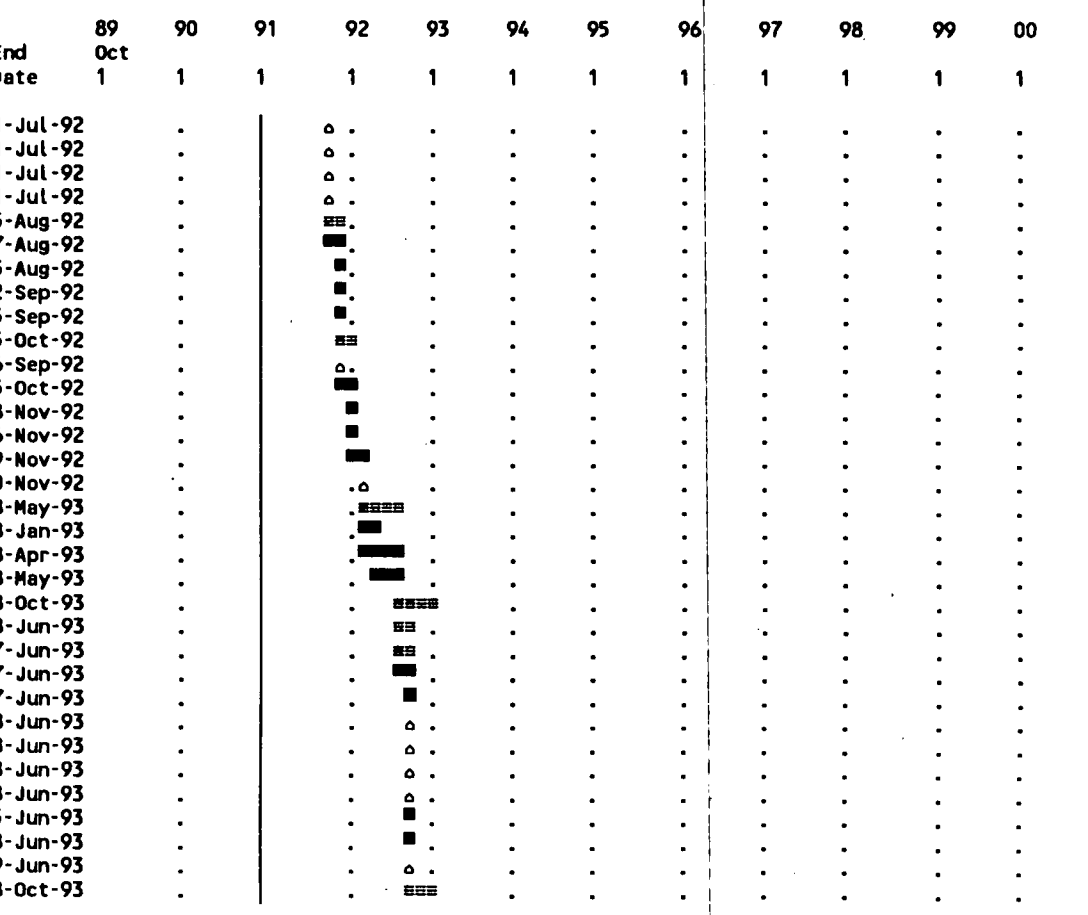


Detail Task ▬▬▬ Summary Task ooooo Baseline
(Progress) (Progress) ▸▸▸ Conflict
(Slack) (Slack) Resource delay
Progress shows Spaces on Baseline ▵ Milestone
---------- Scale: 50 days per character ----------

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
REVIEW	21-Jul-92	0	21-Jul-92
RESPOND TO COMMENTS	21-Jul-92	0	21-Jul-92
PRODUCTION	21-Jul-92	0	21-Jul-92
DELIVER	21-Jul-92	0	21-Jul-92
DOE REVIEW	21-Jul-92	36	25-Aug-92
REVIEW	21-Jul-92	28	17-Aug-92
RESPOND TO COMMENTS	18-Aug-92	8	25-Aug-92
PRODUCTION	26-Aug-92	8	2-Sep-92
DISTRIBUTE TO EPA	3-Sep-92	3	5-Sep-92
REGULATORY REVIEW CYCLE	6-Sep-92	30	5-Oct-92
DELIVER DRAFT TM1	6-Sep-92	0	6-Sep-92
REGULATORY REVIEW	6-Sep-92	30	5-Oct-92
RESPOND TO COMMENTS	6-Oct-92	34	8-Nov-92
PRODUCTION/REVIEW	9-Nov-92	8	16-Nov-92
DAO DIST COMMENT RESP	17-Nov-92	3	19-Nov-92
TM1 COMMENT RESP COMPLETE	20-Nov-92	0	20-Nov-92
VERIFICATION SAMPLING/ANALYSIS	20-Nov-92	180	18-May-93
PERFORM VERIFICATION SAMPLING	20-Nov-92	60	18-Jan-93
VERIFICATION SAMPLE ANALYSIS	20-Nov-92	150	18-Apr-93
DATA VALIDATION	18-Feb-93	90	18-May-93
TM2 VERIFICATION REPORT	19-May-93	163	28-Oct-93
PREPARATION STEP	19-May-93	41	28-Jun-93
PREPARE TM2 VERIF. REPORT	19-May-93	30	17-Jun-93
PREPARE TM2 VERIF. REPORT	19-May-93	30	17-Jun-93
CONTR. SENIOR REVIEW	11-Jun-93	7	17-Jun-93
CONTRACT MANAGER REVIEW	18-Jun-93	0	18-Jun-93
DELIVER TO CONTRACT MGR.	18-Jun-93	0	18-Jun-93
REVIEW	18-Jun-93	0	18-Jun-93
RESPOND TO COMMENTS	18-Jun-93	0	18-Jun-93
PRODUCTION	18-Jun-93	8	25-Jun-93
DISTRIBUTE WORKING DRAFT	26-Jun-93	3	28-Jun-93
DELIVER WORKING DRAFT TM2	29-Jun-93	0	29-Jun-93
REVIEW STEP	29-Jun-93	122	28-Oct-93

