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ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH

COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM

PHASE I:
INSTALLATION ASSESSMENT
MOUND

~~NOT FOR PUBLIC DISSEMINATION.~~

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April 1986

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EXECUTIVE SUMMARY

The U.S. Department of Energy (USDOE) Mound site has been evaluated under Phase I of the Comprehensive Environmental Assessment and Response Program (CEARP) with respect to inactive waste disposal sites, accidentally contaminated sites, current waste management practices, existing and potential surface and ground water contamination, and compliance with applicable federal, state, and local environmental regulations. A major thrust of CEARP is to determine whether waste disposal practices followed in the past prior to recognition of potential environmental hazards and/or the passage of environmental legislation have resulted in environmental problems that require remedial action today. This Phase I CEARP report provides documentation for Phase I of the USDOE Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Order 5480.14 and the following U.S. Environmental Protection Agency (USEPA) CERCLA preremedial activities: (1) Federal Facility Site Discovery and Identification Findings (FFSDIF) (notification of newly discovered sites, including negative findings notification), (2) Preliminary Assessment (PA), (3) Site Inspection (SI) [CEARP Preliminary SI (PSI)], and (4) Hazard Ranking System (HRS) evaluation.

The Phase I CEARP report findings are based on a records search, open literature survey, interviews with Monsanto Research Corporation employees, preliminary assessments, and site inspections. Therefore, the report is unavoidably subject to some uncertainty. Situations in which there is uncertainty regarding actual risk to public health and safety and the environment will be further studied through field studies and data collection during CEARP Phase II (Confirmation).

Potential sites identified during CEARP Phase I are presented in Table EX-I. As appropriate, the results for the potential sites are summarized based on a negative, positive, or uncertain finding for the following USEPA CERCLA elements: (1) FFSDIF and (2) PA, SI (CEARP PSI), and HRS evaluation. Area B, the Mound landfill, is the only site with a positive FFSDIF/PA/SI finding. The HRS Migration Mode Score for area B is 13. Sites with HRS Migration Mode Scores greater than 28.5 are listed on the National Priorities List (NPL) by USEPA. None of the potential sites identified at Mound are recommended for additional action under USEPA CERCLA.

However, some of the sites do or potentially could exceed USDOE remedial action criteria/guidelines and/or potentially could pose regulatory concerns and are recommended for future action as specified in Table EX-1 under USDOE, but not USEPA CERCLA. Additionally, remedial action (CEARP Phase IV) has been or is currently being planned/conducted at several such sites.

Compliance with appropriate environmental statutes at Mound has generally been good. The areas identified in Phase I for further evaluation are (1) the Buried Valley Aquifer to develop a thorough understanding of this important groundwater resource; (2) inactive disposal sites and contaminated sites to determine the potential availability of hazardous substances to be released to the environment; (3) hydrologic monitoring programs to ensure their capability to detect hazardous substances in ground and/or surface water; (4) NPDES-related facilities, which may require upgrading to ensure continued compliance with National Pollutant Discharge Elimination System (NPDES) discharge limits; (5) storm and sanitary drain systems to identify upgrading requirements; and (6) existing oil storage facilities to identify modification and relocation requirements.

Table EX-1. Potential CERCLA Sites Identified During CEARP Phase I

Site	USDOE CEARP Phase I: FFSDIF/PA/PSI[a] Finding	USDOE CEARP Phase I: HRS[b] Score	Planned Future Action: USEPA CERCLA Program Element	Planned Future Action: USDOE CEARP/CERCLA Order Phase
Category 1[c]				
Area A	Negative	NA[d]	None	None
Area B	Positive	13	None	Confirmation (Phase II)
Area C	Uncertain	NE[e]	None	Installation Assessment (Supplemental Phase I)
Area D	NA	NA	None	Remedial Action (Phase IV)
Area E	Negative	NA	None	None
Area F	Negative	NA	None	None
Area G	NA	NA	None	Remedial Action (Phase IV)
Area H	Negative	NA	None	None
Area I	Uncertain	NE	None	Installation Assessment (Supplemental Phase I)
Area J	Negative	NA	None	None
Category 2[f]				
Paint Shop	Negative	NA	None	None
Powerhouse	Negative	NA	None	None
WD Bldg	Negative	NA	None	None
Bldg 61	Negative	NA	None	None
Bldg G	Negative	NA	None	None
Category 3[g]				
Area 1	NA	NA	None	Remedial Action (Phase IV)
Area 2	Negative	NA	None	None
Area 3	NA	NA	None	Remedial Action (Phase IV)
Area 4	NA	NA	None	Remedial Action (Phase IV)

Table EX-1 (cont)

Site	USDOE CEARP Phase I		Planned Future Action	
	FFSDIF/PA/PSI[a] Finding	HRS[b] Score	USEPA CERCLA Program Element	USDOE CEARP/CERCLA Order Phase
Area 4a	NA	NA	None	Remedial Action (Phase IV)
Area 5	NA	NA	None	Remedial Action (Phase IV)
Area 6	Negative	NA	None	None
Area 7	NA	NA	None	Remedial Action (Phase IV)
Area 8	NA	NA	None	Remedial Action (Phase IV)
Area 9	NA	NA	None	Remedial Action (Phase IV)
Area 10	Negative	NA	None	None
Area 11	NA	NA	None	Remedial Action (Phase IV)
Area 12	NA	NA	None	Remedial Action (Phase IV)
Area 13	NA	NA	None	None
Area 14	NA	NA	None	Remedial Action (Phase IV)
Area 15	NA	NA	None	Remedial Action (Phase IV)
Area 16	NA	NA	None	Remedial Action (Phase IV)
Area 17	NA	NA	None	Remedial Action (Phase IV)
Area 18	Negative	NA	None	None
Area 19	NA	NA	None	Remedial Action (Phase IV)
Tritium in the Buried Valley Aquifer	NA	NA	None	Compliance and Verification (Phase V)
Plutonium in the Miami-Erie Canal	NA	NA	None	Compliance and Verification (Phase V)

Table EX-1 (cont)

Site	USDOE CEARP Phase I		Planned Future Action	
	FFSDIF/PA/PSI[a] Finding	HRS[b] Score	USEPA CERCLA Program Element	USDOE CEARP/CERCLA Order Phase
Historical Monsanto Facilities				
Unit I	Negative	NA	None	None
Unit II	Negative	NA	None	None
Unit III	Negative	NA	None	None
Unit IV	Negative	NA	None	None
Warehouse	Negative	NA	None	None
Marion	Negative	NA	None	None

[a]Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections.
[b]USEPA Hazard Ranking System.
[c]Category 1--Areas that potentially could have received oils or hazardous substances.
[d]Not applicable.
[e]Not evaluated.
[f]Category 2--Areas that because of past activities had potential for leaks and spills of oils and hazardous substances.
[g]Category 3--Previously identified radioactivity contaminated areas.

I. INTRODUCTION

I.A. Background

U.S. Department of Energy (USDOE) facilities operate under a policy of full compliance with applicable environmental regulations while conducting their missions. The USDOE Albuquerque Operations Office (AL) initiated the Comprehensive Environmental Assessment and Response Program (CEARP) in mid-1984 to help fulfill that commitment at installations within the AL complex. CEARP will also assist USDOE in setting environmental priorities and will help provide justification for funding to carry out enhancements of existing programs or remedial actions where required. Implementation of CEARP will be realized by combined forces of AL, individual USDOE area offices, USDOE prime contractors, Los Alamos National Laboratory, and other assistance as found to be necessary.

I.B. Authority

Authority to implement CEARP is primarily derived from the following USDOE and AL orders:

* Comprehensive Environmental Response, Compensation, and Liability Act Program (USDOE 5480.14)
* Hazardous, Toxic, and Radioactive Mixed Waste Management (USDOE 5480.2 and AL 5480.2)
* Prevention, Control, and Abatement of Environmental Pollution (Ch. XII of USDOE 5480.1 and AL 5480.1)
* Environmental Protection, Safety, and Health Protection Information Reporting Requirements (USDOE 5484.1 and AL 5484.1)
* Implementation of the National Environmental Policy Act (USDOE 5440.1C and AL 5440.1B)

Federal and state regulations with particular importance to Monsanto Research Corporation (MRC) operations at Mound are discussed in Sec. IV.

I.C. Purpose and Scope

CEARP is a phased program to identify, assess, and correct existing or potential environmental problems. The review covers the major environmental regulations such as

the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), National Environmental Policy Act (NEPA), Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Toxic Substances Control Act (TSCA), and Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), with emphasis on CERCLA and RCRA. Past, current, and future practices to handle and dispose of hazardous substances, as defined under CERCLA, are evaluated. In addition, environmental pollution control requirements and environmental monitoring programs for hazardous substances are evaluated for both adequate understanding of pathways and regulatory compliance.

I.D. Methodology

CEARP is being implemented in five phases, which exactly parallel USDOE CERCLA Order 5480.14. Additionally, the U.S. Environmental Protection Agency (USEPA) has prepared guidance for federal facilities to carry out their responsibilities under CERCLA. The USEPA has outlined its plans and intentions in a series of program elements that are organized in a somewhat different fashion but constitute the same basic approach as CEARP (Federal Facilities Program Manual for Implementing CERCLA Responsibilities of Federal Agencies, final draft). The five CEARP phases are linked as indicated in Fig. I.1. CEARP includes a review of the major federal environmental regulations. The review serves two primary purposes: (1) determines compliance with environmental regulations and (2) evaluates the interaction of CERCLA with other environmental regulations, for example, releases permitted under the CWA or CAA and releases exceeding reportable quantities under CERCLA, or RCRA-related remedial activities and CERCLA-related remedial activities. The purposes of individual CEARP phases are as follows.

I.D.1. Phase I - Assessment of the Installation. Phase I objectives are to determine present compliance with environmental laws and to ascertain the magnitude of potential environmental concerns. Where insufficient data exist to accomplish this, the additional information necessary to complete the evaluation will be identified. The CEARP Phase I report will provide documentation for Phase I of the USDOE CERCLA Order 5480.14 and for the following USEPA CERCLA preremedial activities: (1) Federal Facility Site Discovery and Identification Findings (FFSDIF) (notification of newly discovered sites, including notification of negative findings), (2) Preliminary Assessment (PA), (3) Site Inspection (SI), and (4) Hazard Ranking System (HRS) evaluation (see Sec.

I.E.8., The Hazard Ranking System). Sites at Mound are indicated for no further action when CEARP findings indicate (1) negative findings for the CERCLA FFSDIF process (e.g., potential sites that are found not to exist or spills that were removed in the past through remedial action), or (2) sites initially requiring notification for the FFSDIF process, but are later found to pose no threat of release under USDOE CERCLA for the USEPA CERCLA PA process (e.g., potential sites where the hazardous substance initially identified because of its stability no longer persists in the environment). Consequently, sites at Mound that no longer pose a release threat are not included in the USEPA HRS and USDOE Modified HRS (MHRS). This procedure is consistent with the guidance provided to federal facilities by USEPA (Federal Facility Program Manual for Implementing CERCLA Responsibilities of Federal Agencies, final draft) (Fig. I.2.).

Sites requiring HRS evaluation are scored as follows: (1) nonradioactive sites are scored with the USEPA HRS and (2) radioactive sites are scored with the USEPA HRS and the USDOE MHRS. Sites meeting USEPA criteria for being listed on the National Priorities List (NPL) are recommended for future action under USDOE CERCLA Program Phase II to quantify the potential migration problem. This approach is consistent with USEPA CERCLA. Sites that do not meet USEPA criteria to be listed on the NPL but exceed other applicable USDOE remedial action criteria/guidelines (e.g., guidelines for the USDOE Surplus Facilities Management Program) and/or sites posing potential regulatory compliance concerns (e.g., RCRA-related remedial activities) are recommended for future action under CEARP. No further action is recommended for sites not meeting these criteria.

I.D.2. Phase II - Confirmation. Phase II objectives are to (1) obtain additional information identified as necessary during Phase I, (2) complete an environmental evaluation to confirm the presence or absence of potential environmental concerns identified in Phase I, and (3) plan and carry out measurement and sampling programs as required to understand potential sources of contaminants and potential environmental pathways. Confirmed problems will be assessed for health or environmental risk as a basis for setting priorities for remedial action or other follow-up actions. The CEARP Phase II reports will provide documentation for Phase II of the USDOE CERCLA Order (CEARP Phase IIA Monitoring Plan and CEARP Phase IIB Site Characterization) and for two USEPA CERCLA remedial planning program elements (Remedial Investigation Sampling Plan and Remedial Investigation).

I.D.3. Phase III - Technological Assessment. Phase III objectives are to develop plans for remedial actions or enhancements of existing programs by proposing and assessing alternative technologies and approaches to eliminate or control environmental problems identified as needing correction in CEARP Phase II. The evaluation will include assessing the effectiveness of technology; impacts on health, safety, and the environment; and cost-benefit analysis, where appropriate. Phase III reports will include identifying or developing appropriate criteria and performing any evaluation of environmental impact required by NEPA. CEARP Phase III reports will provide documentation for Phase III of USDOE CERCLA and for two remedial planning program elements of USEPA CERCLA (i.e., Feasibility Study and Remedial Action Selection).

I.D.4. Phase IV - Remedial Action. Phase IV objectives are to implement recommended site-specific remedial measures identified in Phase III, which could include engineering design and construction to remedy or control environmental problems. CEARP Phase IV will encompass requirements of USDOE CERCLA Order (Phase IV) and remedial implementation program elements of USEPA CERCLA (Design and Action).

I.D.5. Phase V - Compliance and Verification. Phase V objectives are to (1) verify and document the adequacy of remedial actions carried out in Phase IV, and (2) identify and plan for any continuing monitoring requirements needed to demonstrate control of migration or adequately recognize future concerns. CEARP Phase V will encompass requirements of USDOE CERCLA Order Phase V and USEPA Final Site Inspection/Closeout and Monitoring.

I.E. Phase I Implementation

CEARP Phase I was carried out at Mound as a number of tasks. These tasks were performed by personnel of the Los Alamos National Laboratory Environmental Surveillance Group and MRC (Mound operating contractor).

I.E.1. Records Search and Literature Survey. During the Mound records search and open literature survey, existing documents in the following categories were reviewed and evaluated by Los Alamos personnel:

- environmental documents
- development or management plans
- environmental monitoring reports
- federal/state/local permits
- operational records/documents
- safety analysis documents
- standard operating procedures
- appraisals, audits, inspections
- contingency/emergency plans
- special/topical studies or reports
- history and mission documents
- accident/incident investigation reports

Information acquired during the records search and literature survey that is directly related to CEARP is included and referenced as appropriate in this CEARP Phase I report. A listing of documents surveyed during the review process is provided in App. E. This listing is representative of documents reviewed. In addition, the appropriate CEARP-related Mound internal files were reviewed, including Mound Loss Prevention and Environmental Control (LP&EC) documentation. Appropriate AL CEARP-related files for Mound were also reviewed.

I.E.2. Employee Interviews. MRC employees (former and current) identified as possibly having knowledge relevant to CEARP were screened to determine who would be interviewed. More than 20 MRC employees familiar with or having had responsibility for past and current management practices for hazardous substances, facility operations (e.g., processes that generated solid and liquid hazardous substances), or who might know about past leaks or spills of hazardous substances were identified during the screening process. These individuals were interviewed during the official review process to identify undocumented incidents or management practices that could have resulted in environmental concerns. Information from the interview process covers the complete history of MRC at Mound and other MRC Mound-related facilities. Those interviewed included 4 employees, 1946-1949; 13 employees, 1950-1959; 24 employees, 1960-1969; 24 employees, 1970-1979; and 24 employees, 1980-1985). Current and past professionals in Operational Safety at Mound (e.g., Technical Services, Industrial Hygiene, Health Physics Operations, and Environment) were interviewed as well as those in Production, Product and Process Development, Advanced Devices, Engineering, Facilities Engineering, Nuclear Operations, Nuclear Technology, and Technology Application and Development. A two-person team from Los Alamos National Laboratory conducted the interviews during the week of Feb. 11, 1985. The interview notes were compiled and returned to the person interviewed for verification. The information from the interview process is included (as appropriate) in this CEARP Phase I report. However, names,

positions, and period of position performance have been omitted to preserve their anonymity and ensure compliance with employee protection requirements of CERCLA (Section 110 of CERCLA).

Information collected represents individual recollections of events and conditions over an extended period of time, some of it as far back as four decades. This information was accepted at face value as an indicator of potential environmental concerns but cannot be taken as documented proof of environmental perturbations. However, any event or condition mentioned that had and/or has potential to release hazardous substances into the environment provided the basis for a recommendation that at least some confirmatory data be collected under CEARP Phase II. This approach ensures that suspect sites are characterized and that potential sources for release of hazardous substances are not overlooked. The intent is to have definitive documentation by the end of CEARP Phase II confirming the presence or absence of any environmental concerns.

I.E.3. Evaluation of Waste Management . Present and past management practices for hazardous substances were reviewed and evaluated. Information for this process was gathered during the CEARP records search and literature survey, employee interviews, and investigation of current operations at Mound.

I.E.4. Identification of Contaminated Areas. Sites that were contaminated or are suspected of being contaminated as a result of current or past practices, including leaks and spills, were identified. Information for this process was gathered during the CEARP records search and literature survey, employee interviews, and investigation of current operations at Mound.

I.E.5. Evaluation of Compliance with Environmental Regulations. An evaluation of compliance with applicable environmental standards and regulations, including USDOE orders and internal guidelines, was conducted. Special emphasis was placed on those regulations that interface with CERCLA (e.g., CWA or CAA permitted releases and exceeding CERCLA reportable quantities).

I.E.6. Preliminary Physical Survey. Preliminary physical surveys of Mound were conducted during 1984 and 1985 to validate observations from the CEARP document

search and interviews and to identify other signs of environmental stress or facility features that might indicate a potential for environmental concerns.

I.E.7. Pathway Evaluation. A preliminary evaluation of potential migration pathways for hazardous substances was made.

I.E.8. The Hazard Ranking System (HRS). The HRS is used by USEPA to establish a National Priorities List (NPL) of facilities for initial attention under CERCLA. Effective Feb. 18, 1986 federal sites meeting criteria for listing on the NPL can be listed there.

The USEPA HRS, however, does not discriminate among different radioisotopes relative to their potential risk at potential CERCLA sites. Therefore, USDOE developed the modified HRS (MHRS) which is a conceptually minor modification/addition to the HRS. The MHRS permits a better assessment of existing radiological risks. Therefore, potentially radioactive sites requiring HRS evaluation are scored with USDOE's MHRS and EPA's HRS; and non-radioactive sites requiring HRS evaluation scored with USEPA's HRS.

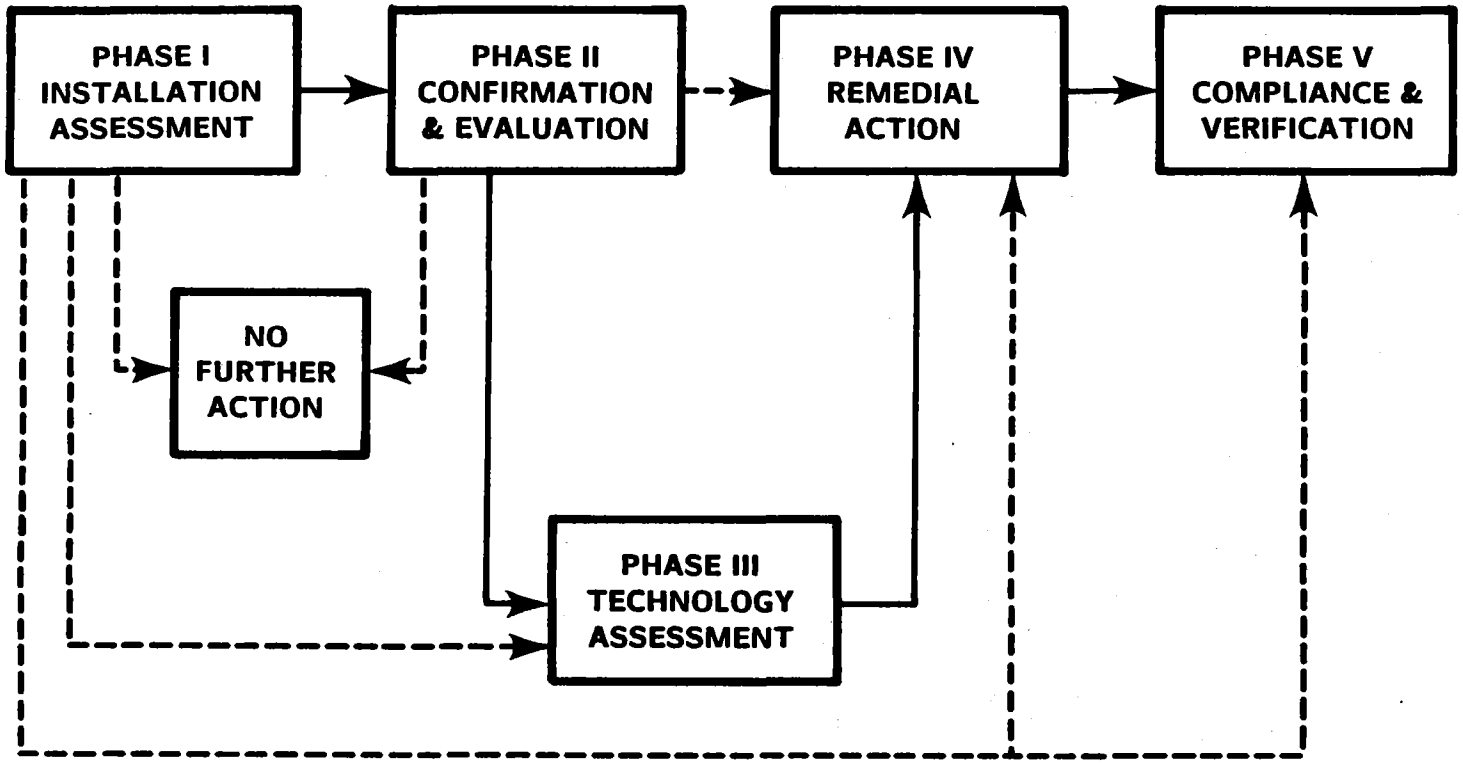

Figure I.1. CEARP Decision Flow Chart.

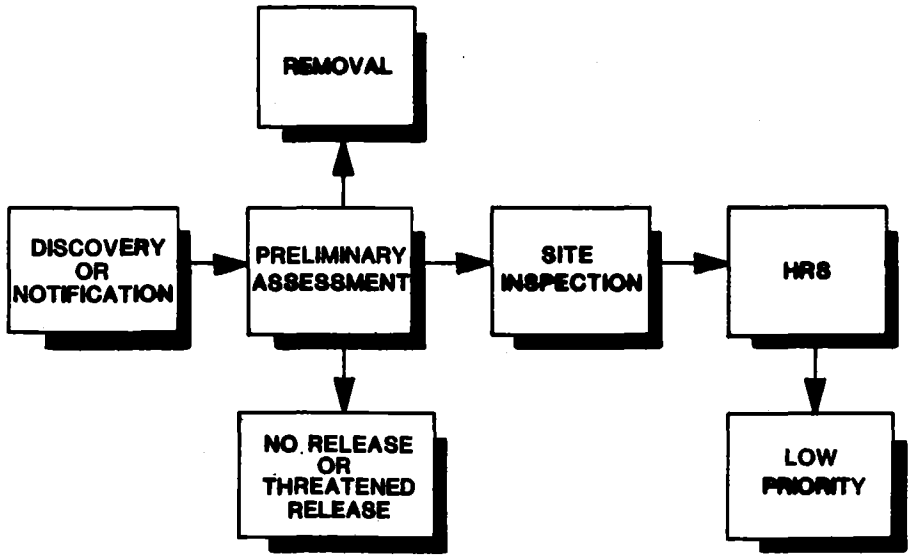

Figure I.2. Initial Phases of Federal Agency-Lead Superfund Response Activities and Events.

II. DESCRIPTION OF THE MOUND INSTALLATION

II.A. Location and Physical Description

Mound is located on a 306-acre site in southern Montgomery County in southwestern Ohio, at the southern boundary of Miamisburg and 0.6 mi due east of the Great Miami River (Fig. II.1. and Fig. II.2.). The site is 10 mi south-southwest of Dayton, Ohio, and 31 mi north-northeast of Cincinnati, Ohio. Several photographs of Mound are provided in Appendix B.

The predominant geographical feature in the five-county region surrounding Mound is the Great Miami River, which flows from northeast to southwest through Miamisburg. The river valley is highly industrialized. The remainder of the region is predominantly farmland, dotted with light industry and small communities.

Mound is situated on a high area overlooking Miamisburg, the Great Miami River, and the river plain area to the west. The property is characterized by two high areas divided by a minor northeast-southwest trending valley (the original Mound site), and the more recently acquired property to the south. Most of the buildings are located on the northwest high area (Fig. II.3.). A smaller group of buildings is located on the southeast high area, and several buildings are located in the valley and on the valley slopes. A detailed discussion of the Mound environs can be found in the Final Environmental Impact Statement for Mound (USDOE 1979).

The present site plan (Fig. II.4.) shows the layout of all facilities, including new construction. The usages for present facilities are presented in Table II.1. The utilities and support services are identified in Fig. II.5.

Buildings on the northwest hill include administrative offices, machine tool and maintenance shops, nuclear and advanced device production and development facilities, cafeteria, library, powerhouse, and other utilities (Monsanto Research Corporation 1985).

Buildings in the valley area include explosive production and test firing facilities, explosive storage bunkers, isotope separation facilities, waste disposal operations, sanitary treatment facilities, warehouses, and offices. Construction sites are available west of the test firing area.

The southeast SM Hill or PP area (Fig. III.1.) of the original Mound site is occupied by Building 50 and the old plutonium processing facilities. The area south of the PP area is flat and is the largest area available for construction on the original site.

The proposed site development plan for Mound is presented in Fig. II.6. A detailed discussion of the plan can be found in "The Mound Site Development and Facilities Utilization Master Plan" (Monsanto Research Corporation 1985).

II.B. Former Use

The original Mound site was used for agrarian purposes prior to the establishment of Mound.

II.C. Organization

MRC operates Mound, a government-owned facility of USDOE at Miamisburg, Ohio. Mound is an integral part of the USDOE AL complex. MRC is the sole contractor involved in waste generation and waste management activities at Mound.

II.D. Mission

Mound is an integrated research, development, and production facility performing work in support of USDOE weapons and energy programs, with emphasis on explosives and nuclear technology (Monsanto Research Corporation 1985).

The weapons program missions include process development, production engineering, manufacturing and surveillance of detonators, explosive timers, explosive actuated transducers, explosive pellets, nuclear components, and specific testing equipment.

The main function at Mound is to manufacture nonnuclear components and tritium-containing components for nuclear weapons. Its major objectives are as follows:

* Manufacture detonators, explosive timers, explosive-actuated transducers and switches, explosive pellets for the nuclear weapons program, firesets, and pyrotechnic actuators.

* Develop and manufacture small heat sources for the national defense program.

* Manufacture tritium components for nuclear weapons applications.

* Perform surveillance and quality assurance on explosive detonators and radioactive components received from other USDOE sites.

* Develop materials and processes for potential future manufacturing of components and explosive-actuated mechanisms containing chemical explosives.

* Develop tritium processes and materials for possible future production.

* Recover and purify tritium generated by tritium operations at various USDOE sites.

* Develop and fabricate components for a variety of radioisotopic heat sources fueled with ^{238}Pu having thermal outputs ranging from 0.2 watt to several thousand watts; assemble and test radioisotopic thermoelectric generators; and act as lead laboratory for heat source programs supporting the national space programs.

* Manage procurement of ordnance materials for weapons programs.

* Separate, purify, and market stable (nonradioactive) isotopes including the noble gases, sulfur, chlorine, and bromine, and market the isotopes of carbon, nitrogen, and oxygen.

* Conduct investigations on chemical explosives and pyrotechnics; plastics, elastomers and adhesives of interest to the nuclear weapons program; fuel systems for thermonuclear energy research programs; joining of exotic metals; instrumentation for the nuclear safeguards program; separation techniques and gas dynamics relating to stable isotopes; energy conversion systems; and management of radioactive wastes.

* Develop and implement methods to decommission and decontaminate radioactive facilities.

II.E. Demographics

The Mound site is mainly within the southern city limits of Miamisburg in Montgomery County, Ohio, an extensively urbanized county dominated by the Dayton metropolitan area (Monsanto Research Corporation 1985). It is situated about 10 mi south-southwest of the Dayton city limits (Fig. II.7.).

The 1980 census populations of Miamisburg, Dayton, and Montgomery Counties were 15,300, 199,540, and 571,700, respectively. Local urban populations are presented in Fig. II.7. There is no large seasonal variation in population for the local area surrounding Mound.

Miamisburg is mostly a residential community, with some supportive commercial facilities and limited industrial development. Most of the residential, commercial, and industrial development within a 5-mi radius of the site is concentrated on the Great Miami River flood plain. The adjacent upland areas are used primarily for residences and agriculture. Agricultural land within a 5-mi radial area around the site is used primarily for corn and soybean production and for livestock grazing. Most of the residential development on the upland areas is relatively new in comparison with development on the flood plain. It is likely that most future development in the area will occur on the upland areas.

Miamisburg has 13 parks and 4 playgrounds. Mound Golf Course and Miamisburg Mound State Memorial Park, directly east of the facility across Mound Road, are heavily used during favorable weather. The park is the site of the 68-ft high Indian mound (Miamisburg Mound), which is located 380 ft east-southeast of the site boundary. The Miamisburg Mound is the only historic landmark in the immediate vicinity of Mound. Within 1 mi of the facility, other recreational areas extensively used in summer include the municipal swimming pool, Harmon Athletic Field, and Library Park.

The major body of water in the Mound vicinity is the Great Miami River, which is approximately 150 to 200 ft wide. The Great Miami River is not used for commercial barge traffic or commercial fishing, but some pleasure boating and sport fishing do occur, usually during the summer.

Principal surface and groundwater users within the Great Miami River basin are depicted in Fig. III.4.). No municipal system in this basin uses surface water for a public water supply below the Mound effluent discharge. Both surface and subsurface waters are used by manufacturing and power companies within the basin for processing and heat exchange. The nearest downstream surface water user is the O. H. Hutchings Power Station (USDOE 1979).

There are no large lakes within a 5-mi radius of the site. Several fishing ponds are located 3.5 mi north-northeast in inactive gravel pits. Some vestiges of the old Miami-Erie Canal lie between the Penn Central Railroad and the Dayton-Cincinnati Pike to the west of the site. The City of Miamisburg has maintained two very small recreation ponds in a small park in this area. During 1978, Miamisburg converted one of the small ponds into a solar pond to heat water for the municipal swimming pool. The city may expand this park area along the west boundary of the site.

Additional discussion of the Mound environs can be found in the Final Environmental Impact Statement for Mound (USDOE 1979).

II.F. Important Site Characteristics

Mound is located in an urbanized area, making accidental releases of hazardous substances, past and current, a sensitive issue to the immediate population. Earlier releases of tritium and plutonium at Mound were made public by MRC, and there has been routine annual reporting of environmental information. There has been no adverse public reaction to such announcements. The tritium releases have resulted in monitoring and pumping local groundwater supplies to ensure that tritium concentrations are within the national interim primary drinking water standard (20 nCi/L)(40 CFR 141). The Buried Valley Aquifer, a major water source for the region, trends along the Great Miami River and extends eastward beneath the valley that bisects Mound (see Sec. III.C.2.b.).

II.G. History of Monsanto Facilities

Mound originated as a technical organization in 1943 when Monsanto Company was requested to accept responsibility for determining the chemical and metallurgical properties of polonium as a project (Dayton Project) of the Manhattan Engineering District. This work was conducted at several satellite units of Monsanto's Central Research Department in the Dayton, Ohio area. Former Monsanto facilities and their respective missions are identified in Table II.2. In 1946 a 182-acre tract adjacent to Miamisburg was selected for a permanent facility. Work at the satellite units was consolidated at Mound in 1948.

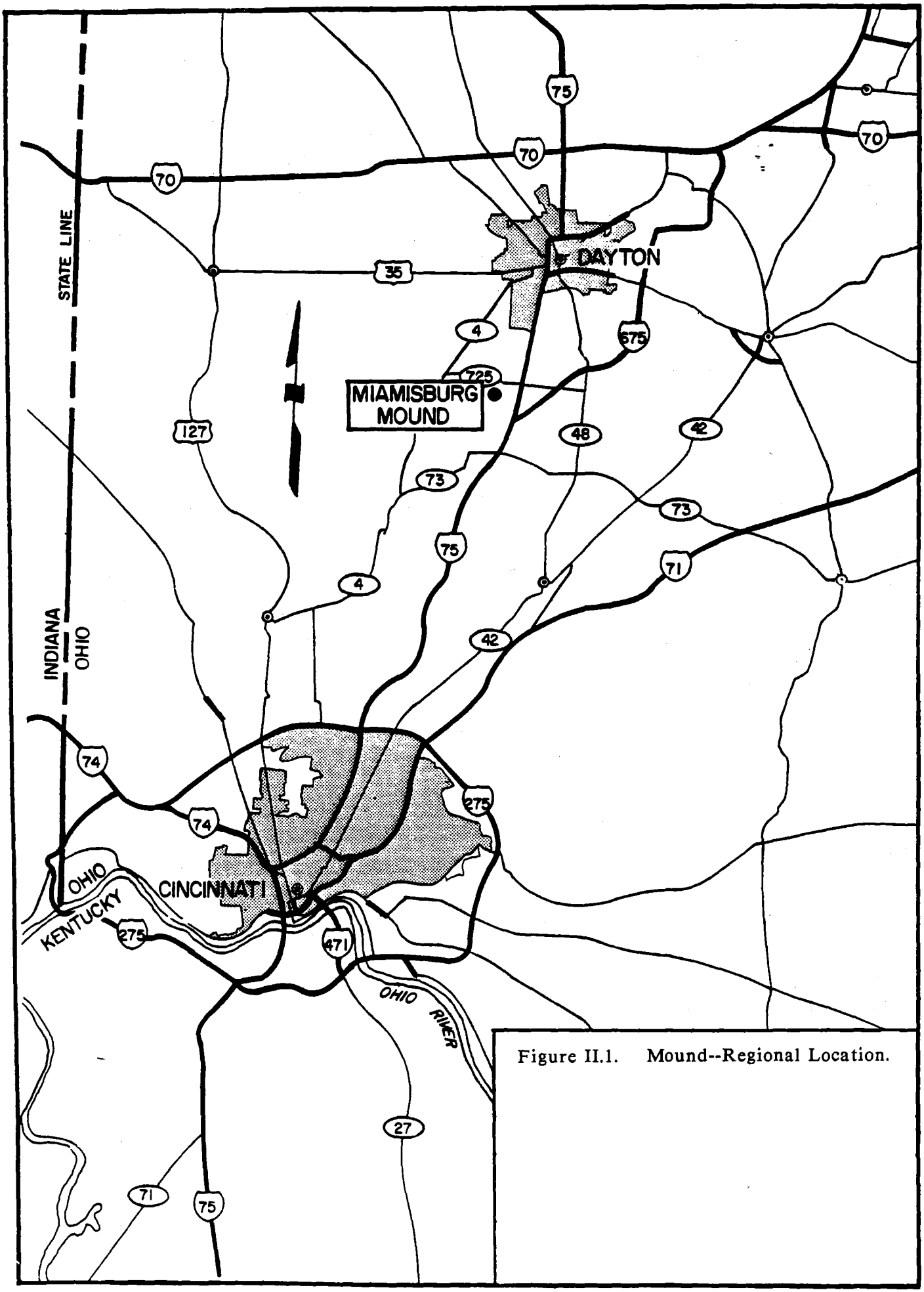

Figure II.1. Mound--Regional Location.

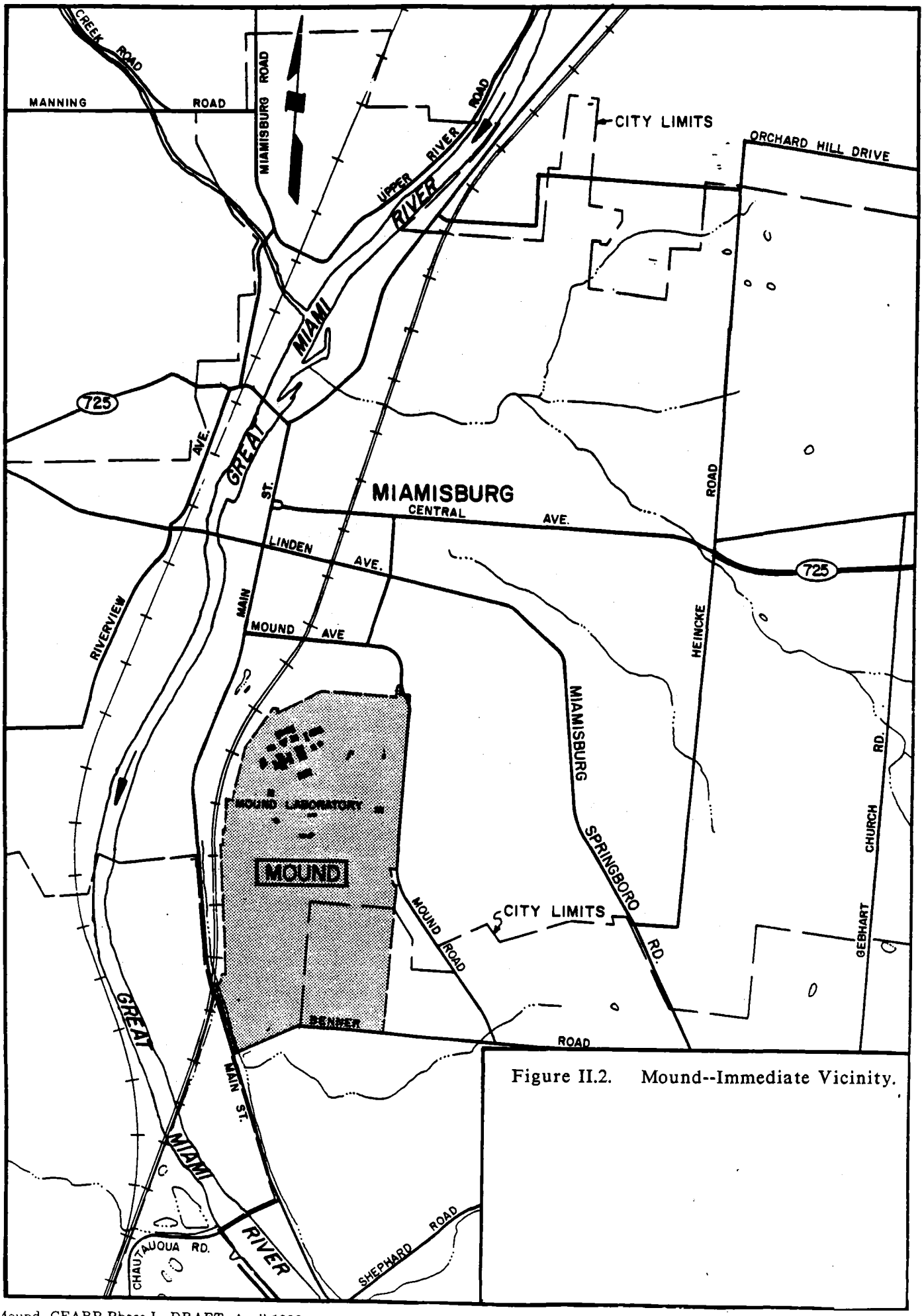

Figure II.2. Mound--Immediate Vicinity.

Figure II.3. Mound--Site Topography.