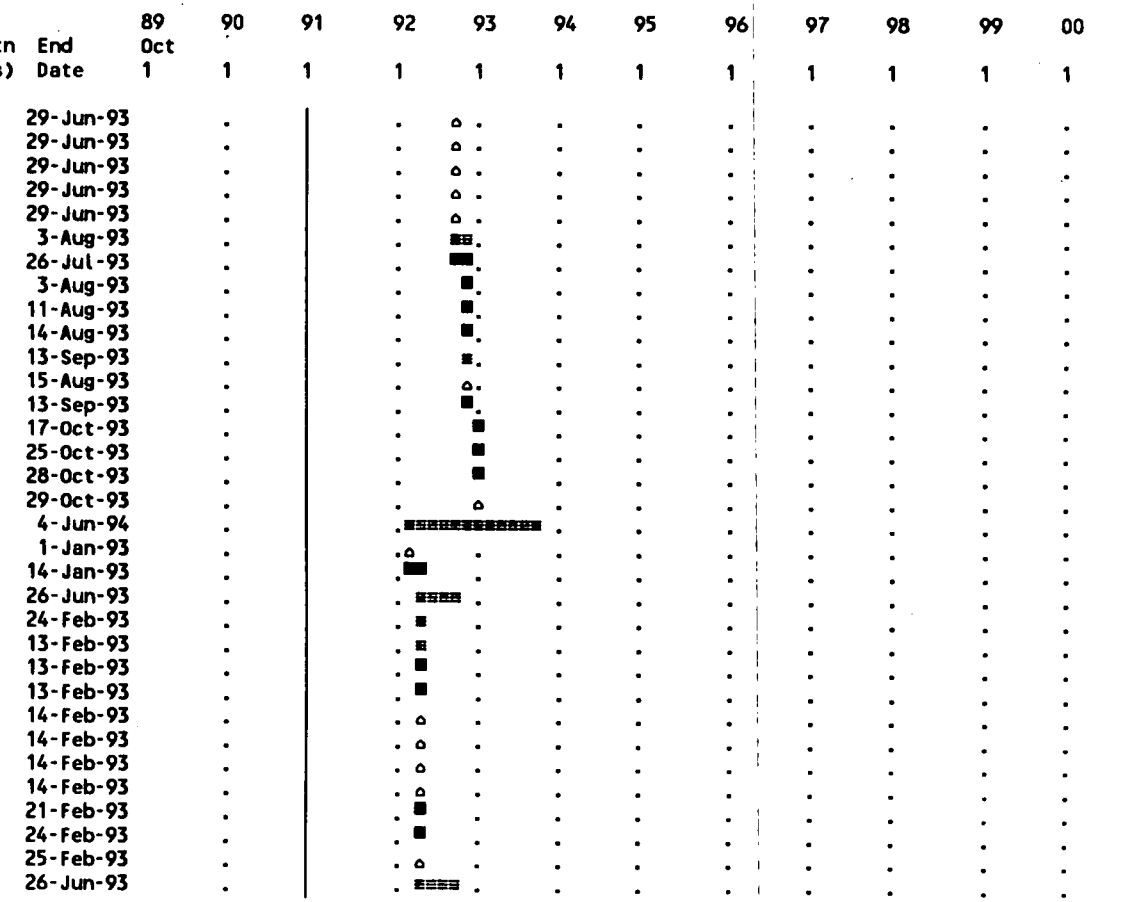


Detail Task ≡≡≡≡≡ Summary Task °°°°° Baseline
(Progress) ≡≡≡≡≡ (Progress) ▸▸▸ Conflict
(Slack) ≡≡≡— (Slack) Resource delay
Progress shows Spaces on Baseline △ Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
INSTALLATION/AO REVIEW	29-Jun-93	0	29-Jun-93
REVIEW	29-Jun-93	0	29-Jun-93
RESPOND TO COMMENTS	29-Jun-93	0	29-Jun-93
PRODUCTION	29-Jun-93	0	29-Jun-93
DELIVER	29-Jun-93	0	29-Jun-93
DOE REVIEW	29-Jun-93	36	3-Aug-93
REVIEW	29-Jun-93	28	26-Jul-93
RESPOND TO COMMENTS	27-Jul-93	8	3-Aug-93
PRODUCTION	4-Aug-93	8	11-Aug-93
DISTRIBUTE TO EPA	12-Aug-93	3	14-Aug-93
REGULATORY REVIEW CYCLE	15-Aug-93	30	13-Sep-93
DELIVER DRAFT TM2	15-Aug-93	0	15-Aug-93
REGULATORY REVIEW	15-Aug-93	30	13-Sep-93
RESPOND TO COMMENTS	14-Sep-93	34	17-Oct-93
PRODUCTION/REVIEW	18-Oct-93	8	25-Oct-93
DAO DIST COMMENT RESP	26-Oct-93	3	28-Oct-93
TM2 COMMENT RESP COMPLETE	29-Oct-93	0	29-Oct-93
RAD WASTE LINES	1-Jan-93	520	4-Jun-94
COMPLETE D&D RAD WASTE LINES	1-Jan-93	0	1-Jan-93
PROJECT INITIATION	1-Jan-93	14	14-Jan-93
TM1 SAMPLING PLAN	15-Jan-93	163	26-Jun-93
PREPARATION STEP	15-Jan-93	41	24-Feb-93
PREPARE TM1 SAMPLING PLAN	15-Jan-93	30	13-Feb-93
PREPARE TM1 SAMPLING PLAN	15-Jan-93	30	13-Feb-93
CONTR. SENIOR REVIEW	7-Feb-93	7	13-Feb-93
CONTRACT MANAGER REVIEW	14-Feb-93	0	14-Feb-93
DELIVER TO CONTRACT MGR.	14-Feb-93	0	14-Feb-93
REVIEW	14-Feb-93	0	14-Feb-93
RESPOND TO COMMENTS	14-Feb-93	0	14-Feb-93
PRODUCTION	14-Feb-93	8	21-Feb-93
DISTRIBUTE WORKING DRAFT	22-Feb-93	3	24-Feb-93
DELIVER WORKING DRAFT TM1	25-Feb-93	0	25-Feb-93
REVIEW STEP	25-Feb-93	122	26-Jun-93



Detail Task ▬▬▬ Summary Task ▬▬▬ Baseline
(Progress) (Progress) Conflict
(Slack) (Slack) Resource delay
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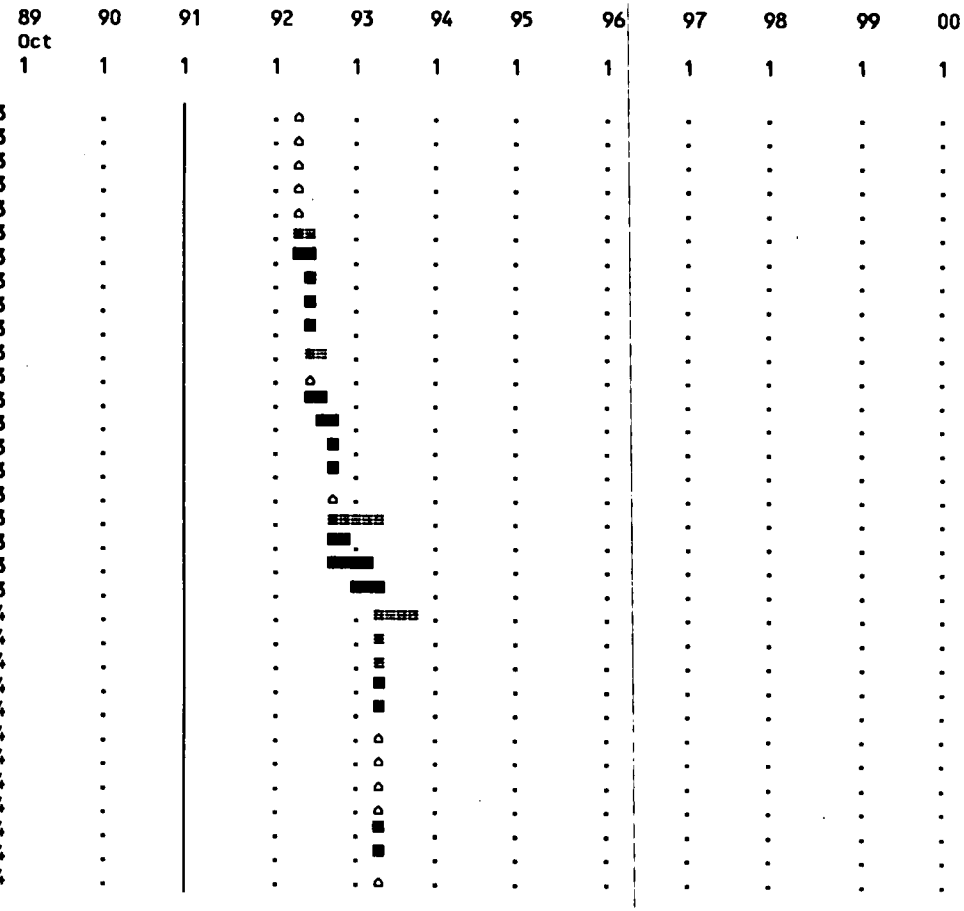
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
INSTALLATION/AO REVIEW	25-Feb-93	0	25-Feb-93
REVIEW	25-Feb-93	0	25-Feb-93
RESPOND TO COMMENTS	25-Feb-93	0	25-Feb-93
PRODUCTION	25-Feb-93	0	25-Feb-93
DELIVER	25-Feb-93	0	25-Feb-93
DOE REVIEW	25-Feb-93	36	1-Apr-93
REVIEW	25-Feb-93	28	24-Mar-93
RESPOND TO COMMENTS	25-Mar-93	8	1-Apr-93
PRODUCTION	2-Apr-93	8	9-Apr-93
DISTRIBUTE TO EPA	10-Apr-93	3	12-Apr-93
REGULATORY REVIEW CYCLE	13-Apr-93	30	12-May-93
DELIVER DRAFT TM1	13-Apr-93	0	13-Apr-93
REGULATORY REVIEW	13-Apr-93	30	12-May-93
RESPOND TO COMMENTS	13-May-93	34	15-Jun-93
PRODUCTION/REVIEW	16-Jun-93	8	23-Jun-93
DAO DIST COMMENT RESP	24-Jun-93	3	26-Jun-93
TM1 COMMENT RESP COMPLETE	27-Jun-93	0	27-Jun-93
VERIFICATION SAMPLING/ANALYSIS	27-Jun-93	180	23-Dec-93
PERFORM VERIFICATION SAMPLING	27-Jun-93	60	25-Aug-93
VERIFICATION SAMPLE ANALYSIS	27-Jun-93	150	23-Nov-93
DATA VALIDATION	25-Sep-93	90	23-Dec-93
TM2 VERIFICATION REPORT	24-Dec-93	163	4-Jun-94
PREPARATION STEP	24-Dec-93	41	2-Feb-94
PREPARE TM2 VERIF. REPORT	24-Dec-93	30	22-Jan-94
PREPARE TM2 VERIF. REPORT	24-Dec-93	30	22-Jan-94
CONTR. SENIOR REVIEW	16-Jan-94	7	22-Jan-94
CONTRACT MANAGER REVIEW	23-Jan-94	0	23-Jan-94
DELIVER TO CONTRACT MGR.	23-Jan-94	0	23-Jan-94
REVIEW	23-Jan-94	0	23-Jan-94
RESPOND TO COMMENTS	23-Jan-94	0	23-Jan-94
PRODUCTION	23-Jan-94	8	30-Jan-94
DISTRIBUTE WORKING DRAFT	31-Jan-94	3	2-Feb-94
DELIVER WORKING DRAFT TM2	3-Feb-94	0	3-Feb-94



Detail Task ≡≡≡≡≡ Summary Task °°°°° Baseline
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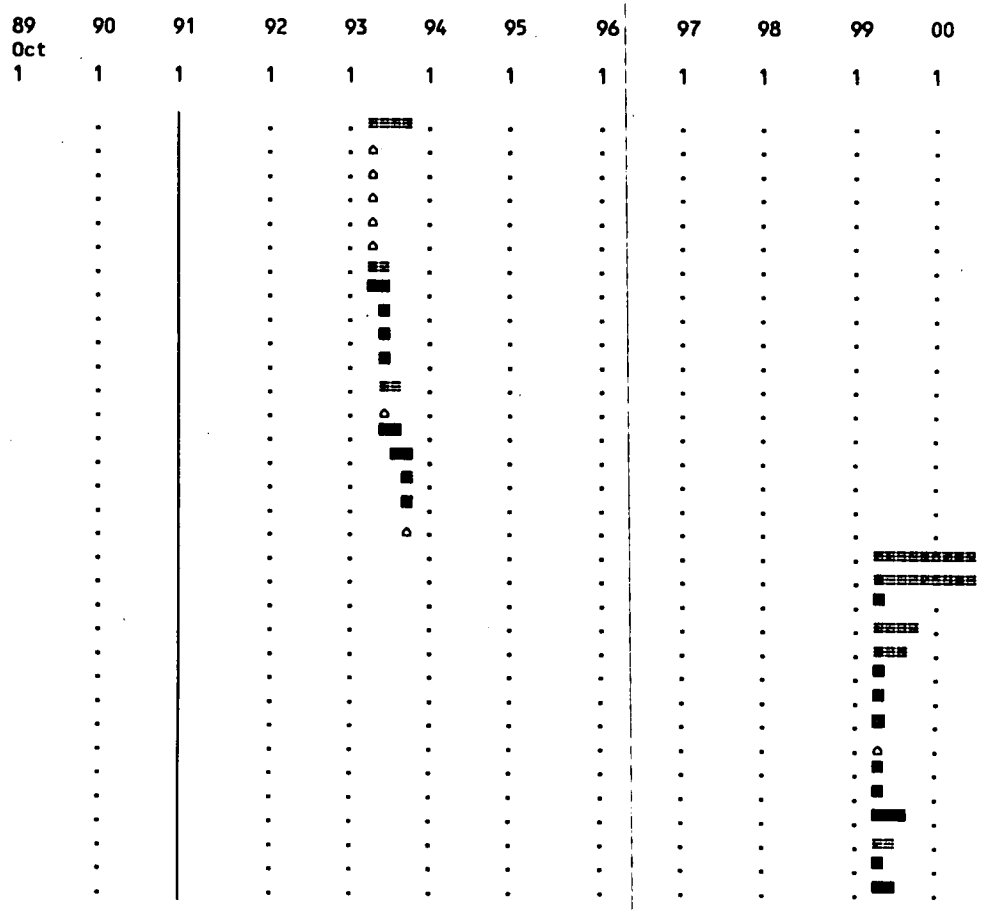
Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
REVIEW STEP	3-Feb-94	122	4-Jun-94
INSTALLATION/AO REVIEW	3-Feb-94	0	3-Feb-94
REVIEW	3-Feb-94	0	3-Feb-94
RESPOND TO COMMENTS	3-Feb-94	0	3-Feb-94
PRODUCTION	3-Feb-94	0	3-Feb-94
DELIVER	3-Feb-94	0	3-Feb-94
DOE REVIEW	3-Feb-94	36	10-Mar-94
REVIEW	3-Feb-94	28	2-Mar-94
RESPOND TO COMMENTS	3-Mar-94	8	10-Mar-94
PRODUCTION	11-Mar-94	8	18-Mar-94
DISTRIBUTE TO EPA	19-Mar-94	3	21-Mar-94
REGULATORY REVIEW CYCLE	22-Mar-94	30	20-Apr-94
DELIVER DRAFT TM2	22-Mar-94	0	22-Mar-94
REGULATORY REVIEW	22-Mar-94	30	20-Apr-94
RESPOND TO COMMENTS	21-Apr-94	34	24-May-94
PRODUCTION/REVIEW	25-May-94	8	1-Jun-94
DAO DIST COMMENT RESP	2-Jun-94	3	4-Jun-94
TM2 COMMENT RESP COMPLETE	5-Jun-94	0	5-Jun-94
FEASIBILITY REPORT/PROP'D PLAN	1-Jan-00	424	27-Feb-01
DEVELOP FSR/PP	1-Jan-00	424	27-Feb-01
PROJECT INITIATION	1-Jan-00	14	14-Jan-00
PREPARATION STEP	15-Jan-00	137	30-May-00
PREPARE WORKING DRAFT FSR/PP	15-Jan-00	120	13-May-00
ASSEMBLE INIT OBJECTIVE & AL	15-Jan-00	30	13-Feb-00
INITIAL SCREEN OF RA ALTS	15-Jan-00	30	13-Feb-00
SUBMISSION/REVIEW RA ALTS/AR	15-Jan-00	30	13-Feb-00
SUBMIT RA ALTS/ARARS	15-Jan-00	0	15-Jan-00
REGULATORY REVIEW	15-Jan-00	30	13-Feb-00
EVAL ALTS & COST EFFECTIVENE	15-Jan-00	30	13-Feb-00
DETAILED ANALYSIS OF ALTS	15-Jan-00	120	13-May-00
EVALUATE NEPA CHAPTER	15-Jan-00	44	27-Feb-00
COMPILE NEPA INFORMATION	15-Jan-00	36	19-Feb-00
PREPARE INTEGRATED SECTIO	15-Jan-00	44	27-Feb-00