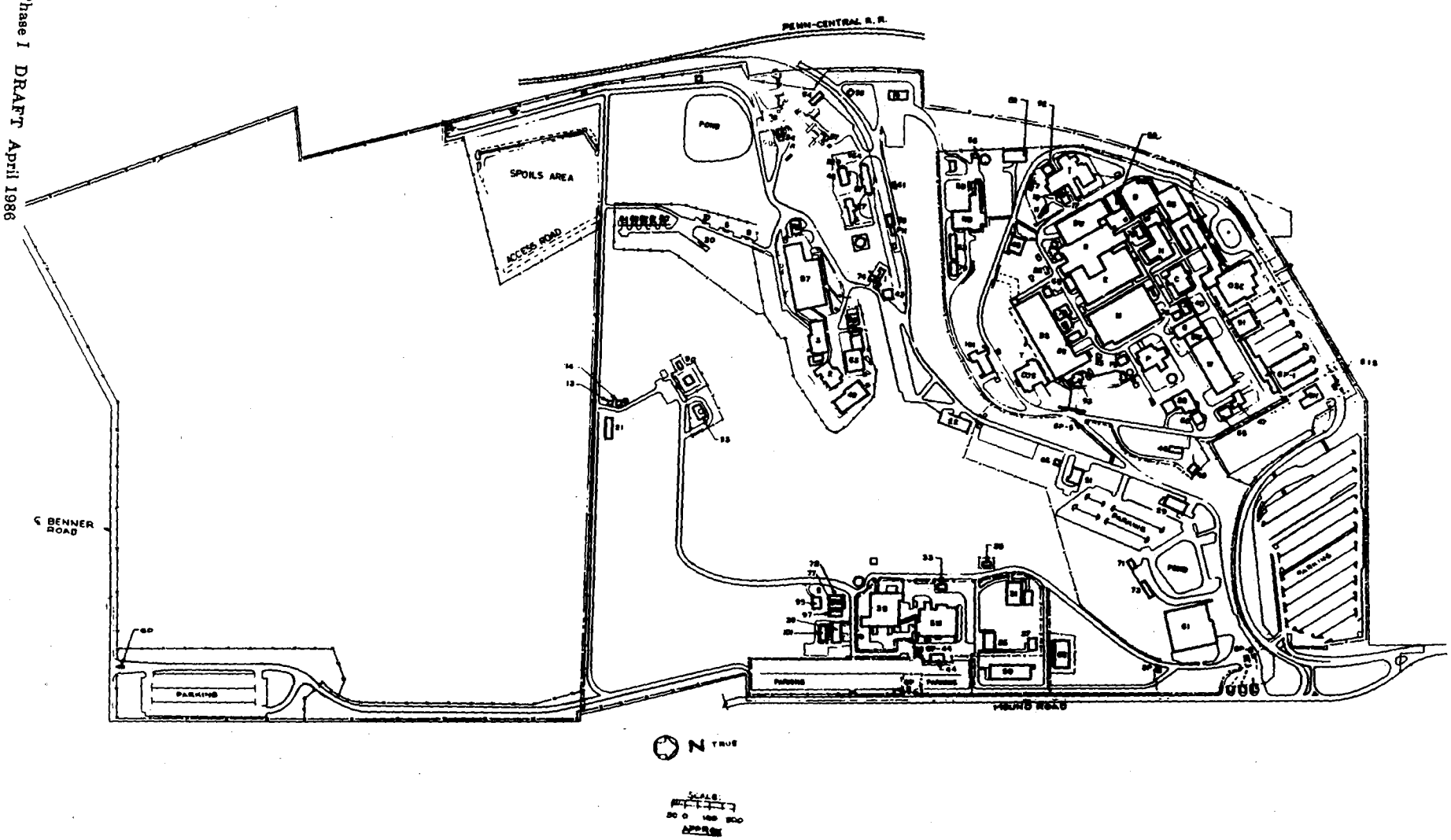

Figure II.4. Mound--Site Plan (1985).

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~~May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.~~

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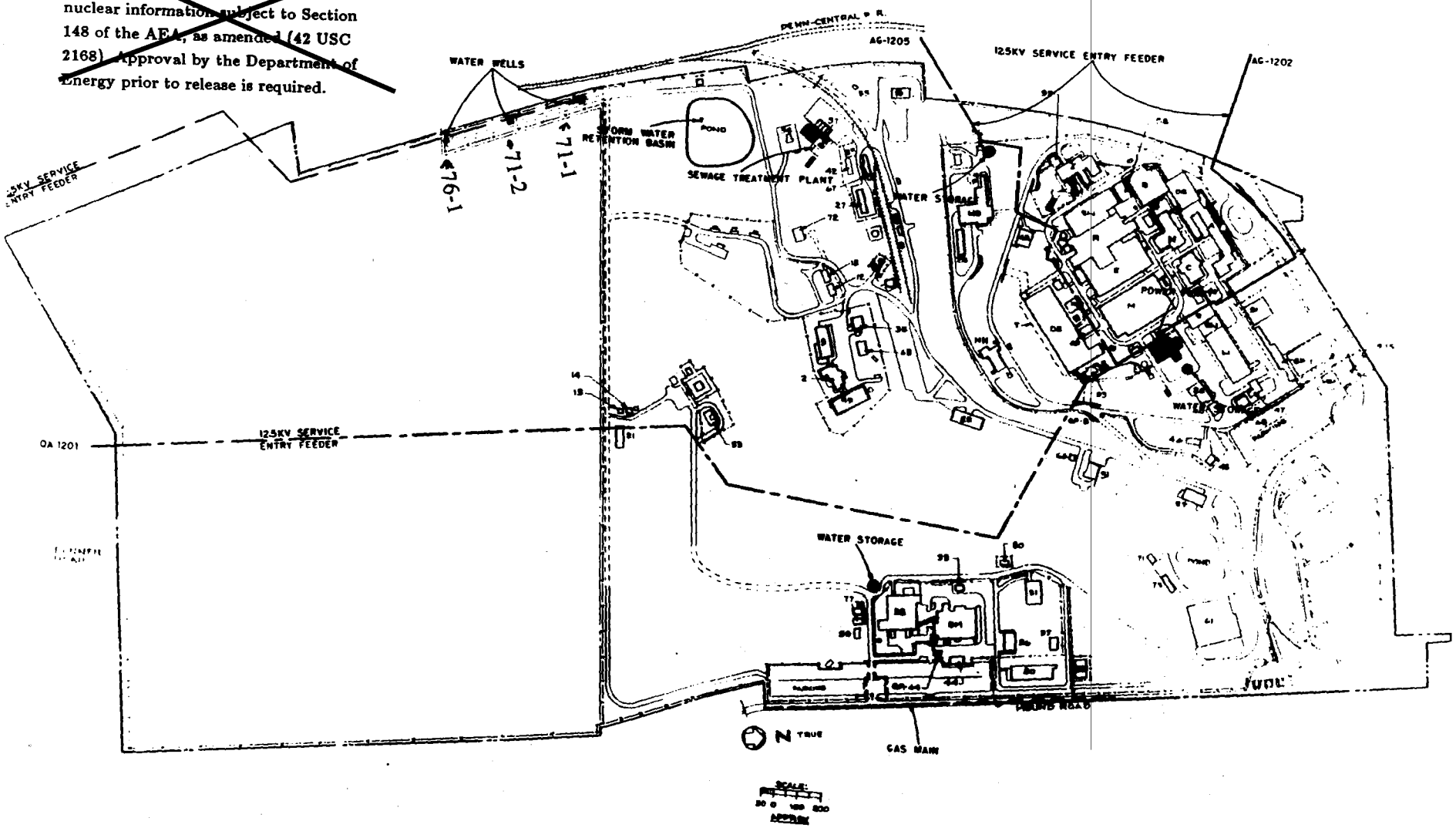

Figure II.5. Mound Utility Locations.

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~~May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.~~

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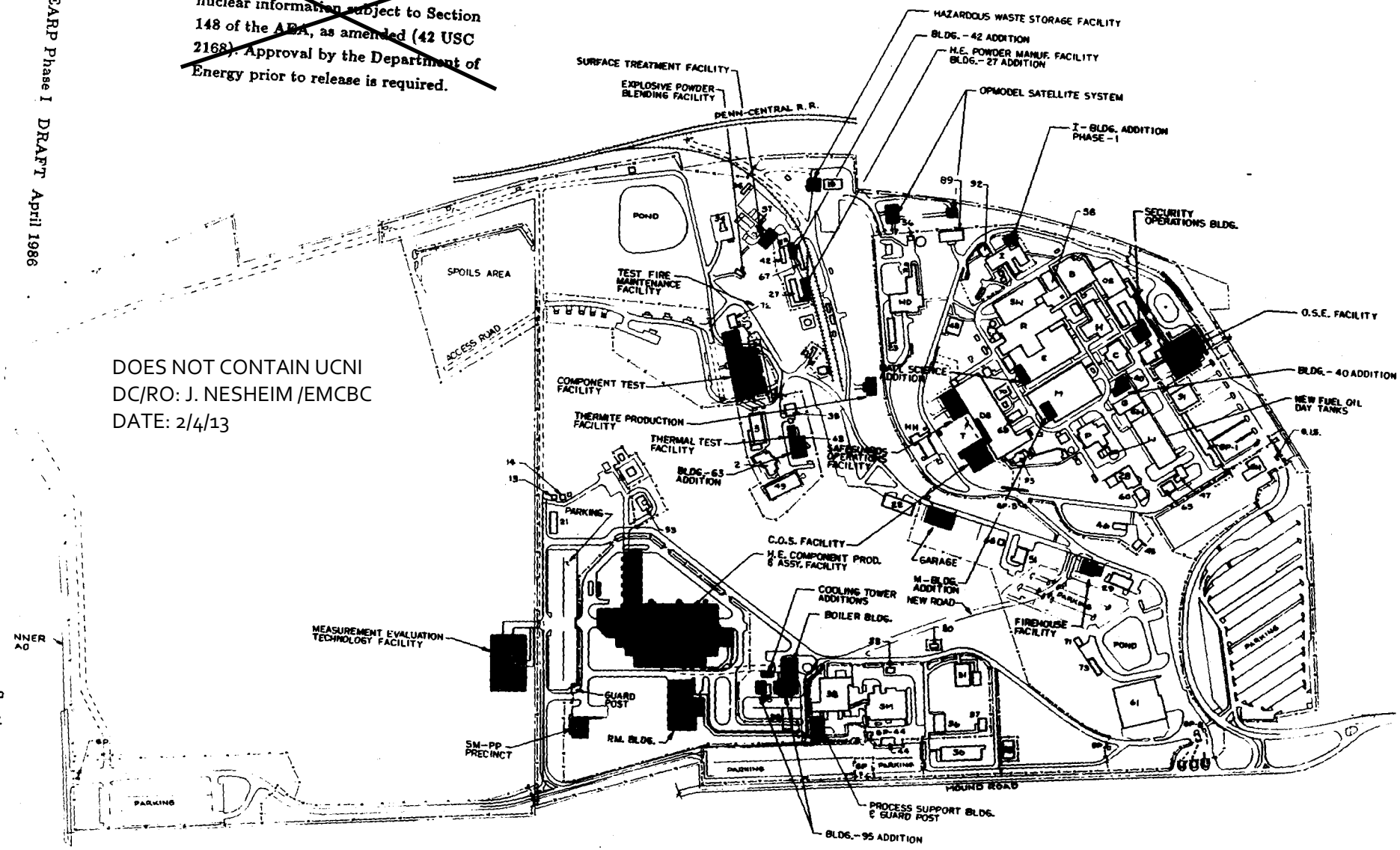
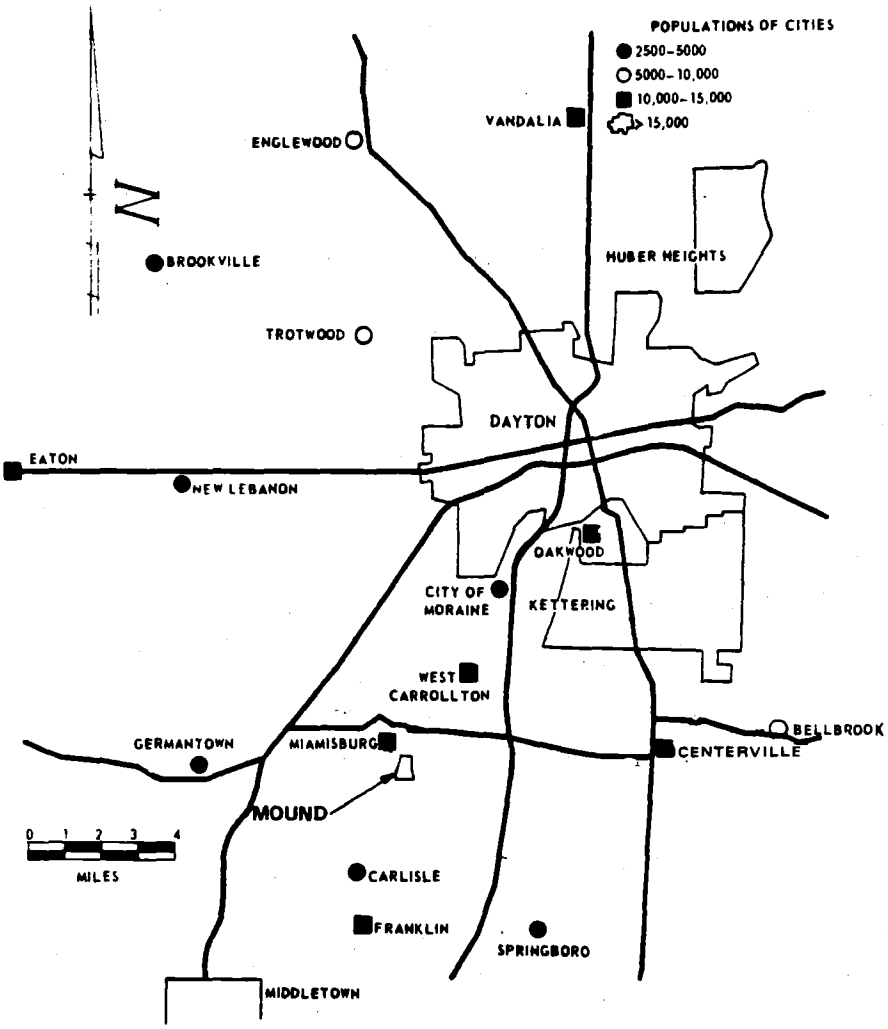


Figure II.6. Proposed Site Development Plan (April 1985).



of Urban Areas Near Mound.

Table II.1. Usage for Present Mound Facilities

Building	Current (1982) Use
A	Offices - Director of Laboratory, Administrative Services, Engineering, Advanced Devices, Personnel, Finance, Medical
B	Advanced Devices Inert Production
C	Cafeteria
DS	Development/Standards
E	Analytical Services/Advanced Devices Production
E Ad'n	Offices, Advanced Devices/CAD System
G	Garage
GH	Visitor Control
GH44	Guard House at SM/PP
G-P1	Guard Post No. 1/Firing Range
GW	Bonded Stores (Advanced Devices Production)
H	Laundry, Environmental Laboratories, Credit Union, Change Rooms
H-H	Isotope Separation
I	High Explosive (H.E.) Production
M	Machine Shops, Electronics Shop, Trades Shops, Maintenance Offices, and Conference Room
OS	Offices - Engineering, DOE, Nuclear Operations, Management Information, CAD, Central Computer Facility
P	Power House - Central Steam, Brine, Compressed Air, and Breathing Air
PS	Paint Shop
R	Nuclear Operations Laboratories, Offices, Library
SD	Sanitary Disposal (Abandoned)
SM	Nuclear Operations Office/Standby
SW	Nuclear Operations, Tritium Development and Recovery
T	Nuclear Operations and Advanced Devices Laboratories, Machine Shop, Administrative Services
W	Warehouse, Trades
WD	Radioactive Waste Disposal
1,2,3, 35,49, 59,63	Test Fire Operation
17	Warehouse
18	Storage
19	Salvage and Sales
21	Raw Material Storage (Cotter)
22	Storage Warehouse
23	Waste Material Staging Area
24	Water Treatment
25	Weather Station
26	Maintenance Shop

Table II.1 (cont)

Building	Current (1982) Use
27	Advanced Devices Programs
28	Ceramic Production
29	Advanced Devices Plastics
30	R&D - Hydropyrolysis
31	Contaminated TRU Waste Storage
33	SM Area Maintenance Shop
34	Emergency Brigade Training
36	Nuclear Operations - Fossil Fuels Development
37	Adhesive Formulation
38	Nuclear Operations Programs and Decontamination and Decommissioning
40	Graphics (Office Services)
42	High Explosive Production
43	Advanced Devices Development
44	Cafeteria - SM Area
45	Neutron Standards
46	Weld Development
47	Fire Station
48	Surveillance
50	Heat Source Loading and Environmental Testing
51	Pilot Scale Test Facility
57	Sanitary Sewage Disposal
58	Filter Bank
61	Warehouse
62	Aqueous Liquid Waste Handling
63	Surveillance
65	Office
66	Offices
67	Energetic Material Support
68	Decontamination and Decommissioning Staging Area
69	Offices
70	Offices
72	Waste Chemical Storage
75	QC Engineering
76	Tool/Gauge Machining
77	D&D Support, Engineering, and Health Physics
78	D&D Support, Nuclear Operations, and Safety
79	Offices
88	Offices
90	Incinerator (Detonators)
90	Detonator Retort
91	Offices
92	Training Facility
93	Offices
94	Materials Compatibility
95	SM Chiller Plant

Table II.2 Former Monsanto Facilities in the Dayton Area

Site Designation	Location and Mission
Unit I	Location--Monsanto Central Research Department Facilities, 1515 Nicholas Road, Dayton, Ohio Mission--The Dayton Project was organized and recruitment initiated at Unit I
Unit II	Location--Monsanto Rocket Propellant work off Betty Lane; site adjacent to present St. Henry Church on Ohio 741; north of Dayton Mall Mission--Dayton Project activities were not conducted at Unit II, which was operated independently as a production facility of rocket propellent
Unit III	Location--Bonebrake Theological Seminary, 1601 West First Street, Dayton, Ohio Mission--Unit III was used as the polonium research facility
Unit IV	Location--Runnymede Playhouse at Dixon Avenue and Runnymede Road in Oakwood, Ohio Mission--Unit IV was used as the polonium separation production facility
Warehouse	Location--Old warehouse at Third Street and Sears Street, Dayton, Ohio Mission--The warehouse was used for analysis of environmental monitoring samples, bioassay samples from project personnel, and preliminary biological studies on the effect of polonium on laboratory animals
Marion	Location--Duplicate production facility located in Marion, Ohio Mission--Marion was a standby facility for the Mound Laboratory T Building, but was never operated. Radioactive materials were never introduced to the facility

III. ENVIRONMENTAL SUMMARY

The topography at Mound is characterized by bedrock bluffs overlooking the Great Miami River. The rugged topography is a remnant of glacial erosion, in which glacial outwash channels form gravel-filled valleys and the remaining bedrock highs form hills, bluffs, and uplands. Runoff from precipitation and snowmelt is moderately rapid; rainfall generally runs off the relatively impermeable bedrock surfaces (where fracturing is not extensive) into stream channels. A fairly humid temperate climate has produced a woods environment in those areas that are not managed for other purposes.

III.A. Meteorology

Southwestern Ohio, where Mound is located, has a continental climate characteristic of the north-central region of the United States. Summers are warm and humid and winters are moderately cold. On the average, daily summer temperatures range from $62^{o}F$ to $85^{o}F$ and daily winter temperatures range from $22^{o}F$ to $37^{o}F$. The average relative humidity is 71%.

Precipitation is distributed throughout each season of the year, totaling 40 in/yr. Snowfall averages approximately 27 in/yr. The average net precipitation is approximately 6 in and the 1-yr, 24-h rainfall is approximately 2.5 in.

Thunderstorms and tornadoes are the principal types of severe weather affecting the area. On the average, thunderstorms are recorded on 39 days per year at Dayton. In an area of approximately 4,800 mi^2 centered near Mound, 31 tornadoes were recorded over a period from 1953 to 1972 (USDOE 1979). The 100-yr return period wind speed for the Mound Facility is a straight wind of 80 mph (Coates 1984).

III.B. Geology

Mound is located on an area of relatively flat lying basement rocks of Precambrian Age on the eastern portion of the "Cincinnati Arch." These basement Precambrian granites are overlain by about 2,600 ft of limestones, shales, some dolomite, and thin sandstone (USDOE 1979).

The original Mound site is divided into two hilltop areas by a small valley that trends to the southwest (Fig. III.1.). The core of the hills consists of limestones and shales

of Ordovician Age. These limestones and shales were deposited in a marine environment. The upper surfaces of these Paleozoic rocks have been eroded and modified by glaciation, the most recent stage being the Wisconsin. Glacial action produced thin phase glacial till and glacial outwash in the immediate vicinity of Mound.

The thin phase forms a thin veneer over limestones and shales that form high areas such as the two hilltop areas and slopes of the valley at Mound (Fig. III.2. and Fig. III.3.). The thin phase is generally less than 20 ft thick and is a mixture of gravels, sands, silts, and clay. It covers most of the upland areas and is the predominant outcrop within Mound. The thin phase is not an aquifer.

The Buried Valley Aquifer (BVA) is a glacial outwash formation, which serves as a major aquifer in the region (Fig. III.2.). Glacial outwash is composed of stratified deposits of gravel, sand, silt, and clay. The BVA varies in thickness and is up to 130 ft thick in an area adjacent to Mound.

III.C. Hydrology

III.C.1. Regional Surface Water. Mound lies within the Great Miami River drainage basin, which covers a significant portion of southern Ohio and small segments of southeast Indiana (Fig. III.4.) The drainage area at Miamisburg, 1 mi upstream from Mound, is 2,711 mi^2. Since the installation of a flood control system in 1921, the maximum flow recorded at Miamisburg was 61,800 cfs in January 1959. The maximum daily measured discharge was 55,600 cfs (1959) and the minimum daily average discharge was 148 cfs (1925).

A flow duration curve for discharge records at Miamisburg over the period 1931 to 1960 is presented in Fig. III.5. The mean flow (expected to occur 50% of the time) is 1,050 cfs. The normal pool elevation of the river in the vicinity of Mound is controlled by the Hutchings Station Dam [680 ft mean sea level (MSL)], which is located about 1.5 mi downstream.

III.C.2. Mound's Surface Water. Onsite surface waters consist of two man-made ponds and a stream. The stream subdivides the original Mound site into two areas, the Main Hill and the SM Hill (Fig. III.6.). The stream watershed is primarily within Mound. The stream channel is located along a buried glacial outwash channel. The

alluvium underlying the stream channel is relatively permeable and allows flow in the channel to infiltrate the shallow aquifer.

Surface runoff from the SM Hill is collected in an asphalt-lined pond, which is located in the upper reach of the stream watershed. Water from the asphalt-lined pond is discharged to the stream.

Near the western boundary of Mound, the streamflow is diverted into a series of interconnected concrete retention basins prior to discharge from Mound. The stream can be diverted to an overflow pond if desired (Fig. III.1.).

After leaving the western boundary of Mound, the stream flows west under the Penn Central railroad tracks through two concrete box culverts. The stream course direction then turns south, paralleling the railroad tracks, following the course of the old Miami-Erie Canal. The stream discharges into the Great Miami River about 1 mi downstream from where it exits the western boundary of Mound.

III.C.3. Groundwater. Aquifers capable of domestic, municipal, or industrial supply in the Mound area include bedrock (low-yield Paleozoic Rocks) and glacial outwash deposits (moderate to high-yield gravels). Thin phase glacial till does not have the storage capacity or permeability to be an aquifer.

III.C.3.a. Bedrock Aquifers. The thin phase of glacial till acts as a low permeability barrier to the recharge of underlying limestones and shales. Water is stored and transmitted through the upper zones of the limestones where surficial weathering has locally opened fractures and bedding planes. The limestones and shales are relatively impermeable. The upper 20 ft have a permeability range of 1 to 10 gpd/ft^2, but below this the bedrock permeability ranges from impermeable to 0.2 gpd/ft^2 (USDOE 1979). Wells drilled into the limestones and shales usually do not yield more than 5 to 10 gpm and many wells fail to yield sufficient quantities of water to become producing wells (Spieker 1968).

A test boring at an elevation of 855 ft MSL near the northeast corner of the Operational Support Building (OS Bldg, Fig. II.4.) penetrated 481 ft of alternating layers of shale, claystone, and limestones. The hole bottomed at an elevation of 374 ft MSL, about 296 ft below the bottom of the Great Miami River. The BVA was not encountered during the test boring (Monsanto Research Corporation 1979).

Small seeps occur on the hillsides where glacial till thins over limestone and shale bedrock. These seeps are the direct result of precipitation and are, for the most part, seasonal and dependent on rainfall. Formation borings have encountered similar water in the base of the glacial till and upper part of the limestones and shales.

Thirty-seven test borings were made in the recently acquired property south of the original Mound site (Bowser and Morner 1983). The borings were made through the thin phase glacial till into the top of the limestones and shales. The BVA was not encountered during boring. Of the 37 borings, water was encountered in only 3, although others reported increased moisture near the contact between the glacial till and limestone and shale. The water resulted from infiltration of precipitation with water recharge occurring during early spring and late fall (Bowser and Morner 1983). Water in the base of the glacial till or the top bedrock aquifer is not a source of water supply for domestic or municipal use because of low yield and small storage capacity.

III.C.3.b. Buried Valley Aquifer. The BVA, consisting of sand and gravel outwash deposits, trends along the Great Miami River and extends eastward beneath the valley that bisects Mound (Fig. III.7.).

The BVA within Mound is thickest along the western boundary of Mound and ranges from 42 to 64 ft (Dames and Moore 1976A). The BVA thickens westward to about 130 ft near the eastern edge of the Great Miami River (Dames and Moore 1976B). This east/west section of the BVA is divided by a silt and clay layer into an upper and lower aquifer (Fig. III.8.).

Under normal conditions in the Mound area (no groundwater withdrawal from BVA), the normal direction of groundwater flow is from the BVA to the river. Aquifer recharge occurs from precipitation infiltrating directly through the glacial outwash moving as underflow into the aquifer along the contact between the glacial till and bedrock along the valley walls. The component of movement is also generally down gradient in the direction of surface water flow.

Three wells that furnish the water supply to Mound are located along the western site boundary (i.e., 71-1, 71-2, and 76-1 in Fig. II.5.). The wells are completed in the upper section of the BVA. The yield from the wells ranges from 450 to 550 gpm. Pumping of

the Mound supply wells can produce a cone of depression, which results in recharge from the Great Miami River (Dames and Moore 1976A).

MRC has conducted investigations to reduce the concentration of tritium in the BVA in order to meet the national interim primary drinking water standard of 20 nCi/L (40 CFR 141) (see Sec. V.A.1.b. for additional detail). The tritium in the aquifer was a result of operations at Mound (USDOE 1979). The pumping of water from the aquifer with subsequent discharge to the Great Miami River has achieved this goal (Dames and Moore 1976A, 1976B, 1978; Styron 1983a).

These investigations included pumping Miamisburg City Well 2, which is located near the western boundary of Mound just north of the Mound water supply wells. Results of the pumping indicated a hydrologic barrier to the east reflecting the increased drawdown against the impermeable shales and limestones along the valley wall. The transmissivity for this area ranged from 60 X 10^3 to 100 X 10^3 gpd/ft. Westward from the pumped well toward the Great Miami River, the transmissivity ranged from 130 X 10^3 to 170 X 10^3 gpd/ft.

The BVA west of Mound is estimated to be capable of producing 15 X 10^6 to 20 X 10^6 gal of groundwater per day per mile of river reach (USDOE 1979). The total volume of the BVA is estimated at 2.5 X 10^9 gal. In perspective, the 24-day aquifer test in 1976 removed about 17 X 10^6 gal, whereas continued pumping in the tritium removal program had by 1983 removed 1.6 X 10^9 gal. The high permeability of the aquifer and large amounts of recharge from the river have resulted in no significant water level declines in the area adjacent to Mound.

III.D. Water Quality

No municipal system in the Great Miami River basin uses surface water for a public water supply below the Mound effluent discharge. Principal users are identified in Sec. II.E. Mound effluent discharges are discussed in Sec. IV.D.

Water quality data are available from the Mound water supply wells, which represent the BVA. The BVA supplies the Miamisburg wells and other municipal water supplies. Data exist for selected constituents in the list of both primary and secondary drinking water standards of the USEPA. The water supply meets the national primary

drinking water standards (40 CFR 141). The water is very hard; total dissolved solids tend to exceed the 500 mg/L secondary standard limit.

III.E. Air Quality

MRC operations are considered to be a minor air pollution source in the greater Miamisburg area. According to the Regional Air Pollution Control Authority (RAPCA), MRC operations are in compliance with state and federal air pollution regulations. RAPCA administers these regulations for the Ohio Environmental Protection Agency (Ohio EPA) in a six county region, which includes Montgomery County. Montgomery County is currently in a status of nonattainment for ozone and total suspended particulates. MRC operations are not considered to be a cause of the nonattainment. Discussion of Mound's atmospheric releases is presented in Sec. IV.C.

III.F. Ecology

Mound is located in the Eastern Deciduous Forest Province in the transition zone between the beech-maple forest and oak-hickory forest plant associations (Bailey 1978). Much of the site has been altered through construction and use, however, heavily wooded areas do remain on and near Mound. These wooded areas support fauna characteristics of the forest/plant association. It has been concluded that the probability of threatened and endangered species occurring at Mound is extremely remote (USDOE 1979). Additional information can be found in the Final Environmental Impact Statement for Mound (USDOE 1979).

III.G. Sensitive Environments

Sensitive environments include wetlands and critical habitats for threatened and endangered species. There are no known sensitive environments being impacted by MRC operations. However, a small undeveloped area (southwestern corner of Mound) is located within the 100-yr flood plain.

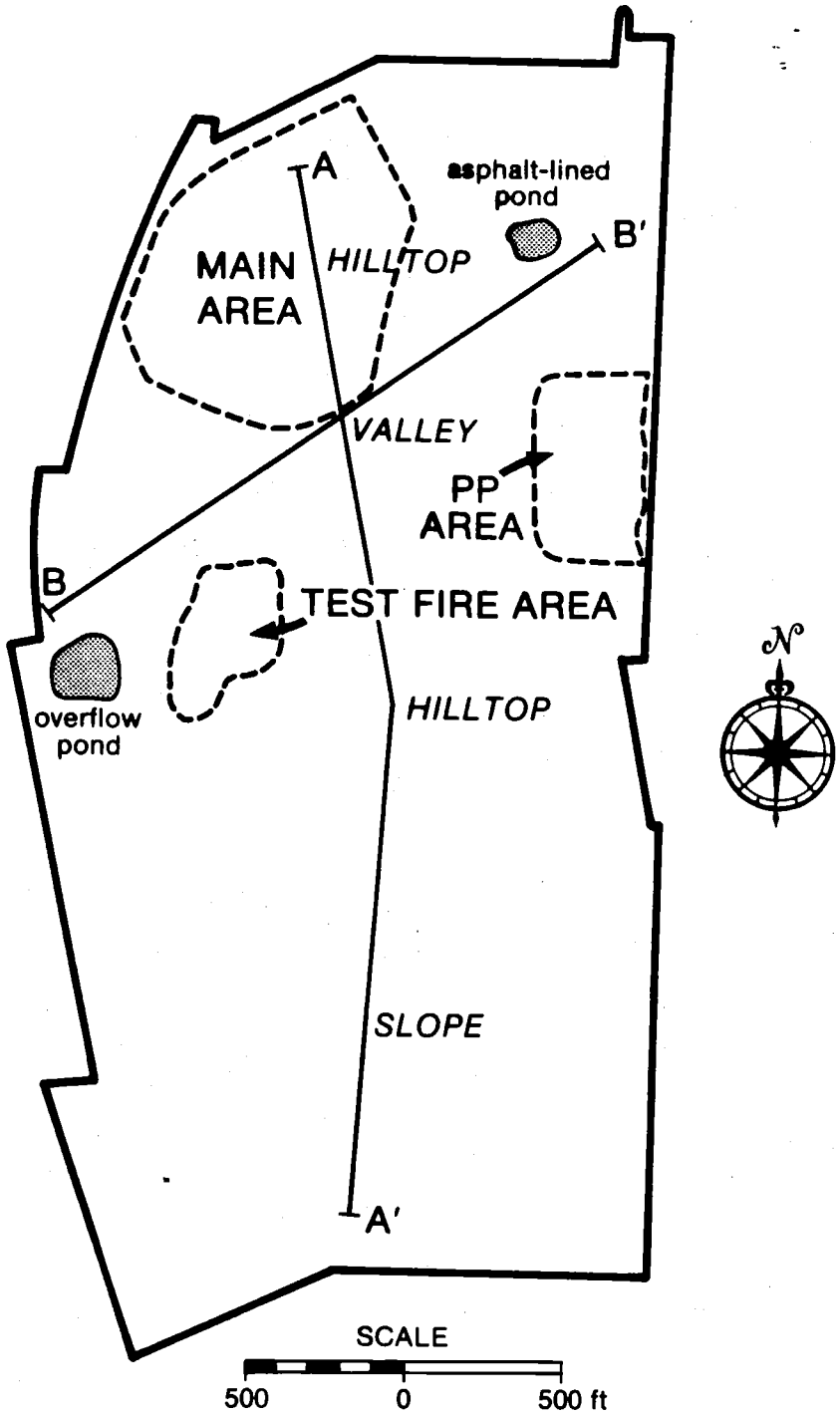


Figure III.1. Mound Facility--Geologic Section Lines.

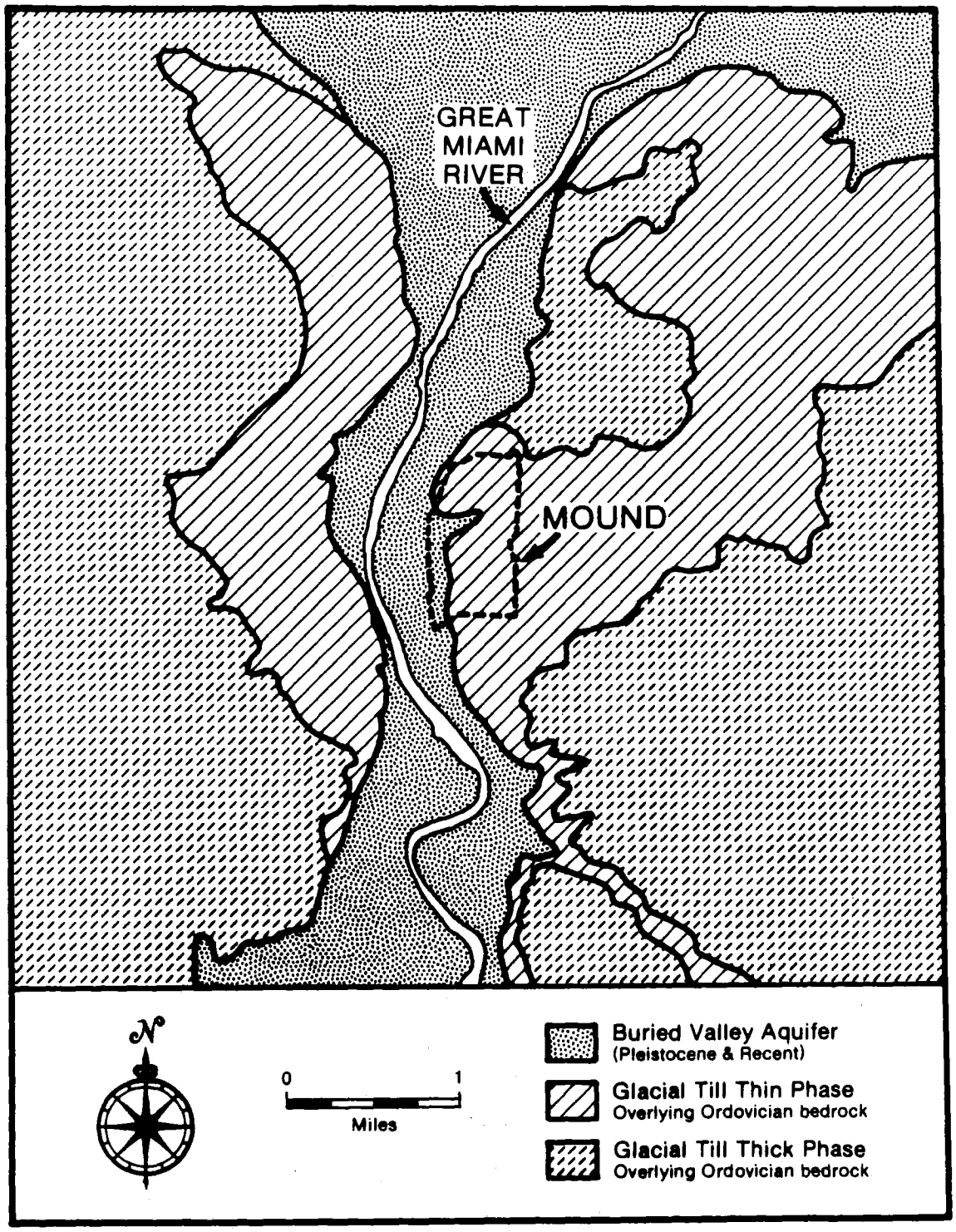


Figure III.2. Mound Area Geology.

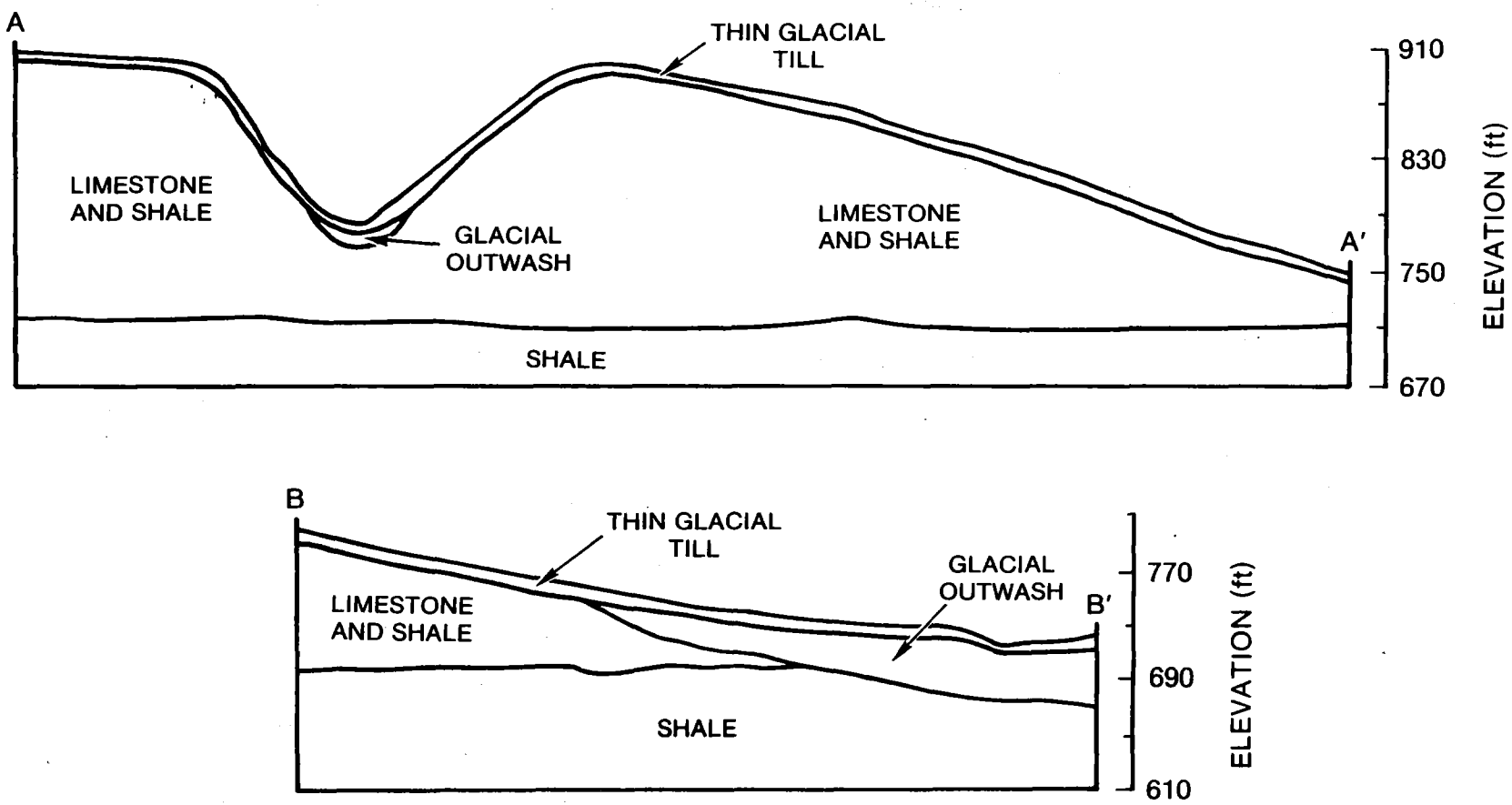


Figure III.3. Generalized Geologic Sections through Mound (see Fig. III.1. for location of geologic section lines).