Detail Task ▬▬▬ Summary Task °°°°° Baseline
(Progress) ▬▬▬ (Progress) ▸▸▸ Conflict
(Slack) ▬▬— (Slack) ▬▬ Resource delay
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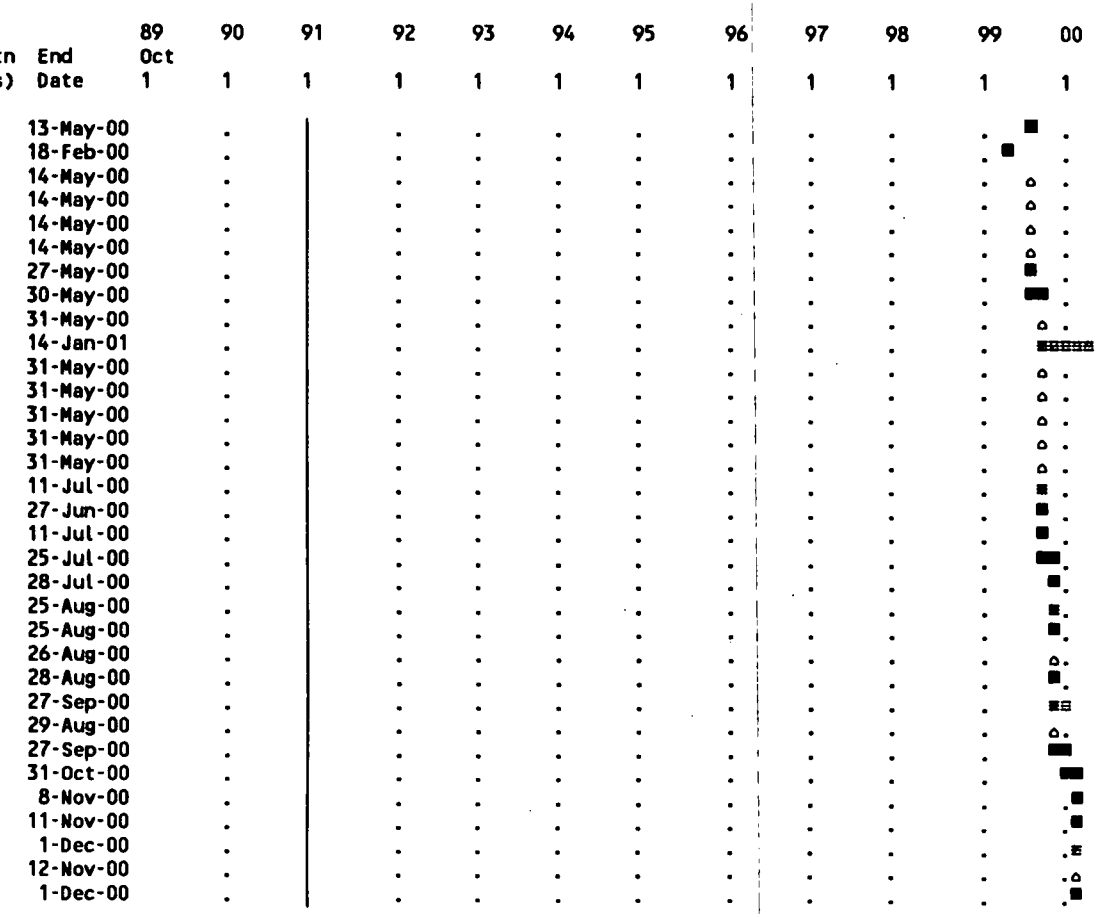
Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
CONTR. SENIOR REVIEW	30-Apr-00	14	13-May-00
PREP WORK DRFT PROPOSED PLAN	15-Jan-00	35	18-Feb-00
CONTRACT MANAGER REVIEW	14-May-00	0	14-May-00
DELIVER TO CONTRACT MGR.	14-May-00	0	14-May-00
REVIEW	14-May-00	0	14-May-00
RESPOND TO COMMENTS	14-May-00	0	14-May-00
PRODUCTION	14-May-00	14	27-May-00
DISTRIBUTE WORKING DRFT FSR/PP	28-May-00	3	30-May-00
DELIVER WORKING DRAFT FSR/PP	31-May-00	0	31-May-00
REVIEW STEP	31-May-00	229	14-Jan-01
INSTALLATION/AO REVIEW	31-May-00	0	31-May-00
REVIEW	31-May-00	0	31-May-00
RESPOND TO COMMENTS	31-May-00	0	31-May-00
PRODUCTION	31-May-00	0	31-May-00
DELIVER	31-May-00	0	31-May-00
DOE REVIEW	31-May-00	42	11-Jul-00
REVIEW	31-May-00	28	27-Jun-00
RESPOND TO COMMENTS	28-Jun-00	14	11-Jul-00
PRODUCTION	12-Jul-00	14	25-Jul-00
DISTRIBUTE TO DOE/HQ	26-Jul-00	3	28-Jul-00
DOE/HQ APPROVAL CYCLE	29-Jul-00	28	25-Aug-00
DOE/HQ APPROVAL	29-Jul-00	28	25-Aug-00
DOE/HQ APPROVAL REC'D	26-Aug-00	0	26-Aug-00
DISTRIBUTE TO EPA	26-Aug-00	3	28-Aug-00
REGULATORY REVIEW CYCLE	29-Aug-00	30	27-Sep-00
DELIVER DRAFT FSR/PP	29-Aug-00	0	29-Aug-00
REGULATORY REVIEW	29-Aug-00	30	27-Sep-00
RESPOND TO COMMENTS	28-Sep-00	34	31-Oct-00
PRODUCTION/REVIEW	1-Nov-00	8	8-Nov-00
DISTRIBUTE TO EPA	9-Nov-00	3	11-Nov-00
REGULATORY REVIEW CYCLE	12-Nov-00	20	1-Dec-00
DELIVER DRAFT FSR/PP	12-Nov-00	0	12-Nov-00
REGULATORY REVIEW	12-Nov-00	20	1-Dec-00

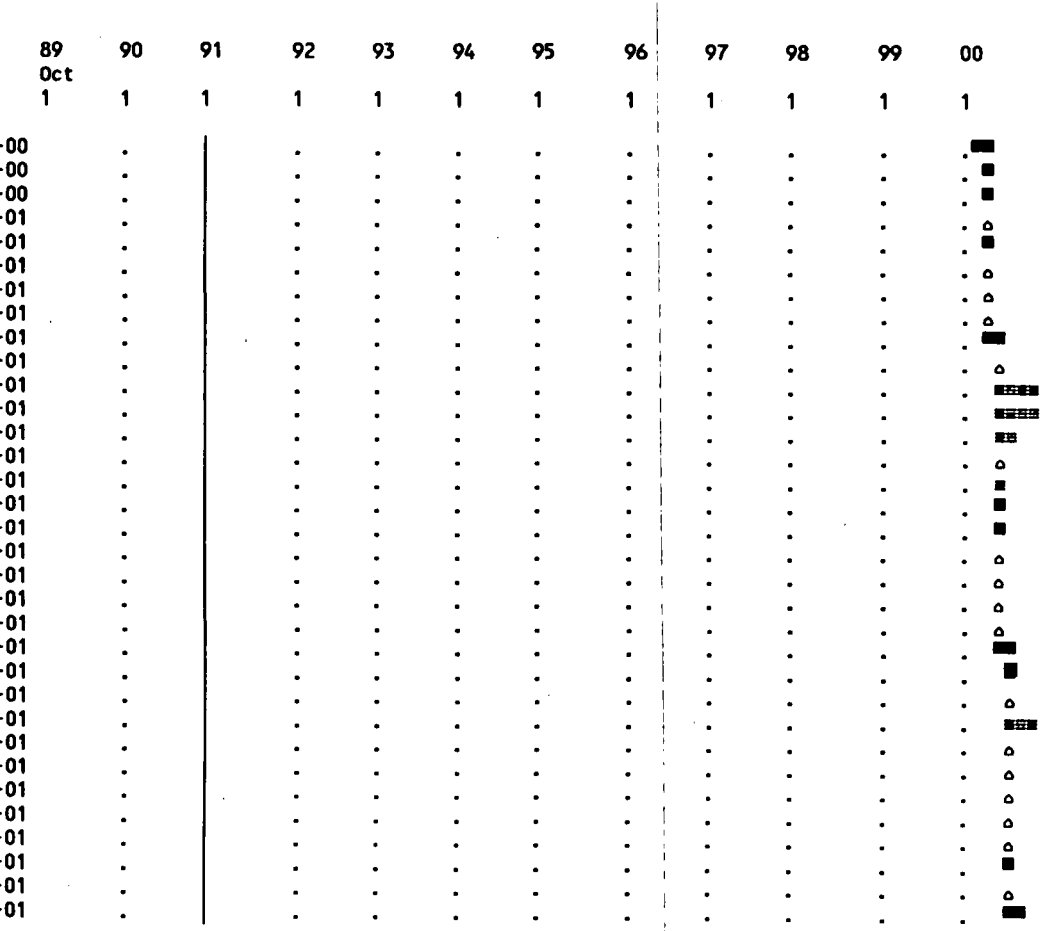


Detail Task | Summary Task | Baseline
(Progress) | (Progress) | Conflict
(Slack) | (Slack) | Resource delay
Progress shows Spaces on Baseline | Milestone
Scale: 50 days per character

Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
RESPOND TO COMMENTS	2-Dec-00	19	20-Dec-00
PRODUCTION/REVIEW	21-Dec-00	8	28-Dec-00
DAO DISTRIBUTION/DRAFT FINAL	29-Dec-00	3	31-Dec-00
RESPONSE COMPLETE	1-Jan-01	0	1-Jan-01
REGULATORY APPROVAL	1-Jan-01	14	14-Jan-01
REGULATORY APPROVAL RECEIVED	15-Jan-01	0	15-Jan-01
INTEGRATE TO OU 9	15-Jan-01	0	15-Jan-01
RELEASE PROPOSED PLAN- PUBLIC	15-Jan-01	0	15-Jan-01
PUBLIC COMMENT-PROPOSED PLAN	15-Jan-01	44	27-Feb-01
PUBLIC COMMENT PERIOD COMPLETE	28-Feb-01	0	28-Feb-01
ROD/RESPONSIVENESS SUMMARY	28-Feb-01	135	12-Jul-01
PREPARE ROD/RESP SUMMARY	28-Feb-01	135	12-Jul-01
PREPARATION STEP	28-Feb-01	30	29-Mar-01
PROJECT INITIATION ROD/RS	28-Feb-01	0	28-Feb-01
PREPARE WORKING DRAFT ROD/RS	28-Feb-01	21	20-Mar-01
PREPARE WORKING DRAFT ROD/RS	28-Feb-01	21	20-Mar-01
CONTR. SENIOR REVIEW	14-Mar-01	7	20-Mar-01
CONTRACT MANAGER REVIEW	21-Mar-01	0	21-Mar-01
DELIVER TO CONTRACT MGR.	21-Mar-01	0	21-Mar-01
REVIEW	21-Mar-01	0	21-Mar-01
RESPOND TO COMMENTS	21-Mar-01	0	21-Mar-01
PRODUCTION	21-Mar-01	6	26-Mar-01
DISTRIBUTE WORK DRFT ROD/RS	27-Mar-01	3	29-Mar-01
DEL WORK DRAFT ROD/RS-DOE/EPA	30-Mar-01	0	30-Mar-01
REVIEW STEP	30-Mar-01	105	12-Jul-01
DISTRIBUTE TO DOE/HQ	30-Mar-01	0	30-Mar-01
DOE/HQ APPROVAL CYCLE	30-Mar-01	0	30-Mar-01
DOE/HQ APPROVAL	30-Mar-01	0	30-Mar-01
DOE/HQ APPROVAL REC'D	30-Mar-01	0	30-Mar-01
DELIVER DRAFT ROD/RS	30-Mar-01	0	30-Mar-01
REGULATORY/DOE REVIEW	30-Mar-01	30	28-Apr-01
REGULATOR REVIEW COMPLETE	29-Apr-01	0	29-Apr-01
RESPOND/INCORPORATE COMMENTS	29-Apr-01	21	19-May-01



Detail Task | Summary Task | Baseline
(Progress) | (Progress) | Conflict
(Slack) | (Slack) | Resource delay
Progress shows Spaces on Baseline | Milestone
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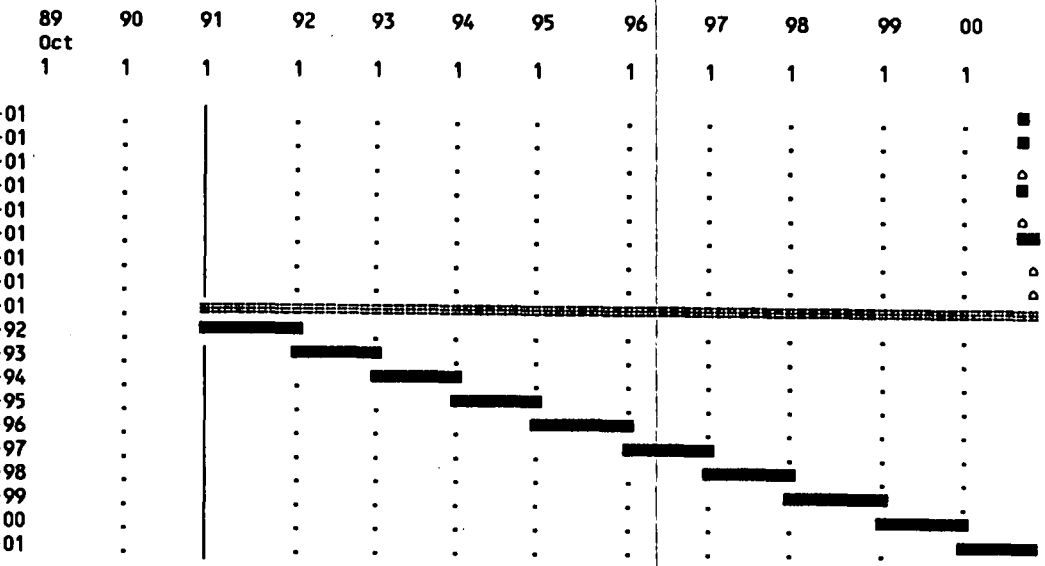
Schedule Name : MOUND D&D BASELINE SCHEDULE
Responsible : EG&G MOUND/LANE METCALF
As of Date : 1-Oct-91 Schedule File : OU6AFY92
Printed : 7-Jan-92 12:06pm