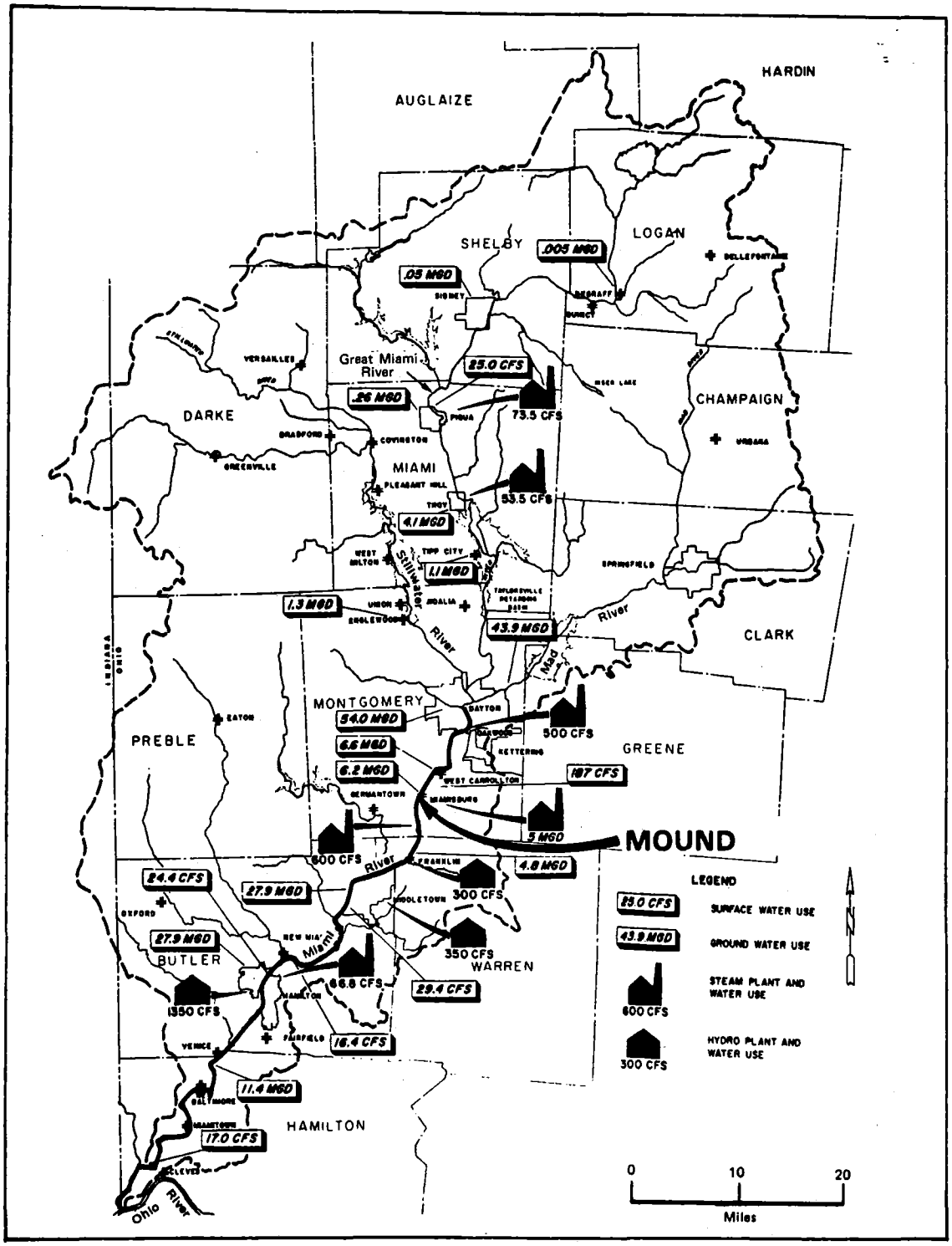


Figure III.4. Major Hydrologic Features of the Area.

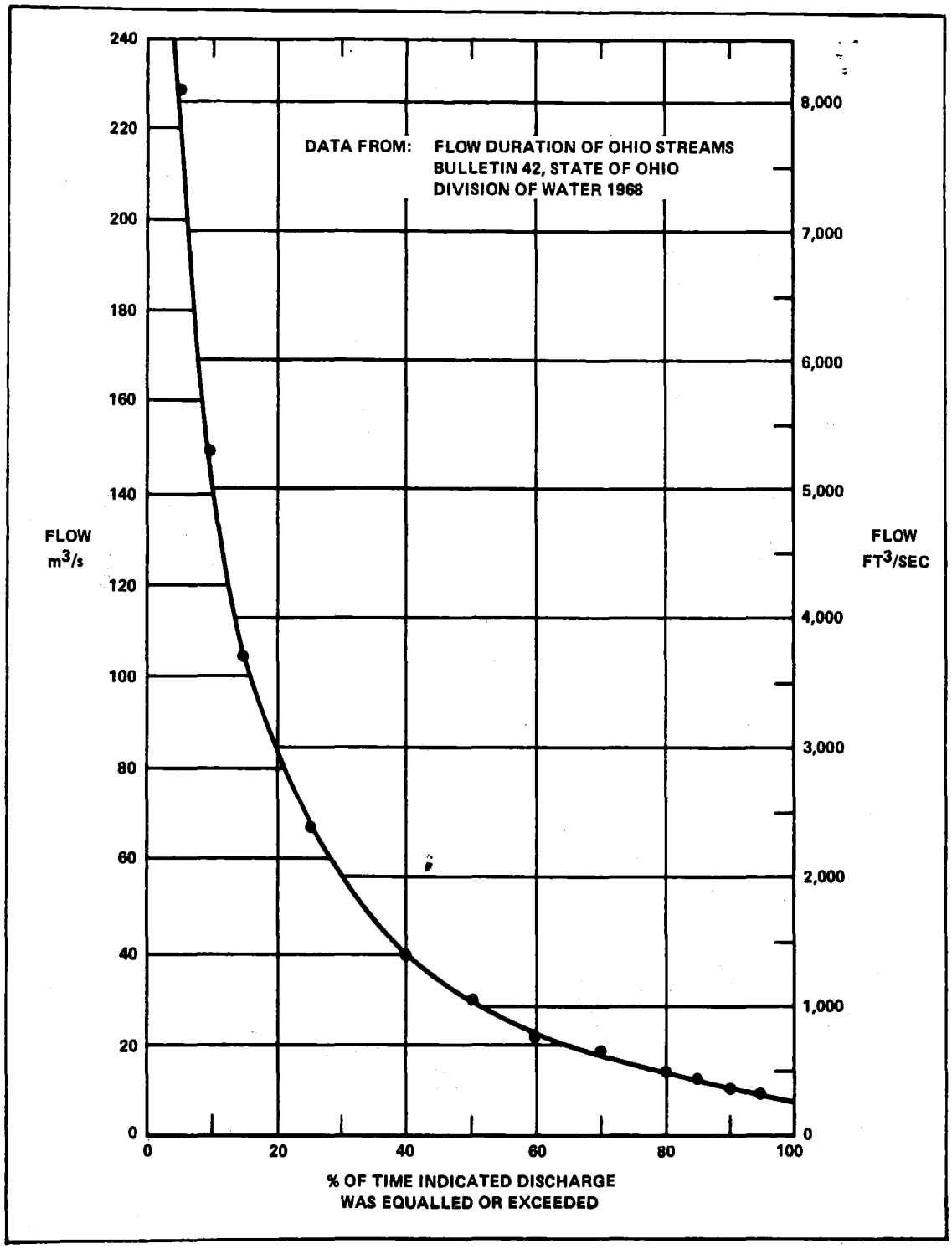


Figure III.5. Flow Duration Curve at Miamisburg, Ohio.

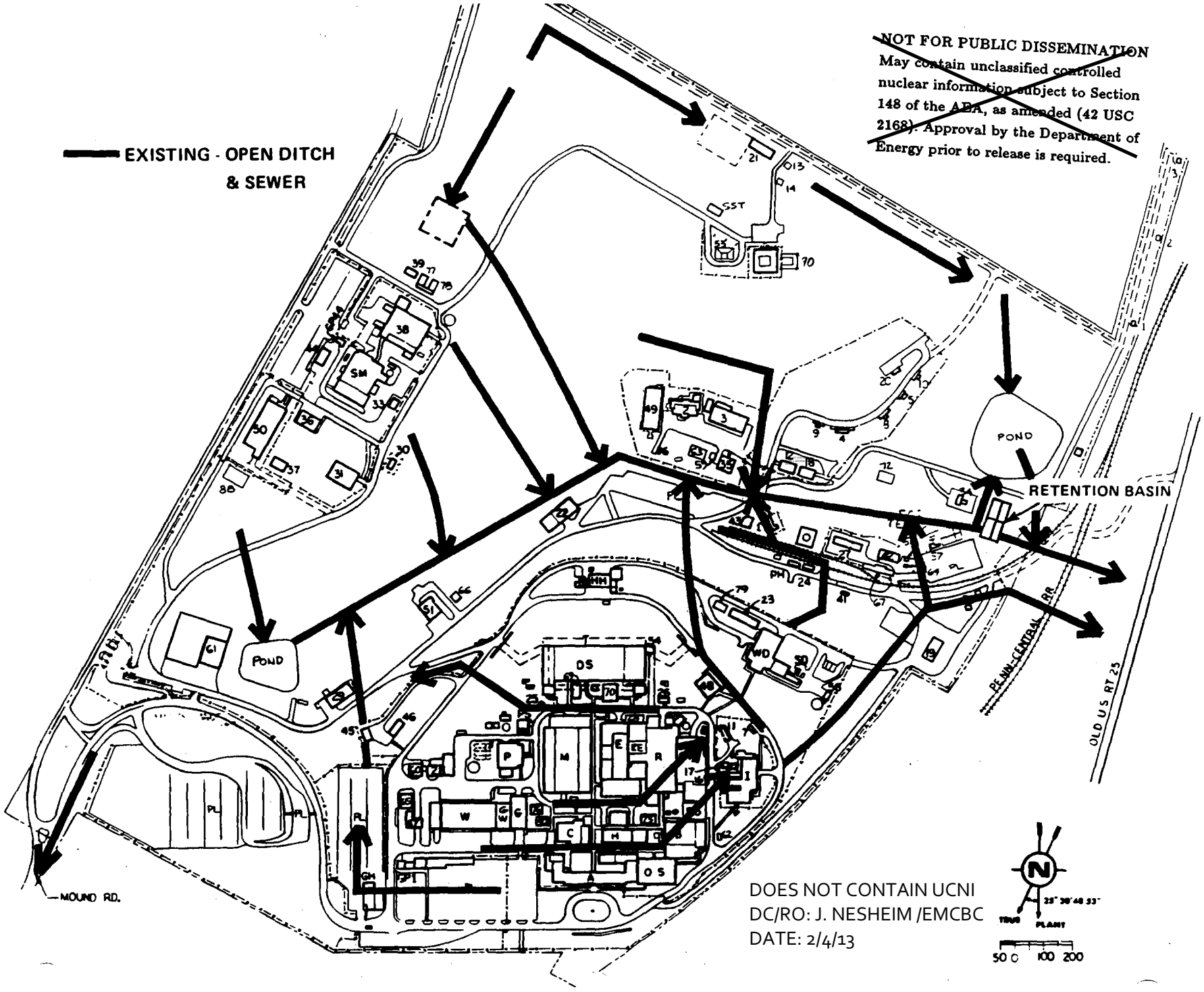


Figure III.6. Major Drainag- -Open Ditch and Sewer.

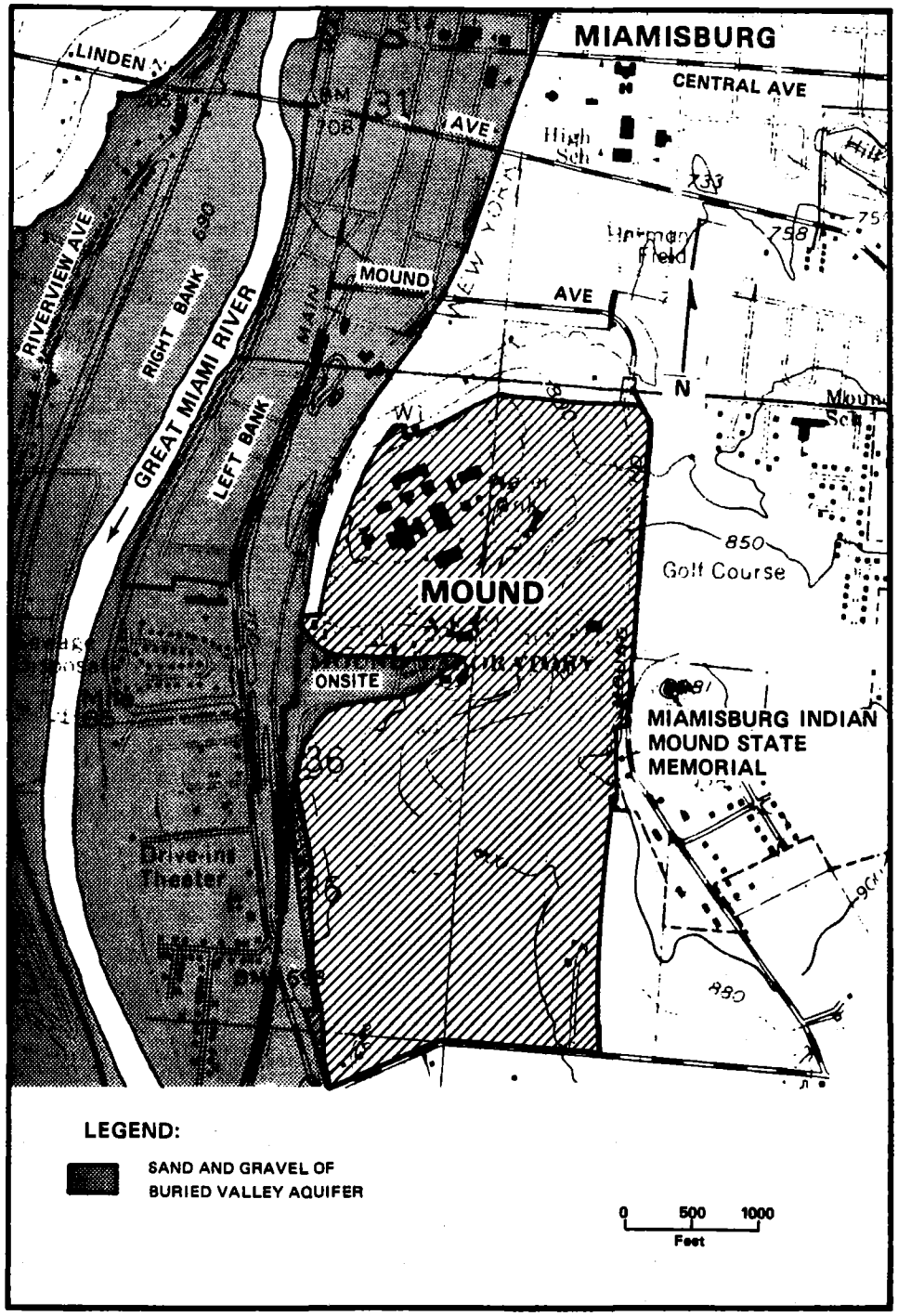


Figure III.7. Buried Valley Aquifer.

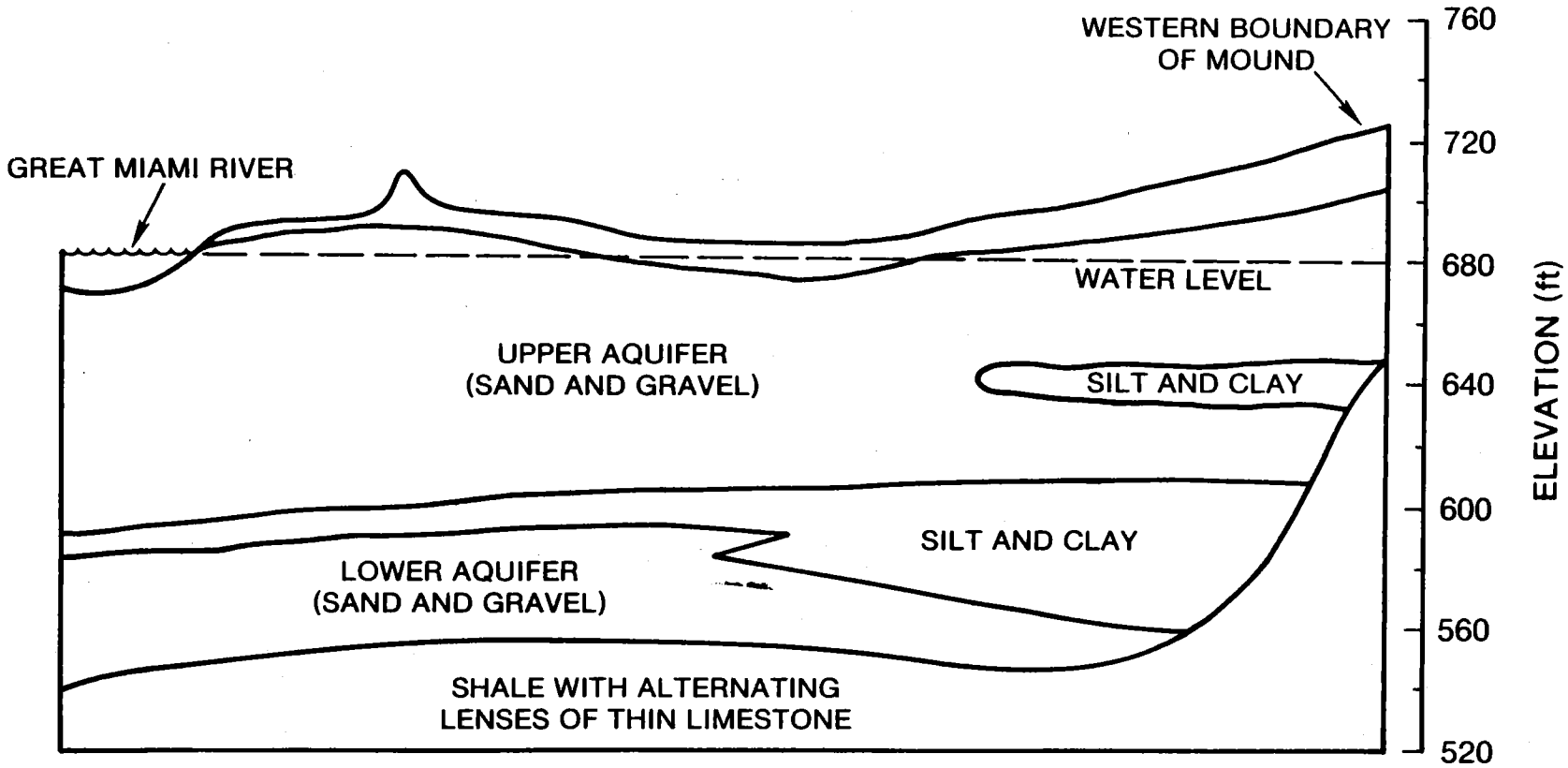


Figure III.8. Geologic Section Showing Upper and Lower Sand and Gravel Aquifer in Glacial Outwash.

IV. ENVIRONMENTAL LAWS APPLICABLE TO MOUND

USDOE, its predecessors, and operating contractors were in operation long before the present environmental laws were enacted. During this time, USDOE, its predecessors, and contractors were guided by internal guidelines and standards and the Atomic Energy Act of 1954 with regard to pollution and radiation control.

Presently, USDOE and its operating contractors are guided by the existing applicable environmental laws and USDOE orders. Mound's compliance with the environmental laws that apply to its facility is discussed below:

IV.A. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Current CERCLA regulations address inactive waste sites from the standpoint of hazardous substances. Sites are given a numerical Hazard Ranking System (HRS) score based on various site and waste characteristics. Sites with a HRS Migration Mode Score above the value of 28.5 are included on the National Priorities List (NPL) for cleanup. Although federal facilities are not currently included on the NPL, several have been evaluated by the USEPA, and changes in CERCLA regulations to permit inclusion of federal sites on the NPL were effective Feb. 18, 1986. The USEPA HRS Migration Mode Score for Mound area B is presented in Sec. V.A.1.d. and Appendix D.

Additionally, CERCLA requires reporting releases of hazardous substances from facilities that exceed reportable quantities as specified in 40 CFR 302. There have been no known releases of hazardous substances exceeding reportable quantities from Mound (Friedman 1985, Interviews 1985).

However, on Nov. 4, 1985, Ohio sent USDOE, MRC, and the Monsanto Company a 60-day demand letter demanding payment of $63,000,000 for a 1969 spill of plutonium-238, which Ohio interprets as a release under CERCLA.

CERCLA did not exist in 1969. Nevertheless, the Mound facility undertook immediate remedial action at the spill site. Moreover the subsequent studies and monitoring conducted by the MRC in conjunction with the State of Ohio for the past 16 years indicate that there is not a current or future threat to health or the environment as a result of this spill and that no further remedial action for this site is warranted or

necessary. Currently USDOE and the State of Ohio are attempting to resolve the matter. (See also Sec. V.A.1.c.)

USDOE also has special procedures for handling emergencies, which are detailed in "Emergency Preparedness System-Response to Fires, Explosions or Releases of Oils, Hazardous Substances and Hazardous Wastes" (Metcalf and Janowiecki 1984).

CERCLA also required that nonpermitted RCRA hazardous waste sites be reported to the USEPA by June 9, 1981. USDOE reported the Mound site landfill to USEPA Region V by the required date.

IV.B. Resource Conservation and Recovery Act (RCRA)

MRC is a generator of RCRA-regulated hazardous waste. Because hazardous wastes are stored and treated, MRC/USDOE were required to prepare an RCRA Part A application. USDOE submitted RCRA notification form 8700-12 to the USEPA Region V on Aug. 15, 1980. On Apr. 9, 1981, USDOE sent a photocopy of the USEPA Part A to the Ohio EPA in response to a notice that a photocopy of the federal permit application would be considered a valid Ohio application. The Ohio EPA acknowledged receipt of the USDOE Part A permit application and requested additional information, which was provided. USDOE also submitted a revised Part A application to the State of Ohio in November 1984 and additional versions in January, March, and May 1985. The compounds identified in these permit applications and their method of process treatment for 1985 are presented in Table IV.1.

IV.C. Clean Air Act (CAA)

Nonradioactive atmospheric releases and emission standards, regulated under CAA, are summarized in Table IV.2. (Carfagno and Farmer 1985). Atmospheric releases from Mound are regulated by the Regional Air Pollution Control Authority (RAPCA).

USDOE routinely notifies RAPCA prior to conducting explosives burning or fire fighter training. RAPCA no longer requires a permit for the paint shop, which is under RAPCA registration status, and fume hood releases do not require permits under CAA.

Asbestos operations and radionuclide releases at Mound are regulated by the CAA under National Emission Standards for Hazardous Air Pollutants (NESHAPS). USDOE

also notifies RAPCA of demolition operations involving the removal of friable asbestos and reports to RAPCA the occasional production of plastic detonator caps using asbestos filler.

MRC has an extensive monitoring program for radioactive releases (Appendix C, Monitoring Programs). Moreover, MRC/USDOE have a commitment to maintain radiation exposure to levels as low as reasonably achievable (ALARA).

IV.D. Clean Water Act (CWA)

The State of Ohio's water quality standards were approved by the USEPA on May 14, 1975. These standards were last amended Jan. 4, 1985, and became effective Apr. 4, 1985. Water quality standards may serve as the basis not only for imposing effluent limitations on point source dischargers but also for establishing controls on nonpoint sources under water quality management plans.

Region V of the USEPA initially issued a discharge permit under the National Pollutant Discharge Elimination System (NPDES) regulations covering liquid effluent streams at Mound in June 1975. The NPDES permit was renewed during December 1980 by Region V. The State of Ohio (Ohio EPA) subsequently received authority from USEPA to monitor USDOE NPDES permits in July 1983. USDOE applied for renewal of the permit, which was due to expire June 1984, during March 1984. USDOE application for renewal automatically extended the expiration date of the permit until negotiations were completed with the Ohio EPA for renewal of the permit. The new permit was issued Sept. 30, 1985.

The NPDES-regulated discharges are monitored at the four stations identified in Table IV.3.). The discharge limitations for each effluent stream are presented in Table IV.4. MRC will modify its NPDES permits as necessary.

Special procedures for handling emergencies are detailed in "Emergency Preparedness System-Response to Fires, Explosions or Releases of Oils, Hazardous Substances and Hazardous Wastes" (Metcalf and Janowiecki 1984). Appropriate federal, state, and local authorities were notified of the release of approximately 10 gal of No. 2 fuel oil, which occurred on Aug. 18, 1983. The fuel oil was released into the Mound drainage system and resulted in a minor oil sheen, approximately one-quarter mi downriver from the Mound outfall.

MRC operations do not discharge into a publicly owned treatment works (POTW) and are not subject to general pretreatment regulations for existing and new sources of pollution.

IV.E. Toxic Substances Control Act (TSCA)

TSCA establishes a list of chemicals defined as toxic, for which manufacture, use, storage, handling, and disposition are regulated. TSCA-regulated polychlorinated biphenyls (PCBs) are used at Mound. Monthly inspections are made for PCB leaks and spills (Monsanto Research Corporation 1984). PCB wastes are contained, marked, stored temporarily, and inspected monthly as required by PCB Marking and Disposal Regulations. PCB management records are kept as required. Special procedures for handling PCB emergencies are detailed in "Emergency Preparedness System-Response to Fires, Explosions or Releases of Oils, Hazardous Substances and Hazardous Wastes," Appendix B (Metcalf and Janowiecki 1984).

On occasion MRC also produces plastic detonator caps using asbestos filler, also regulated under TSCA. MRC reports this occasional use of asbestos filler to the USEPA.

IV.F. Safe Drinking Water Act (SDWA)

Drinking water supplies at Mound are obtained from onsite wells. The water supply system is categorized by the Ohio EPA as a major, noncommunity public water supply system. Applicable regulations require sampling and analysis for total coliform once per calendar quarter with submission of reports to the Ohio EPA. Results to date have shown that the water supply does not contain coliform bacteria.

In addition to these requirements, a self-imposed program including the following is maintained:

* Sampling and analysis for total coliform on a monthly basis at approximately eight locations.

* Analysis of raw well water for heavy metals on a quarterly basis.

* Weekly analysis for tritium in raw well water and at several internal use points on a weekly basis.

* All other analyses required for community systems, including priority pollutants, have been completed at least once on the well water system.

All of these analyses were within the national interim drinking water standards (40 CFR 141).

Disposal of hazardous wastes through underground injection is regulated through the SWDA. MRC does not dispose of hazardous wastes through onsite underground injection.

IV.G. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

MRC has established guidelines for pesticide and herbicide usage and storage that will ensure compliance with USDOE Order 5480.1 Ch. XII, which provides assurance that pest control programs for USDOE operations are conducted safely and in accordance with requirements of Executive Order 11870, Environmental Safeguards on Activities for Animal Damage Control on Federal Lands, and FIFRA, as amended. FIFRA-registered compounds are applied by outside licensed contractors.

IV.H. National Environmental Policy Act (NEPA)

MRC has established guidelines (i.e., Sec. 2.3 of the Loss Prevention and Environmental Control Technical Manual MD-10193, Issue 1, January 1984) for NEPA documentation to ensure compliance with NEPA and USDOE Order 5440.1C (Implementation of the National Environmental Policy Act). The NEPA evaluation process is initiated with preparation of an action description memorandum (ADM) and concluded with NEPA documentation (i.e., memo to file, environmental assessment, or environmental impact statement) consistent with USDOE guidance for implementation of NEPA. Additionally, MRC guidance for preparing an ADM includes provisions for evaluating historic and national landmarks, floodplains/wetlands, and endangered and threatened species as appropriate.

Table IV.1

Management of RCRA-Regulated Wastes

EPA Hazard Waste No.	Estimated Annual Quantity of Waste (lb/yr)	Process Treatment Code
D001	66,000	S01
F001	(included with D001)	S01
F003	(included with D001)	S01
F005	(included with D001)	S01
D002	18,000	S01
F007	(included with D002)	S01
F009	(included with D002)	S01
D003	4000	T04,T03
D004	300	S01
D005	300	S01
D006	1500	S01
D006	25	T03
D007	500	S01
D008	2000	S01
D009	12,000	S01
D010	100	S01
D011	20,000	S01
F002	15,000	S01
F003	20,000	S01
F004	300	S01
F005	5000	S01
F007	1000	S01
F008	1000	S01
F009	1000	S01
U003	2400	T03
U009	400	T03
U037	400	T03
U158	1500	S01
U211	400	T03
Misc.	50,000	S01

D001--A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D.

F001--The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; and sludges from the recovery of these solvents in degreasing operations.

Table IV.1 (cont)

F003--The following spent nonhalogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobuyl ketone, n-butyl alcohol, cyclohexanone, and methanol; and the still bottoms from the recovery of these solvents.

F005--The following spent nonhalogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, and pyridine: and the still bottoms from the recovery of these solvents.

D002--A solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D.

F007--Spent cyanide plating bath solutions from electroplating operations.

F009--Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.

D003--A solid waste that exhibits the characteristic of reactivity, but is not listed as a hazardous waste in Subpart D.

D004--Arsenic.

D005--Barium.

D006--Cadmium.

D007--Chromium.

D008--Lead.

D009--Mercury.

D010--Selenium.

D011--Silver.

F002--The following spent halogenated solvents: tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, orthodichlorobenzene, and trichlorofluoromethane; and the still bottoms from the recovery of these solvents.

F004--The following spent nonhalogenated solvents: cresols and cresylic acid, and nitrobenzene; and the still bottoms from the recovery of these solvents.

F008--Plating bath sludges from the bottom of plating baths from electroplating operations where cyanides are used in the process.

U003--Acetonitrile

U009--Acrylonitrile

Table IV.1 (cont)

U037--Benzene, chloro-

U158--4,4'-Methylenebis (2-chloroaniline)

U211--Carbon tetrachloride

S01--Storage container

T03--Treatment incinerator. (Explosives are treated in an incinerator on an occasional as-needed basis; estimated annual quantity: 300 lbs; process capacity: 12 lbs per burn.)

A "cyclone incinerator" and a "glass melter" are developmental units used for hazardous waste treatment. The incinerator includes a single-stage cyclonic combustion chamber, a wet off-gas treatment system, and a high-efficiency filter. The glass melter includes a refractory chamber with molten glass over which waste is burned, a wet off-gas treatment system, and a high efficiency filter. Each unit has a design capacity of 50 lbs/h of organic waste.

T04--Treatment/Other. (Open burning of explosive-contaminated waste is conducted on an occasional as-needed basis; estimated annual quantity: 1,000 lbs; process capacity: 40 lbs per day. Detonators and pellets are treated in a retort (propane fired kiln) on an occasional as-needed basis; estimated annual quantity: 2,000 lbs; process capacity 0.33 lb per 30 seconds.)

Misc.--Periodic lab wastes, primarily having D001, D002, D003, and EP toxicity characteristics, but also including listed wastes in small quantities. The mix and quantity is dependent upon program requirements.

Table IV.2

Nonradioactive Atmospheric Emissions 1984

Emission Source	Pollutant	Emission	Emission Standard[a]	% of Standard
Powerhouse	Particulates	0.013 lb/10^6 Btu Input	0.2 lb/10^6 Btu	6.5
Powerhouse	Sulfur Oxides	0.005 lb/10^6 Btu Input	1.6 lb/10^6 Btu	0.31
Paint Shop	Organics	0.5 lb/day	40 lb/day	1.3
Explosives Burning	Particulates	8.2 lb	NA[b]	NA[b]
Fire Fighter Training	Particulates	35 lb	NA[b]	NA[b]

[a]Ohio EPA Air Pollution Regulations 3745-17-01 through 3745-17-13 and 3745-21-01 through 3745-21-08.
[b]NA--not applicable.

Table IV.3

NPDES Discharges

Discharge	Source
001-A	Sanitary sewage treatment plant
001-B	Storm water runoff, single-pass cooling water, zeolite softener backwash, boiler-plant blowdown, and radioactive waste disposal facility.
001-C	Electroplating facilities prior to sanitary treatment.
002	Single-pass cooling water, cooling tower blowdown, zeolite softener backwash, and most of the storm water runoff.

Table IV.4

NPDES Permit Limits

Parameter	Units	NPDES Permit Limits Maximum[a]	NPDES Permit Limits Monthly Average
Discharge 001-A			
Flow rate[b]	MGD	---[c]	---[c]
pH	pH units	9.0	---[c]
Biochem. O_2 demand	mg/L	15	10.0
Suspended solids	mg/L	30	15
Fecal coliform (summer only)	MPN/100 mL	2000	1000
Total Residual Chlorine (summer only)	mg/L	0.5	---c
Discharge 001-B			
Flow rate	MGD	---[c]	---[c]
pH	pH units	9.0	---[c]
Suspended solids	mg/L	45	30
Grease and oil	mg/L	10	---[c]
Chemical O_2 demand	mg/L	---[c]	---[c]
Discharge 001-C			
Cyanide	mg/L	1.0	0.65
Chromium	mg/L	0.5	---[c]
Cadmium	mg/L	0.1	---[c]
Nickel	mg/L	0.5	---[c]
Copper	mg/L	0.5	---[c]
Toxic Organics	mg/L	2.13[d]	---c
Discharge 002			
Flow rate	MGD	---[c]	---[c]
pH	pH units	9.0	---[c]
Suspended solids	mg/L	45	30

[a]pH has a minimum limit of 6.5 and a maximum limit of 9.0.
[b]Includes flow from Discharge 001-C. The maximum flow from 001-C is approximately 2,000 gal/day.
[c]No limit applicable.
[d]Guideline-based limitation.

V. FINDINGS AND PLANNED FUTURE ACTIONS

V.A. Potential CERCLA Sites -- Inactive or Former Disposal Facilities/Activities/Spills and Leaks

Potential CERCLA sites identified during CEARP Phase I (the equivalent of USDOE CERCLA Order Phase I) are presented in Sec. V.A.1., and Sec. V.A.2. The CEARP findings, as appropriate, are presented based on a negative, positive, or uncertain finding for the following USEPA CERCLA program elements: (1) Federal Facilities Site Discovery and Identification Findings (FFSDIF) and (2) Preliminary Assessments (PA), Site Inspections (SI) [SI in CEARP is a preliminary SI (PSI)], and Hazard Ranking System (HRS) evaluation.

V.A.1. Mound.

V.A.1.a. Inactive Isolated Sites at Mound. Based on a detailed records search, including interviews with MRC employees and PSI, inactive sites at Mound were placed into three categories: (1) areas that potentially could have received oils or hazardous substances; (2) areas that because of past activities had potential for leaks and spills of oil and hazardous substances, and (3) previously identified radioactively contaminated areas. Findings for categories 1 and 2 are presented in Fig. V.1.; Table V.1.; and Table V.2.

Twenty isolated areas were previously identified on the original Mound site as being contaminated with radioactive materials (Fig. V.2.; Table V.3.) (Monsanto Research Corporation 1985). These areas are primarily associated with past operational mishaps and equipment failures and were decontaminated under guidelines in existence at the time using the best available technology. Guidelines have become more restrictive since the early 1970s. The isolated contaminated areas have been evaluated as part of the MRC Site Survey Program, which was initiated in 1982. Survey results will be published under the title, "Radiological Characterization of Mound," and should be available by the fourth quarter of FY86. Information gathered by this survey and evaluation provided the basis for estimating the cost, timing, and method for removing or stabilizing contaminated soil on site (if required). Sites potentially requiring remedial action have been submitted under the Site Survey Program or to the USDOE Surplus Facilities Management Program (SFMP). Objectives of SFMP include:

* Provide for surveillance and maintenance of surplus radioactively contaminated USDOE facilities awaiting decommissioning, in order to meet all applicable USDOE standards; to protect public and on-site personnel health and safety; and to reduce potential environmental hazards to as low as reasonably achievable.

* Implement a structured decommissioning program to accomplish disposition of all present and future surplus USDOE-owned facilities under the responsibility of the USDOE Division of Remedial Action Projects (DRAP) and Office of Defense Waste and Byproducts Management (DWBM).

* Conduct financial estimating, budgetary management, integrated planning and scheduling, facility-specific engineering, and technology development to support cost effective docommissioning activities on a long-term basis.

Planned Future Actions: Category 1 areas B, C, and I (Fig. V.1.; Table V.1.) require additional investigation under CEARP Phases I and II. None of the areas in category 2 (Table V.2.) require additional investigation under CEARP. The category 3 areas (Fig. V.2.; Table V.3.) based on the detailed records search, including interviews with MRC employees, do not contain nonradioactive hazardous substances. Action on the category 3 areas has been completed, is being taken, or will be taken as indicated in Table V.3. under SFMP. Due to the status of SFMP activities (i.e., CEARP Phase IV) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate for these sites.

Planned Future Actions: Results of the MRC Site Survey Program and SFMP activities will be evaluated under CEARP.

V.A.1.b. Tritium in the Buried Valley Aquifer. Prior to 1970, tritiated waste liquids were collected in sumps, assayed for tritium concentrations, diluted to less than applicable concentration guides, and released to the Great Miami River via the site drainage ditch and a remnant of the Miami-Erie Canal. This activity resulted in elevated tritium levels in the BVA. Tritium remains in the BVA, and MRC monitors and conducts remedial pumping actions to keep BVA water in compliance with the USEPA interim drinking water standard for tritium (20 nCi/L) (40 CFR 141) (Styron 1981, 1983A&B). Due to the status of MRC activities (i.e., CEARP Phase V) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate.

Planned Future Actions: MRC will continue to monitor tritium levels in the BVA and conduct remedial pumping actions to keep BVA water in compliance with the drinking water standard.

V.A.1.c. Plutonium in the Miami-Erie Canal. Residual ^{238}Pu remains in the Miami-Erie Canal, connected ponds, and associated waterways as a result of past activities at Mound, primarily from the rupture of a process waste line. An extensive investigation of the situation was conducted in the 1970s with the finding that the ^{238}Pu is not a health hazard. Follow-up studies have continued to confirm the original finding (USDOE 1979). MRC monitors for potential ^{238}Pu in air and drinking water to confirm that there is no health hazard. Due to the status of MRC activities (i.e., CEARP Phase V) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate.

Planned Future Actions: MRC will continue to monitor for potential ^{238}Pu in air and drinking water to confirm that the residual plutonium does not pose a health risk.

V.A.1.d. Hazard Ranking System (HRS) and Modified HRS (MHRS) Scores. The HRS is applied to those CERCLA sites with positive findings for the CERCLA FFSDIF, PA, and PSI (see App. D). The HRS is applied to category 1 area B (App. D). Area B is an engineered landfill (Fig. V.3.). The landfill system could contain up to 1,000 ft^3 of nonradioactive hazardous substances. Based on the detailed records search, including interviews with MRC employees, it appears that insignificant quantities of nonradiological hazardous substances remain outside of the engineered landfill. Radioactive materials were not placed in the landfill. No releases from the landfill are known to have occurred. The resulting HRS Migration Mode Score is 13. Areas C and I potentially contain small quantities of hazardous substances, however, no releases from these areas have been detected. There is not sufficient information to calculate a HRS Migration Mode scores for areas C and I. The MHRS is not applied to any sites at Mound.

V.A.2. Former Monsanto Facilities. Waste management activities at former Monsanto facilities, which are summarized below, are based on Meyer (1979) and the CEARP Phase I MRC staff interviews (Interviews 1985). Additional discussion of the former Monsanto facilities is presented in Sec. II.B. and Table II.2.

V.A.2.a. Unit I. In the Dayton Project, polonium was not produced at Unit I. Various research projects were undertaken that involved radioisotopes. This work was done on behalf of the Atomic Energy Commission (AEC), and Oak Ridge National Laboratory took possession of and responsibility for all packaged nuclear waste from the Unit I site. There is no evidence of onsite disposal. The CERCLA Finding for Unit I is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Actions: No future action is warranted at Unit 1.

V.A.2.b. Unit II. Dayton Project activities were not conducted at Unit II. Scrap explosives were combusted onsite. No fuel wastes, refuse or other waste materials were ever buried onsite. Radioactive materials were not handled at Unit II. The CERCLA Finding for Unit II is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No future action is warranted at Unit II.

V.A.2.c. Unit III. Radioactive wastes generated at Unit III were ultimately packaged according to U.S. Department of Transportation (DOT) regulations and shipped on government vehicles to Oak Ridge National Laboratory for onsite burial. The principal isotope involved was ^{210}Po, which has a physical half-life of 138 days. No materials were buried onsite at Unit III, sent to city landfills, or other disposal facilities.

All operations ceased at Unit III in 1948. The facilities and site were completely decontaminated and turned over to the Dayton Board of Education, the site owner. The CERCLA Finding for Unit III is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at Unit III.

V.A.2.d. Unit IV. Radioactive wastes were managed the same as at Unit III. The principal isotope was ^{210}Po. All operations at Unit IV were ceased and transferred to Mound Laboratory late in 1948. By spring 1950, all radioactively contaminated Unit IV structures, services, and utilities were removed, packaged and shipped to Oak Ridge for disposal. Clean fill dirt replaced the excavated soil and the site was landscaped and returned to the original owner. The CERCLA Finding for Unit IV is negative

for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at Unit IV.