TASK ID # AL-MD-6 (DRAFT) W/TAXES
REVISED DATES PER EPA GUIDANCE MEETING, 10/25/91

Task Name	Start Date	Duratn (Days)	End Date
PRODUCTION/REVIEW	20-May-01	6	25-May-01
DAO DISTRIBUTION/DRAFT FINAL	26-May-01	3	28-May-01
RESPONSE COMPLETE	29-May-01	0	29-May-01
REGULATORY APPROVAL	29-May-01	30	27-Jun-01
ROD APPROVED	28-Jun-01	0	28-Jun-01
PUBLIC NOTICE	28-Jun-01	15	12-Jul-01
COMPLETION	13-Jul-01	0	13-Jul-01
COMPLETION	13-Jul-01	0	13-Jul-01
MOUND O/H COSTS	1-Oct-91	3,573	12-Jul-01
MOUND O/H BASE COST-FY92	1-Oct-91	366	30-Sep-92
MOUND O/H BASE COST-FY93	1-Oct-92	365	30-Sep-93
MOUND O/H BASE COST-FY94	1-Oct-93	365	30-Sep-94
MOUND O/H BASE COST-FY95	1-Oct-94	366	1-Oct-95
MOUND O/H BASE COST-FY96	1-Oct-95	365	29-Sep-96
MOUND O/H BASE COST-FY97	1-Oct-96	365	30-Sep-97
MOUND O/H BASE COST-FY98	1-Oct-97	365	30-Sep-98
MOUND O/H BASE COST-FY99	1-Oct-98	365	30-Sep-99
MOUND O/H BASE COST-FY00	1-Oct-99	366	30-Sep-00
MOUND O/H BASE COST-FY01	1-Oct-00	285	12-Jul-01



Detail Task | Summary Task | Baseline
(Progress) | (Progress) | Conflict
(Slack) | (Slack) | Resource delay
Progress shows Spaces on Baseline | Milestone
Scale: 50 days per character

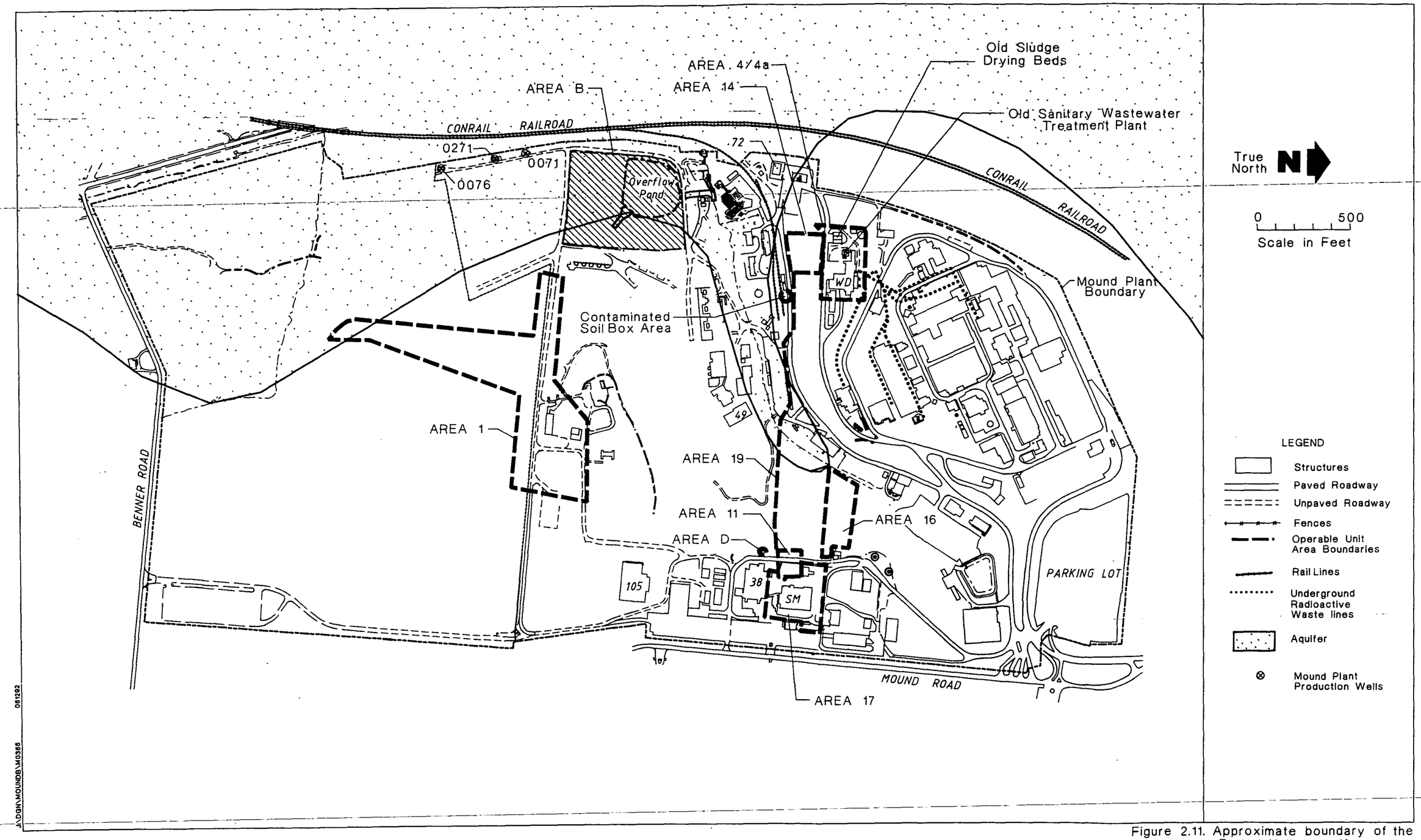


Figure 2.11. Approximate boundary of the Buried Valley aquifer.