V.A.2.e. Warehouse. Operations were limited to trace quantities of ^{210}Po from the analysis of environmental monitoring samples, bioassay samples from the project personnel and preliminary biological studies on the effect of polonium on laboratory animals. To the best of current knowledge, samples, waste materials, and plated copper disc from the polonium analyses were discarded into the general warehouse wastes because the amount and concentration of polonium was so small. Warehouse operations, including equipment, were transferred to Mound Laboratory in 1948-1949. The area was decontaminated and returned to the building manager to rent to other clients. The CERCLA Finding for the Warehouse is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at the Warehouse.

V.A.2.f. Marion. The facility at Marion, Ohio, never became operational and no hazardous substances, including radioactive materials, were ever used at the facility. By the mid 1950s, all process equipment, instrumentation, and supplies were transferred to Mound. The facility was turned over to the GSA for other possible government use or sale. The CERCLA Finding for Marion is negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Actions: No further action is warranted at Marion.

V.A.2.g. Hazard Ranking System (HRS) and Modified HRS (MHRS). The HRS and MHRS are not applied to the former Monsanto facilities because the CERCLA findings for FFSDIF, PA, and PSI are negative for the facilities.

V.A.3. Summary of Planned Future Actions for Potential CERCLA Sites. Potential sites identified during CEARP Phase I (the equivalent of USDOE CERCLA Order 5480.14 Phase I) are presented in Table V.4. As appropriate, the results for the potential sites are summarized based on a negative, positive, or uncertain finding for the following USEPA CERCLA program elements: (1) FFSDIF and (2) PA, SI [CEARP preliminary SI (PSI)], and HRS evaluation.

Those sites with negative findings for the FFSDIF, PA, and PSI processes are dropped from further consideration under CEARP and other CERCLA reporting requirements. Area B, the Mound landfill, is the only site with a positive FFSDIF/PA/SI finding that is evaluated using the HRS. The HRS Migration Mode Score for area B is 13. Sites with HRS Migration Mode scores greater than 28.5 are listed on the National Priorities List (NPL) by USEPA. None of the potential sites identified at Mound are recommended for additional action under USEPA CERCLA. Additionally, sites not meeting USEPA criteria for listing on the NPL but exceeding USDOE remedial action criteria/guidelines (e.g., guidelines for the USDOE Surplus Facilities Management Program) and/or sites posing potential regulatory compliance concerns (e.g., RCRA-related remedial activities) are recommended for future action under USDOE, but not USEPA CERCLA. Due to uncertainty, Category 1 areas C and I are retained for supplemental CEARP Phase I investigation. Additionally, remedial action has been or is currently being planned/conducted at several sites under the Site Survey Program and SFMP.

V.B. Potential Environmental Concerns -- Management of Hazardous Substances/ Oils and Environmental Surveillance

V.B.1. Process Review. Environmental residuals generated as a result of activities at Mound are managed as contained waste streams (e.g., hazardous, radioactive, radioactive mixed, or sanitary sludge), recycled (e.g., wood and metal), or released to the environment at permitted levels (e.g., NPDES discharge limits). The focus of the process review is management of oils and hazardous substances. Environmental releases are discussed under Operational Emissions and Environmental Monitoring, Sec. V.B.7.

Categories of hazardous waste generated at Mound, the processes generating them, and their management are listed in Fig. V.4. and Table V.5. (Monsanto Research Corporation 1984). The waste categories include organic solvents; photoprocessing wastes; waste oils, paint wastes, and plating bath wastes; and radioactive mixed wastes. The waste management locations for hazardous wastes are identified in Fig. V.5. A detailed breakdown of the RCRA-regulated materials is presented in Table IV.1. Radioactive wastes are managed as required by USDOE. There are no active onsite waste disposal activities/facilities at Mound. MRC has formerly utilized and currently utilizes commercial contractors for treatment/disposal of nonradioactive hazardous substances. During 1984, 60 spent electric

storage (lead-acid) batteries, each weighing approximately 150 lbs, were returned to the manufacturer for reuse/recovery instead of being sent for disposal.

Efforts are continuing to reduce the volume of nonradioactive waste requiring off-site disposal by investigating the feasibility of sending some spent solvents for recycling, and reclaiming silver from photoprocessing wastes. The use of the onsite cyclone incinerator and glass melter is also being investigated to enhance waste volume reduction.

V.B.2. Existing Oil Storage Facilities. Number 2 fuel oil (backup supply for powerhouse) is stored in a 300,000-gal oil storage tank located just east of Building 27. In the event of an accident, the fuel storage tank could release No. 2 fuel oil into the environment (i.e., escape the diked containment area and flow down the stream channel to the Great Miami River). Recent USDOE AL audits have pointed out that a serious impact could result if a major spill were to occur. Because of the age of the fuel storage tank facility, the risk is considered high for such an occurrence. This risk is compounded by inadequate diking, which is incapable of containing 150% of the entire contents of the tank, and the containment liner requires continuing maintenance. The storage tank is also within an explosive storage area clearance ring. Additionally, other holding tanks for No. 2 fuel oil are located underground near the powerhouse and cannot be adequately monitored for leaks to the environment. A study is being conducted by MRC to evaluate relocation options for existing oil storage facilities. Tentative relocation sites have been identified.

Planned Future Actions: The oil storage facilities will be relocated. A containment dike will be placed around the relocated above-ground oil storage tank to contain the maximum accidental release. Additionally, the underground fuel oil holding tanks near the powerhouse will be placed above ground. The oil storage facilities will be constructed and operated in compliance with existing CWA (40 CFR 110 and 112) requirements and DOE Order 5480.1 Ch. XII Prevention, Control, and Abatement of Environmental Pollution.

V.B.3. Existing Waste Treatment and Disposal Facilities/Systems.

V.B.3.a. Sanitary Waste Treatment Facility. The activated sludge sanitary waste treatment facility that serves Mound has a capacity of 130,000 gal/day.

Treatment consists of aeration, sludge digestion, clarification, and chlorination. After processing, the sanitary sludge is air dried and packaged for offsite disposal. The sludge contains radionuclides, but does not have RCRA listed hazardous waste or hazardous waste characteristics. The sludge is being managed as a radioactive waste and shipped to an offiste USDOE disposal loction.

Sanitary waste treatment facility effluent discharges are discussed under the Clean Water Act, Sec. IV.D., and Operational Emissions and Environmental Monitoring, Sec. V.B.7.

Planned Future Actions: MRC will continue to manage the sanitary sudge as a radioactive waste.

V.B.3.b. Storm Runoff Treatment. Storm runoff at Mound is treated by settling suspended solids in the asphalt-lined pond, overflow pond, and a series of concrete basins to help ensure compliance with NPDES discharge limits. NPDES permit exceptions for total suspended solids due to storm runoff have been reported as required by the permit. Storm runoff discharges are discussed under the Clean Water Act, Sec. IV.D. and Operational Emissions and Environmental Monitoring, Sec. V.B.7.

The asphalt-lined pond is a storm water retention basin located between the Main Hill and the SM Hill (Fig. III.6.). The pond collects storm water runoff from the SM Hill. The pond also collects noncontact single-pass cooling water. Water from the pond is discharged to the onsite stream through a buried culvert. The pond was dredged in 1983 and the dredged material was shipped offsite for disposal as low-level radioactive waste.

The 5-million gal overflow pond, lined with a minimum of 3 ft of compacted clay, was constructed to hold a combination of runoff and effluents before release to the stream and the Great Miami River. The pond is located near the western boundary of Mound (Fig. III.6.). The pond is designed to store a 5-day supply should a spill or storm necessitate containment. The pond also functions as a sediment trap. The pond has never been dredged. Recent evaluation of the sediment retention capacity indicates no need to dredge at this time.

Near the western boundary of Mound, onsite streamflow is diverted through a series of interconnected concrete retention basins that regulate the rate and quality of discharge. During periods when the capacity of the concrete basins is exceeded, the stream-

flow is diverted into the overflow pond. The retention basins were dredged once and the dredged material deposited near the SM water tower. Evaluation of this deposited material is included under the Site Survey Program (Sec. V.A.1.a.).

Planned Future Actions: Storm runoff treatment will be upgraded as described under Upgrade Storm and Sanitary Sewer Drainage Systems, Sec. V.B.5.b.

V.B.3.c. Thermal Treatment of Explosive Wastes. Solid wastes from explosives operations are destroyed by thermal treatment (i.e., incineration, retorting, and open burning) (Monsanto Research Corporation 1984). The controlled access thermal treatment site is located in a remote area of the facility (Building 53 area). Wastes consist of small amounts of mild detonating fuse, pyrotechnic materials, rejected components containing small amounts of explosives, and operational waste such as tissue and cardboard that have been contaminated with explosives or pyrotechnics. Classified wastes resulting from destructive testing and burning explosive devices are drummed and transported off-site for disposal.

Planned Future Actions: Explosive wastes will continue to be thermally treated as indicated in the RCRA Part A permit application (Sec. IV.B., RCRA).

V.B.3.d. Management of Liquid Wastes from Pyrotechnic Operations. Small quantities (<10 gal/yr) of wastes from pyrotechnic material operations are drummed and stored.

Planned Future Actions: MRC is studying methods for long-term management of this waste stream. The pyrotechnic wastes will be managed by MRC as appropriate under RCRA (40 CFR 265).

V.B.3.e. Management of Explosive Manufacturing Liquors. Limited quantities (approx. 1,000 gal/yr) of industrial liquors with dissolved explosives (the principal process liquid is acetone) are generated. These industrial liquors are drummed and stored. The explosive manufacturing liquor wastes are being managed by MRC as appropriate under RCRA (40 CFR 265).

Planned Future Actions: MRC is studying more efficient methods for long-term management of this waste stream.

V.B.3.f. Construction Soil Disposal Area. MRC placed into operation the first cell of a new construction soil disposal area during the first quarter of FY 85 (Fig. II.6., spoils area). The soil disposal area is planned to consist of three cells, with a capacity for handling the disposal of about 350,000 yd^3 of uncontaminated construction soil.

Planned Future Action: MRC will place cells 2 and 3 into operation as funding levels allow. MRC will operate the new construction soil disposal area in accordance with good engineering practice.

V.B.3.g. Radioactive Waste Management. Radioactive wastes, both liquid and solid, are managed as either transuranic or low-level wastes (Monsanto Research Corporation 1984). Transuranic solids are packaged (liquids are immobilized prior to packaging) in the process areas and shipped in Department of Transportation approved drums to a USDOE facility for retrievable storage.

Low-level (alpha-contaminated liquid) wastes are either piped or transported by tank truck to the waste disposal building. The wastes are treated with ferric sulfate, calcium chloride, activated charcoal, and sodium hydroxide (pH adjustment), then precipitated in a clariflocculator. The sludge from this operation containing the radioactive contaminants is solidified in cement and shipped to an offsite USDOE radioactive burial ground. The waste has been tested for EP (extraction procedure) toxicity and was determined not to exhibit EP toxicity. Further liquid treatment may involve filtration through a sand filter and a column of bone char. Treated liquids are analyzed and, if they meet release guidelines of USDOE Orders 5480.1A - Environmental Protection, Safety, and Health Protection Program for USDOE Operations and 5484.1 - Environmental Protection, Safety, and Health Protection Reporting Requirements, effluents are pumped to the river via a closed pipeline. Low-level tritium contaminated liquids are piped to the waste disposal building. They are mixed with cement and a diatomaceous earth absorbent in 55-gal steel drums prior to offsite shipment. Low-level solid wastes are compacted as necessary and drummed for shipment. All low-level wastes are shipped to an offsite USDOE facility for disposal. During FY 84, the total quantity of radioactive waste shipped offsite was 112,800 ft^3 (i.e., 20,000 ft^3 tritium contaminated waste; 2,900 ft^3 transuranic waste; and 89,900 ft^3 nontransuranic alpha waste).

Planned Future Actions: Radioactive waste will continue to be managed by MRC as required under existing regulations and USDOE Orders 5480.2 - Hazardous, Toxic, and Radioactive Mixed Waste Management and 5820.2 - Radioactive Waste Management.

V.B.4. Existing Hazardous Waste Storage Facilities. Hazardous wastes, excluding radioactive wastes, currently managed at Mound are listed in Table V.5. (Monsanto Research Corporation 1984, 1985). Waste management locations are shown in Fig. V.5. Building 72 at Mound is the principal onsite hazardous waste storage facility for consolidating containerized waste prior to offsite shipment. Building 72 is operated in compliance with RCRA interim status requirements.

Building 72 is a steel-roofed open-sided structure, 40 X 60 ft, containing four rectangular diked areas with a concrete base. These diked areas are used for segregating incompatible materials. Fire extinguishers, a portable eyewash unit, protective clothing, and various tools are located at the facility. Overhead explosion-proof lighting is provided, and electrical explosion-proof outlets are available. Signs are posted warning that only authorized personnel are allowed in the storage facility. The area is also fenced.

Three of the dike areas, each approximately 13 X 40 ft, have concrete bases sloped slightly downward toward the east. Containers of waste are stored inside these diked areas. Each area can hold approximately seventy 55-gal drums of waste with aisle space. Because of the sloped base, the concrete dike around each area varies in height above the base from 6 in on the west to 15 in on the east. The sloped base is intended to drain and remove liquids resulting from leaks, spills, or precipitation and to minimize contact of containers with accumulated liquids. The diked areas are intended to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed. The fourth area, with a total area of 20 X 40 ft, contains a level base and a sump pit surrounded by a diked area, 9 X 24 ft. It can be used for containerized storage if needed, but it is intended primarily for use in transferring waste from a defective container to one in good condition, preparing waste containers for offsite shipment, and performing related activities.

A gravel surface access exists from the service roadway to the container storage facility. Drums of waste can be moved into and out of the facility using conventional fork lifts.

Leakage from any drums stored in a diked area and any influx of rain water will collect in the low end of the diked area and can be removed by portable pump and properly disposed of.

Accidental reactions between ignitable or reactive wastes are prevented primarily by segregating the wastes in closed containers and drums during all phases of handling, storage and disposal, and by protecting the waste from sources of ignition such as open flames, cutting and welding, hot surfaces, heat, sparks, spontaneous ignition, and radiant heat. Smoking and open flames are prohibited in those areas where ignitable or reactive waste may be present or handled.

Waste PCBs are stored primarily in a diked secure vault near P-Building (power plant) that meets the requirements of 40 CFR 761 (see Sec. V.B.6.c., Other Nonradioactive Liquid Wastes, for additional discussion of PCBs).

Planned Future Actions: Building 72, the principal existing storage facility for containerized hazardous waste, will be upgraded and relocated in 1985-1986. The upgrading will include the installation of (1) partial side walls around the perimeter to keep out precipitation, (2) floor grating over all of the dike areas to allow elevated drum storage above the base and to simplify the detection of leaky containers, (3) an overhead hoist to expedite moving and positioning containerized waste within the facility, and (4) fencing to improve the security of the facility.

V.B.5. Proposed Waste Treatment and Disposal Systems/Facilities. MRC has proposed to remove single-pass noncontact cooling water from the storm drainage system and to upgrade storm and sanitary sewer drainage systems. A detailed discussion of these proposals can be found in the Monsanto Research Corporation Conceptual Design Report for Environment, Safety and Health Upgrades, February 1985, which has been submitted for inclusion in the FY 87 budget.

V.B.5.a. Separate Single-Pass Noncontact Cooling Water from Storm System. The current NPDES suspended-solids limits for the main drainage ditch are restrictive in order to control the quality of process cooling water discharged into the Great Miami River. Because of this, permit compliance during storm runoff has been difficult. Almost all of the suspended solid exceptions during 1984 were not caused by operational discharges but were related to construction/maintenance activities and/or storm runoff.

By separating noncontact process water from storm runoff, the main drainage channel would carry minimal flow except during storms and the expected future NPDES limitations could be easily met, bringing Mound into compliance.

The removal of noncontact process cooling water will be accomplished by placing the five major users of single-pass cooling water on closed-loop cooling water systems. This system will account for the removal of approximately 400,000 gal per day of current discharge. The remaining small volume users throughout Mound will be combined in a process water piping system and piped to the discharge point or handled on small closed-loop package coolers.

Planned Future Actions: MRC will separate the process water from the storm system, where appropriate.

V.B.5.b. Upgrade Storm and Sanitary Sewer Drainage Systems. The 30 plus years of operation of Mound without a major upgrade of the sanitary and storm sewer system, coupled with facility additions over this same time that have added significantly to the load on these systems, has been brought into sharp focus by recent concerns over environmental pollution. A 2-yr study by Eastern Utilities Specialists, Inc., conducted through the Utilities Systems Study Program, was recently completed and pointed to the need for major repairs to the sewer systems in order to limit contaminant discharge due to leakage and infiltration. One repair was completed as a result of this study. This repair consisted of inserting a plastic liner into the existing sewer line between the site boundary and the Great Miami River. This eliminated the potential for leakage from the discharge line to infiltrate the ground and underlying aquifer.

In addition, several modifications to the storm sewer system are required in order to control the volume of suspended solids in the storm runoff that discharges into the Great Miami River. These modifications are identified in the MRC Drainage Master Plan. MRC is operating under an NPDES Permit limitation for this discharge.

Planned Future Actions: MRC will continue to pursue upgrading the storm and sanitary sewer drainage systems.

V.B.6. Commercial Nonradioactive Hazardous Waste Disposal Recycling Practices. Major nonradioactive wastes that are commercially disposed of can be grouped into the following categories; photoprocessing, solvent, other nonradioactive liquids, and

nonradioactive solid waste (Monsanto Research Corporation 1984). Laboratory chemical wastes (approx. 1,500 lb/yr) also are produced. Most of these wastes contain constituents regulated under RCRA.

V.B.6.a. Photoprocessing Wastes. Spent fixer solution (approx. 600 gal/yr) is collected and stored onsite for future recovery of silver using a recently acquired electrolytic recovery unit. The remaining photoprocessing waste solutions including developers, stop, bleaches, rinses, etc. (approx. 600 gal/yr) are collected for onsite storage prior to transfer to an USEPA-permitted vendor for transport and treatment/disposal.

V.B.6.b. Solvent Wastes. Operations at Mound, excluding those required for processing explosives (see V.B.3.d.), use approximately 5,400 gal of organic solvents annually (Monsanto Research Corporation 1984). The most widely used organic solvents are acetone, methylene chloride, methanol, ethanol, isopropanol, trichloroethylene, and chlorinated fluorocarbons. Solvent discharges occur to the atmosphere through fume hood operations and to the sanitary treatment facility. Used solvents are accumulated for disposal mostly in 2- or 5-gal safety cans and 55-gal drums. A USEPA-permitted waste disposal firm disposes of these wastes by incineration.

V.B.6.c. Other Nonradioactive Liquid Wastes. Waste oils (automotive, hydraulic, pump), (estimated 3,900 gal/yr), discarded excess paints and thinners (estimated 330 gal/yr), and waste corrosive solutions (estimated 290 gal/yr) are collected and disposed of by an USEPA-permitted vendor (Monsanto Research Corporation 1984). Disposal services for spent plating-bath solutions of chromic acid, cadmium cyanide, nickel sulfate, nickel chloride, electroless nickel, black oxide, and copper cyanide are handled by an USEPA-permitted vendor. First rinse and cleanup waste from the preparation of fresh plating baths are used onsite in new bath makeup.

Waste polychlorinated biphenyl (PCB) sources include transformers located throughout the facility, capacitors, fluorescent light ballasts, storage cans, microwave ovens, and electronic equipment. Less than 0.08 lb of PCB wastes are stored onsite; this waste is stored according to regulation and will be sent to an USEPA-approved disposal site after 10 to 25 lb have been accumulated.

V.B.6.d. Nonradioactive Nonhazardous Solid Wastes. Waste wood and metals are segregated on the plant site and sold periodically to salvage dealers. The

collection and disposal of nonhazardous waste (trash) is contracted to a commercial landfill company (GSX Waste Services of Ohio) whose operation is licensed by Montgomery County and approved by the Ohio EPA. Mound trash is picked up daily and transported to the local sanitary landfill.

Planned Future Actions: MRC will continue to manage nonradioactive hazardous and nonhazardous wastes as required by RCRA (e.g., 40 CFR 260, 261, 262, 264, and 265).

V.B.7. Operational Emissions and Environmental Monitoring. Environmentally regulated emissions at Mound are grouped into two categories: hydrologic (surface waters) and atmospheric. Details of the MRC environmental monitoring programs for these emissions are presented in Appendix C. The environmental monitoring findings are published in an annual monitoring report (Carfagno and Farmer 1984, 1985).