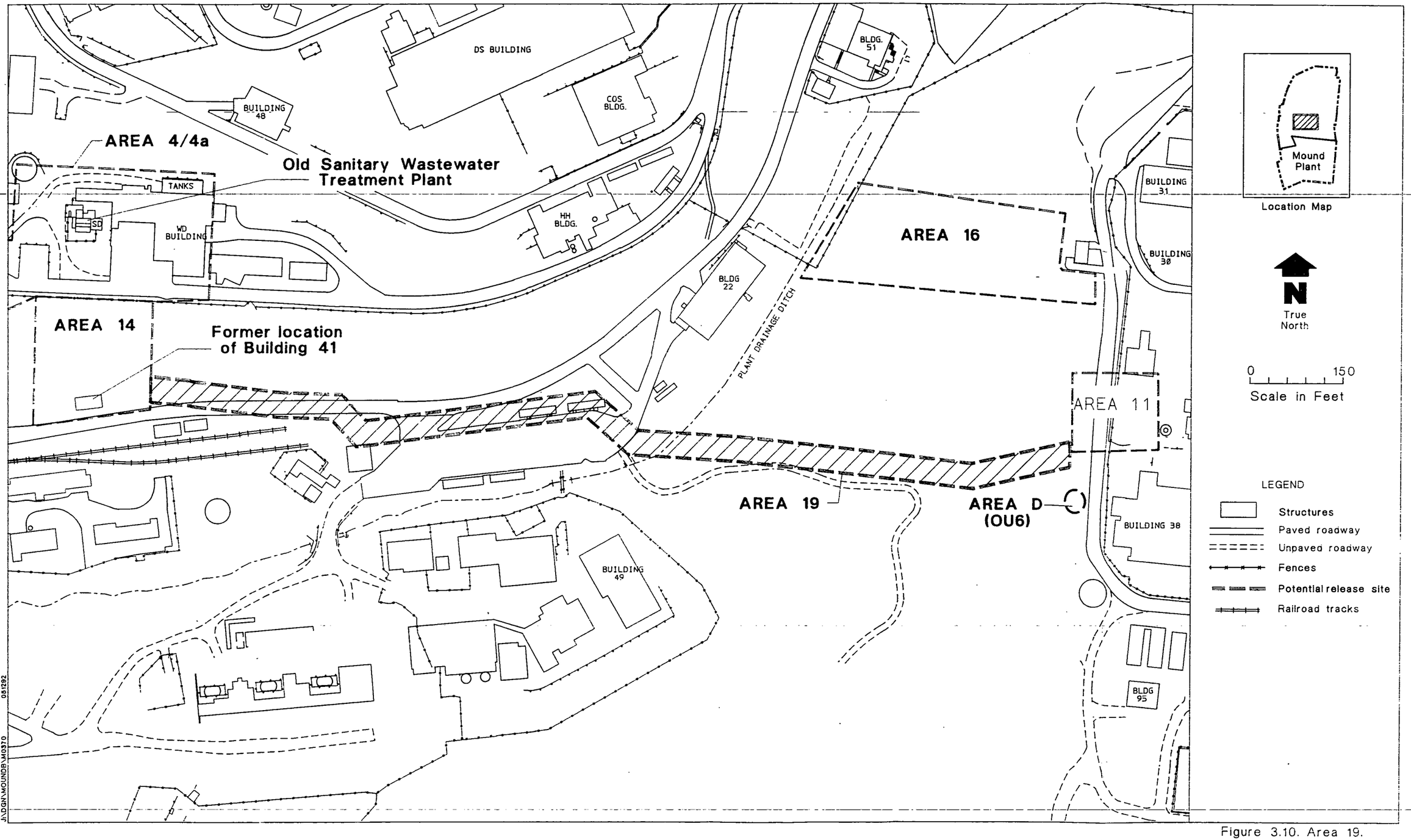


Figure 3.10. Area 19.

Table IV.3. Potential Chemical/Radionuclide-Specific ARARs/TBCs For Operable Unit 6 Surface Water Quality Standards

Parameter	Ohio Water Quality Standard	SDWA MCL Final[a]	SDWA MCL Proposed[b]	SDWA MCLG Final[a]	SDWA MCLG Proposed[b]	Proposed RCRA Subpart S Corrective Action Levels (55 Federal Register 30798)[e]	CWA, AWQC for Protection of Aquatic Life[c]		CWA, WQC for Protection of Human Health)		Health Advisories (TBCs)[d]							
											10 kg Child			70 kg Adult				
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only	One-Day	Ten-Day	Longer Term	Longer Term	RfD µg/kg/day	DWEL	Lifetime	µg/L at 10^{-4} Cancer Risk
Particulate																		
Asbestos (fibers > 10 µm)		7 x 10^6 fibers/L		7 x 10^6 fibers/L					30,000 p/L[g]									
Anions																		
N as Nitrate		10 mg/L		10 mg/L					10 mg/L									
N as Nitrate + Nitrite	100 mg/L[m]	10 mg/L		10 mg/L														
N as Nitrite		1 mg/L		1 mg/L														
Metal																		
Antimony																		
Arsenic	190 µg/L[m]	50 µg/L																
Barium		1,000 µg/L	1,000 µg/L		1,000 µg/L													
Beryllium	TBD[o]		1 µg/L		0 µg/L													
Cadmium	TBD[o]	5 µg/L																
Chromium total	TBD[o]	100 µg/L		100 µg/L							1000 µg/L	1000 µg/L	200 µg/L	800 µg/L	5	200 µg/L	100 µg/L	
Chromium VI	11 µg/L[m]	100 µg/L		100 µg/L		1.6E+01 µg/L	11 µg/L	50 µg/L										
Copper	TBD[o]		1,300 µg/L		1,300 µg/L													
Cyanide	12 µg/L[m]		200 µg/L		200 µg/L	2.2E+01 µg/L	5.2 µg/L	200 µg/L			200 µg/L	200 µg/L	200 µg/L	800 µg/L	22	800 µg/L	200 µg/L	
Lead	TBD[o]	50 µg/L				8.2E+01 µg/L[h]	3.2 µg/L[h]	50 µg/L										
Mercury	0.012 µg/L[n]	2 µg/L		2 µg/L	2 µg/L	2.4E-00 µg/L	12 ng/L	144 ng/L	146 ng/L						0.3	10 µg/L	2 µg/L	
Nickel	TBD[o]		100 µg/L			7E-01 mg/L	1.4 mg/L[h]	160 µg/L[h]	13.4 µg/L	100 µg/L	1000 µg/L	1000 µg/L	200 µg/L	600 µg/L	20	600 µg/L	200 µg/L	
Selenium	5 µg/L[m]	50 µg/L		50 µg/L														
Silver	1.3 µg/L[m]	50 µg/L					4.1 µg/L	120 µg/L	50 µg/L						3			
Thallium	16 µg/L		2/1 µg/L		0.5 µg/L													

Table IV.3. (page 2 of 4)

Parameter	Ohio Water Quality Standard	SDWA MCL Final[a]	SDWA MCL Proposed[b]	SDWA MCLG Final[a]	SDWA MCLG Proposed[b]	Proposed RCRA Subpart S Corrective Action Levels (55 Federal Register 30798)[e]	CWA, AWQC for Protection of Aquatic Life[c]		CWA, WQC for Protection of Human Health)		Health Advisories (TBCs)[d]							
											10 kg Child			70 kg Adult				
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only	One-Day	Ten-Day	Longer Term	Longer Term	RfD µg/kg/day	DWEL	Lifetime	µg/L at 10^{-4} Cancer Risk
Radionuclide																		
Actinium-227																		
Americium-241																		
Bismuth-210																		
Cesium-137																		
Cobalt-60																		
Plutonium-238																		
Radium-226		5 pCi/L[j]																
Strontium-90		8 pCi/L																
Thorium-228																		
Thorium-230																		
Thorium-232																		
Tritium		20,000 pCi/L																
Uranium-233																		160 pCi/L (total U)
Uranium-234																		160 pCi/L (total U)
Uranium-235																		160 pCi/L (total U)
Uranium-238																		160 pCi/L (total U)
Gross Alpha		15 pCi/L																
Gross Beta		4 mrem/yr																4 mrem/yr

Table IV.3. (page 3 of 4)

Parameter	Ohio Water Quality Standard	SDWA MCL Final[a]	SDWA MCL Proposed[b]	SDWA MCLG Final[a]	SDWA MCLG Proposed[b]	Proposed RCRA Subpart S Corrective Action Levels (55 Federal Register 30798)[e]	CWA, AWQC for Protection of Aquatic Life[c]		CWA, WQC for Protection of Human Health)		Health Advisories (TBCs)[d]							
											10 kg Child			70 kg Adult				
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only	One-Day	Ten-Day	Longer Term	Longer Term	RfD µg/kg/day	DWEL	Lifetime	µg/L at 10^{-4} Cancer Risk
Volatile Organic Compounds																		
Acetone	78 mg/L[m]					4E-00 mg/L												
Bis(2-ethylhexyl)phthalate	8.4 µg/L[m]																	
Benzene	560 µg/L[m]	5 µg/L					5.3 mg/L[k]		660 ng/L[k]	40 µg/L[k]	200 µg/L	200 µg/L						100
Bromodichloromethane		Total THM[l] < 100 µg/L				3E-05 mg/L									2			
Bromoform	1,000 µg/L[m]	Total THM[l] < 100 µg/L[l]				7E-01 mg/L									20			
2 Butanone	7.1 mg/L[m]																	
Chloroform	79 µg/L[m]	Total THM[l] < 100 µg/L				6E-03 mg/L	28.9 mg/L[k]	1.24 mg/L[k]	0.19 µg/L[g]	15.7 µg/L[g]					10			
1,1-Dichloroethane																		
1,2-Dichloroethane	990 µg/L[n]	5 µg/L		0 µg/L			118 mg/L[k]	20 mg/L[k]	0.94 µg/L[g]	243 µg/L[g]	0.7 mg/L	0.7 mg/L	0.7 mg/L	2.6 mg/L				40
1,2-*trans*-Dichloroethene		100 µg/L		100 µg/L							20 mg/L	2 mg/L	2 mg/L	6 mg/L	20	0.6 mg/L	0.1 mg/L	
Ethylbenzene	62 µg/L[m]	700 µg/L		700 µg/L		4E-00 mg/L	32 mg/L		1.4 mg/L	3.28 mg/L	30 mg/L	3 mg/L	1 mg/L	3 mg/L	100	3 mg/L	0.7 mg/L	
PCBs	0.00079 µg/L[n]																	
Phenol	370 µg/L[m]					5E+04 mg/L												
Styrene	56 µg/L	100 µg/L		100 µg/L		7E-00 mg/L					20 mg/L	2 mg/L	2 mg/L	7 mg/L	200	7 mg/L		1
Tetrachloroethene	73 µg/L[m]	5 µg/L		0 µg/L		7E-04 mg/L	5.28 mg/L[k]	0.84 mg/L[k]	0.8 µg/L[g]	8.85 µg/L[g]	2 mg/L	2 mg/L	1 mg/L	5 mg/L	10	0.5 mg/L		70
Toluene	1,700 µg/L[m]	1,000 µg/L		1,000 µg/L		1E+01 mg/L	17.5 mg/L[k]		14.3 mg/L	424.0 mg/L	20 mg/L	3 mg/L	3 mg/L	10 mg/L	300	10 mg/L	2 mg/L	
Trichloroethene	75 µg/L[m]	5 µg/L		0 µg/L			45.0 mg/L[k]	21.9 mg/L[k]	2.7 µg/L[g]	80.7 µg/L[g]								
1,1,1-Trichloroethane	418 µg/L[n]	200 µg/L		200 µg/L		3E-00 mg/L			18.4 mg/L	1.03 g/L	100 mg/L	40 mg/L	40 mg/L	100 mg/L	90	1 mg/L	0.2 mg/L	
Xylenes (total)		10 mg/L		10 mg/L		7E+01 mg/L					40 mg/L	40 mg/L	40 mg/L	10 mg/L	2,000	60 mg/L	10 mg/L	

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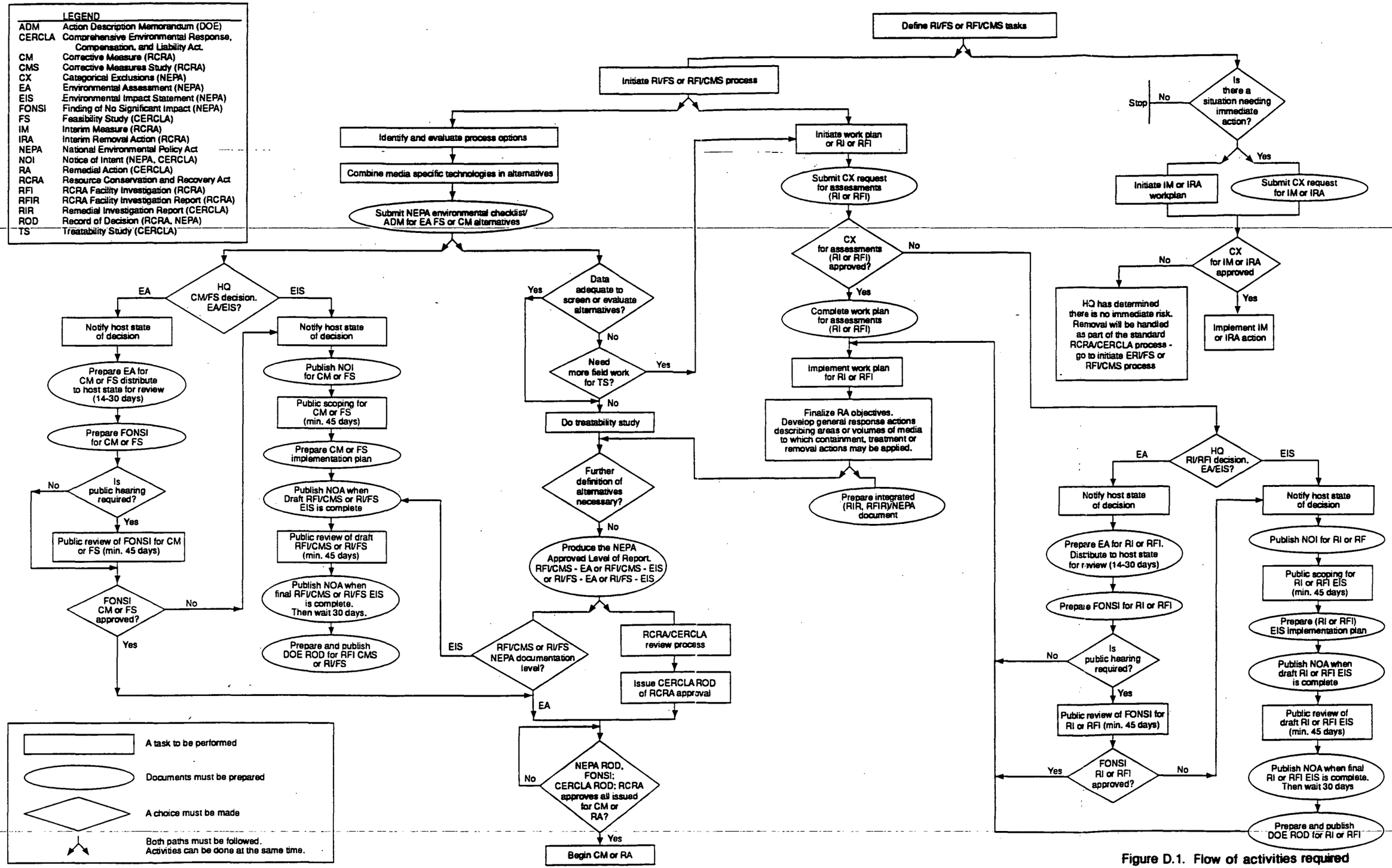

Figure D.1. Flow of activities required to integrate CERCLA, RCRA and NEPA.