V.B.7.a. Hydrologic. There currently are four NPDES-regulated discharges at Mound (Table IV.3.). The NPDES discharge limits are presented in Table IV.4. During 1983 a total of 1,402 NPDES analyses were performed for the four NPDES monitoring stations (Carfagno and Farmer 1984). Effluent parameters exceeded their maximum values 32 times and their monthly averages 13 times. The increased suspended-solids content from storm runoff after rain and snow precipitation was responsible for 31 total suspended-solids exceptions.

During 1984 a similar trend was observed. A total of 1,468 NPDES analyses were performed. Effluent parameters exceeded their maximum values 58 times and their monthly averages 23 times. Increased suspended-solids content resulting from construction and storm runoff was responsible for 62 of the exceptions (Carfagno and Farmer 1985).

Surface waters are monitored for release of radioactive materials from Mound. The average incremental concentration of ^{238}Pu, tritium, and $^{233,234,238}U$ in the Great Miami River were 1.1 X 10^{-15} mCi/mL [0.00006% of the USDOE Radioactivity Concentration Guide (RCG)], 0.04 X 10^{-9} mCi/L (0.004% of the RCG), and 0.22 X 10^{-13} mCi/L (0.01% of the RCG), respectively. The total amounts of ^{238}Pu, tritium, and $^{233,234}U$ discharged to the Great Miami River during 1984 were 1.34 mCi, 8.47 Ci, and 0.47 mCi, respectively (Carfagno and Farmer 1985).

Drinking water from communities in the surrounding area is sampled and analyzed quarterly for tritium. The average concentration of tritium for all locations during 1984

was 0.3 X 10^{-9} mCi/mL, which is 2% of the interim drinking water standard. Drinking water from private wells is also analyzed for tritium. The average concentrations of tritium for all private well locations was 6.02 X 10^{-9} mCi/mL, which is 30% of the standard.

V.B.7.b. Atmospheric. The primary source of nonradioactive airborne emissions at Mound is the steam power plant (Carfagno and Farmer 1985). This plant is normally fueled with natural gas, but has the capability to burn fuel oil. During unusually cold weather, if the natural gas supply to Mound is interrupted, fuel oil with <1% sulfur content is burned. Approximately 53,000 gal of fuel oil was burned during 1984.

Radionuclides in particulate form are removed from process air effluents by HEPA filters (Carfagno and Farmer 1985). Air effluents are filtered first at their point of origin (i.e., glove boxes) and then just before reaching the stack, where they are released. The filtering system at the stack consists of two banks of HEPA filters in series, each bank having a collection efficiency of 99.95%. The quantity of ^{238}Pu discharged to the atmosphere during 1984 was 0.0065 mCi. The quantity of tritium discharged to the atmosphere during 1984 was 3,430 Ci. These quantities are in compliance with USDOE operating orders.

Results of the atmospheric environmental monitoring program demonstrate compliance with atmospheric release of radioactive materials under USDOE operating orders. However, procedures must be developed to document compliance with CAA NESHAPS requirements for radioactive materials (40 CFR 61).

Given the volume of hazardous substances used at Mound on an annual basis, the potential for release of hazardous substances, other than radioactive materials, is not sufficiently large to require implementation of an atmospheric monitoring program for these substances.

Planned Future Actions: Planned future actions relative to potential hydrologic and atmospheric releases are presented in Table V.6. Major actions are required by MRC to ensure compliance with CWA NPDES effluent limitations. Additionally, releases of hazardous substances to the environment, which exceed reportable quantities as specified in 40 CFR 302, are to be reported under CERCLA.

A comprehensive hydrologic environmental monitoring program will be developed and implemented by MRC based on results of the geohydrologic investigation (Sec. V.B.8., Important Site Characteristics) and the location of sources of potential contamination of ground and surface water by hazardous substances (Sect. V.A., Potential CERCLA Sites--Former Disposal Facilities/Activities/Spills and Leaks) as required by USDOE Order 5480.14 - Comprehensive Environmental Response, Compensation, and Liability Act Program.

V.B.8. Important Site Characteristics. The Buried Valley Aquifer (BVA) in the immediate Mound area is an important water resource. The aquifer system is not completely understood in terms of recharge and movement away from Mound. Oils or hazardous substances (Sec. V.A.) and leakage from the storm and sanitary sewer drainage system (Sec. V.B.5.) could potentially contribute to contamination of the BVA. Although there are no known drinking water problems (Sec. V.B.7.a.), the proximity of MRC operations to this important water supply necessitates a thorough understanding of the aquifer system.

Planned Future Actions: A geohydrological investigation of the aquifer system in the immediate vicinity of Mound will be conducted under CEARP. This investigation will supplement existing geohydrological understanding of the location, direction and rate of movement, and recharge and discharge of the aquifer system. The investigation will result in sufficient knowledge of the aquifer systems such that a ground and surface water monitoring network can be established (Sec. V.B.7., Operational Emissions and Environmental Monitoring,) to detect potential releases of hazardous substances from activities at Mound.

V.B.9. Sensitive Environments. The southwestern portion of Mound is located within the 100-yr floodplain.

Planned Future Actions: Activities at Mound within the 100-yr flood plain will continue to comply with Executive Order 11988--Floodplain Management and USDOE Compliance with Floodplain/Wetlands Environmental Review Requirements (44 FR 12594, Mar. 7, 1979).

V.B.10. Weed, Pest, and Ice Control. The normal maintenance of the grounds within Mound includes the use of fertilizer and herbicides plus the use of ice-removal material during winter months. The general purpose fertilizer is a 13(nitrogen)-13(phosphorus)-13(potassium) formulation. MRC uses 200 to 300 lb of herbicide for weed control.

Urea is used for ice removal and control on sidewalks. MRC uses approximately 2.5 tons of urea during an average winter. Commercial-grade rock salt is used for ice control of streets, roadways, and parking lots. Approximately 300 tons of salt are used during an average winter. Melting snow and rainfall carry this material into the storm sewer system and ultimately into the Great Miami River. The environmental effect of this discharge is negligible and is only a small fraction of that caused by the total ice control salt used by municipalities upstream from Mound.

Planned Future Actions: MRC will continue to comply with USDOE Order 5480.1 Chapter XII - Prevention, Control, and Abatement of Environmental Pollution when conducting weed and pest control.

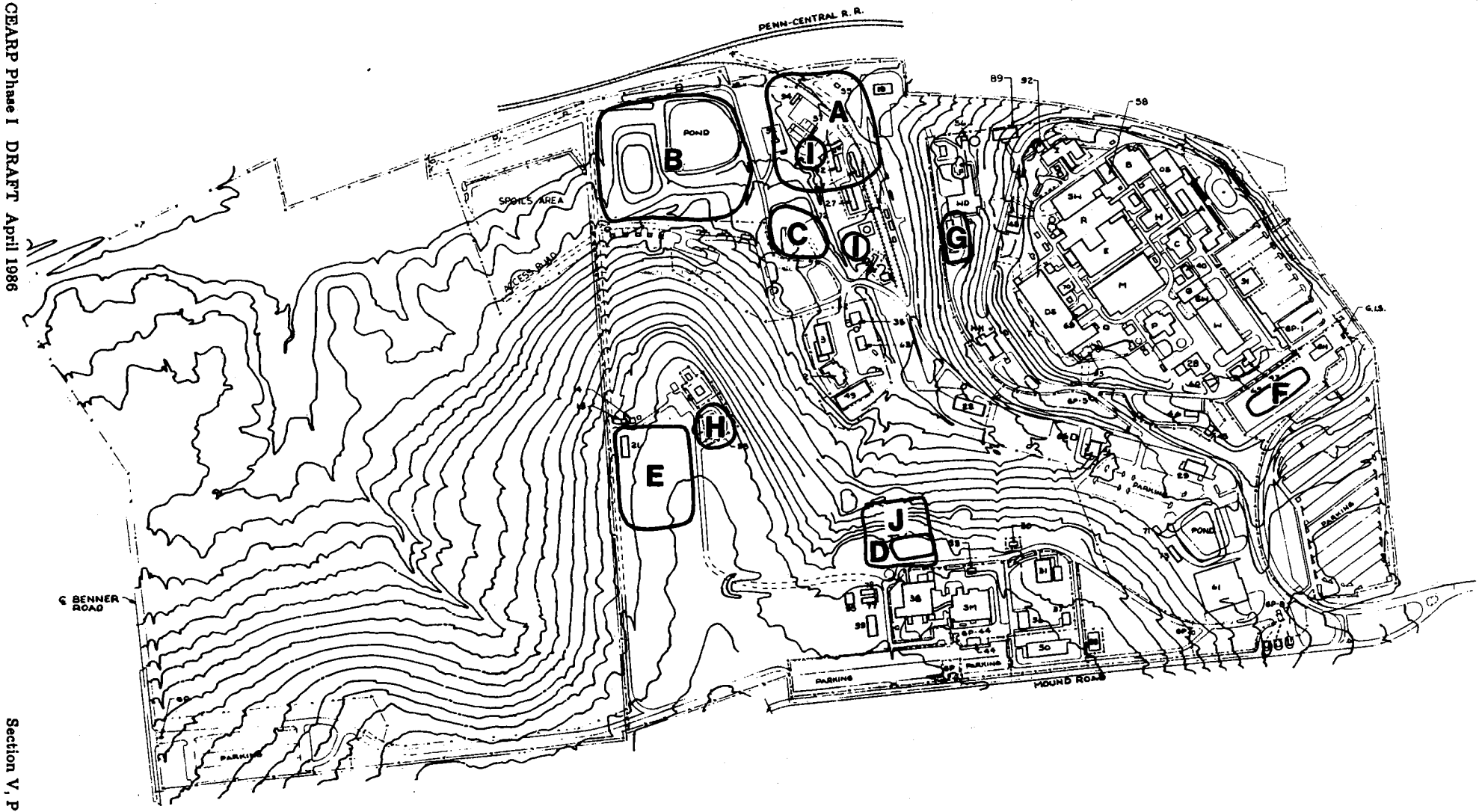


Figure V.1. Areas Potentially Contaminated with Hazardous Substances.

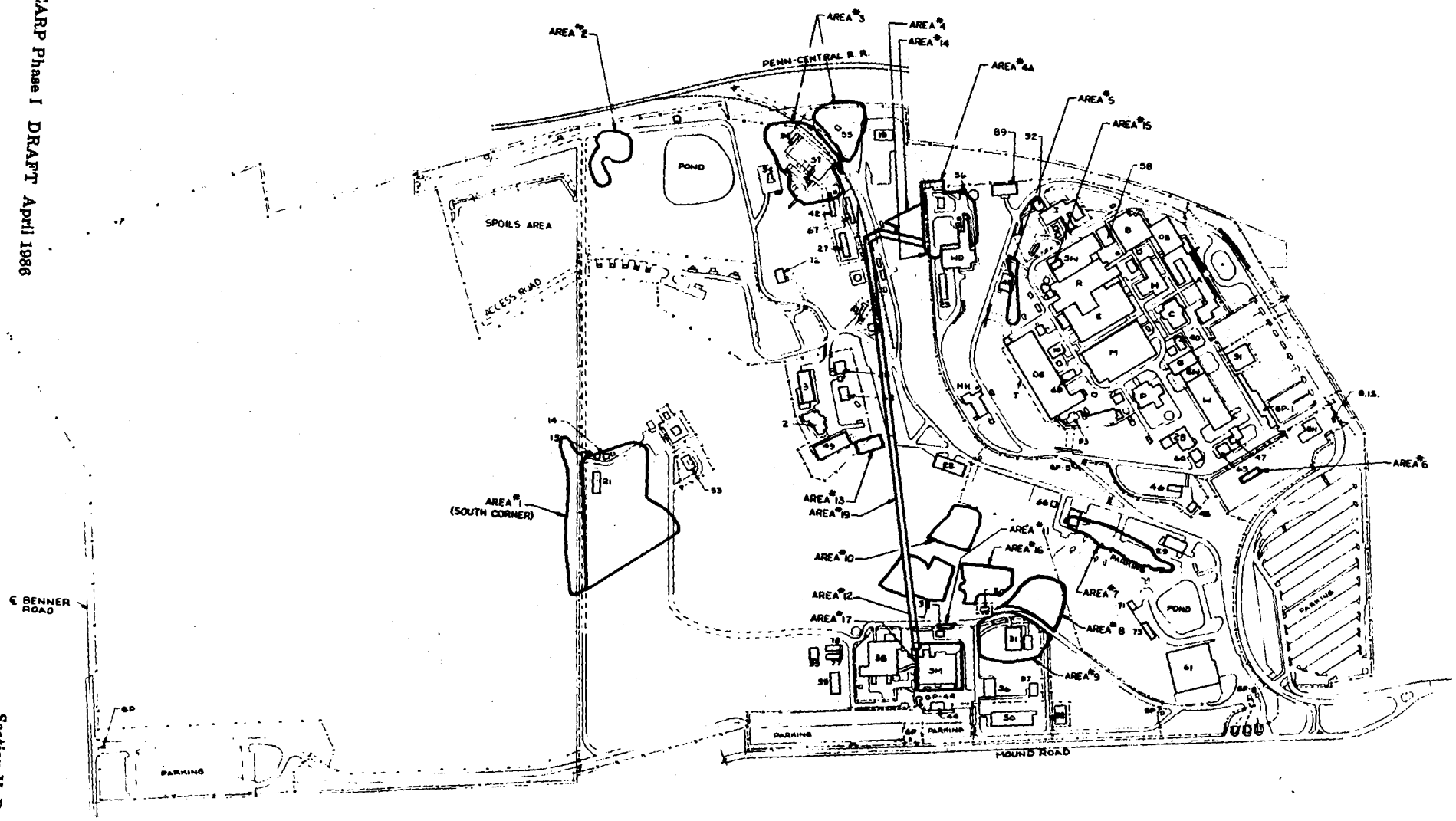


Figure V.2. Radioactive Contamination Areas.

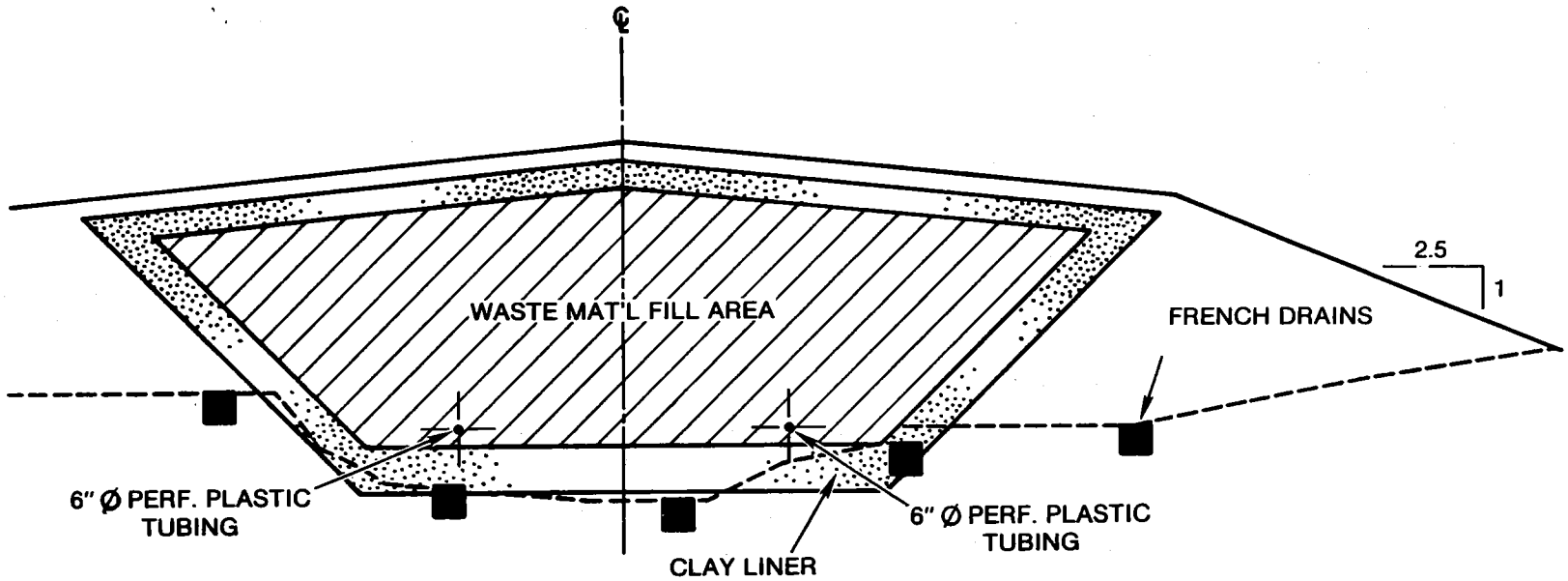


Figure V.3. Schematic of Site Landfill (Category 1 Area B).

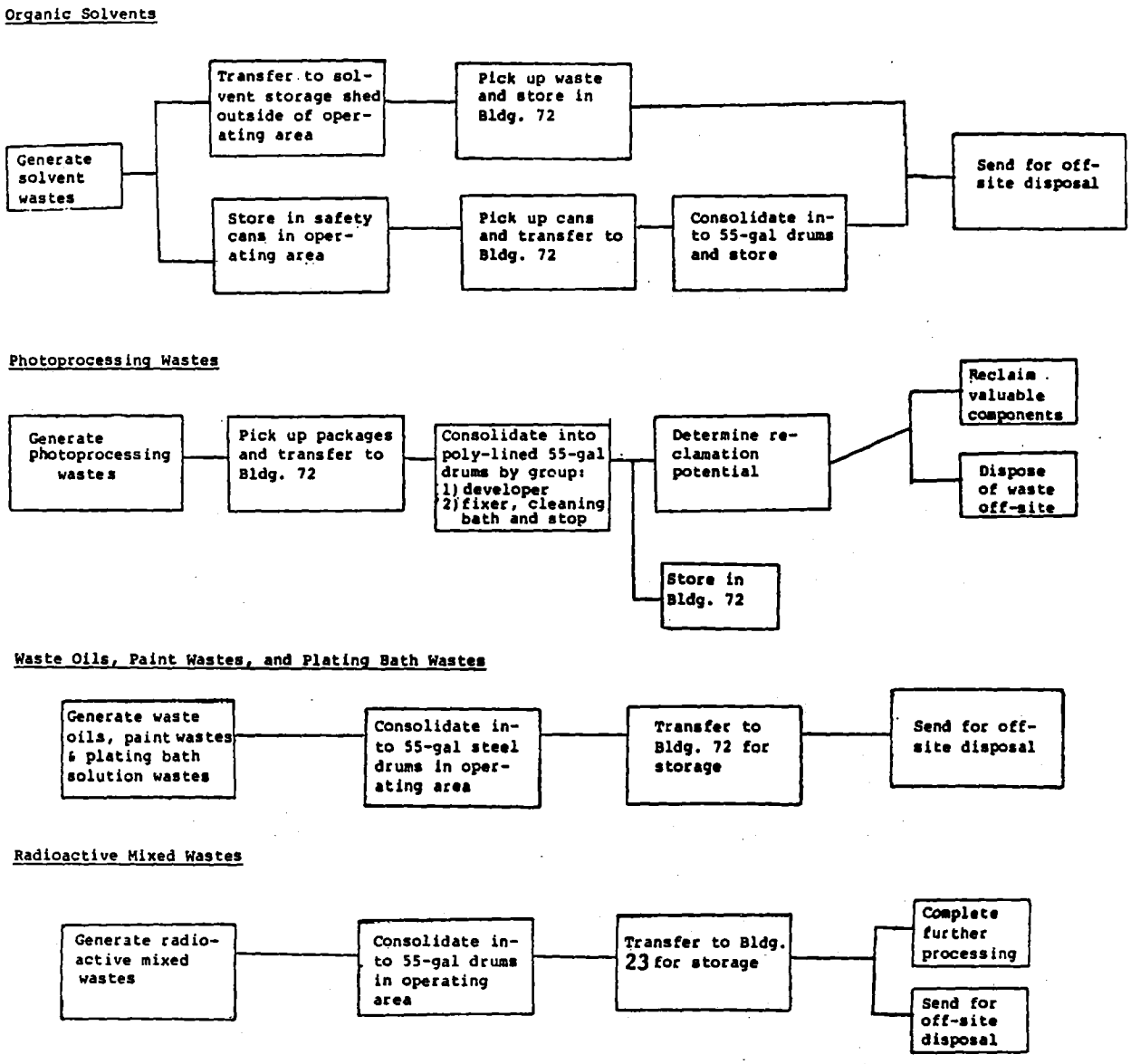


Figure V.4. Waste Management Schemes for Hazardous Waste Streams.

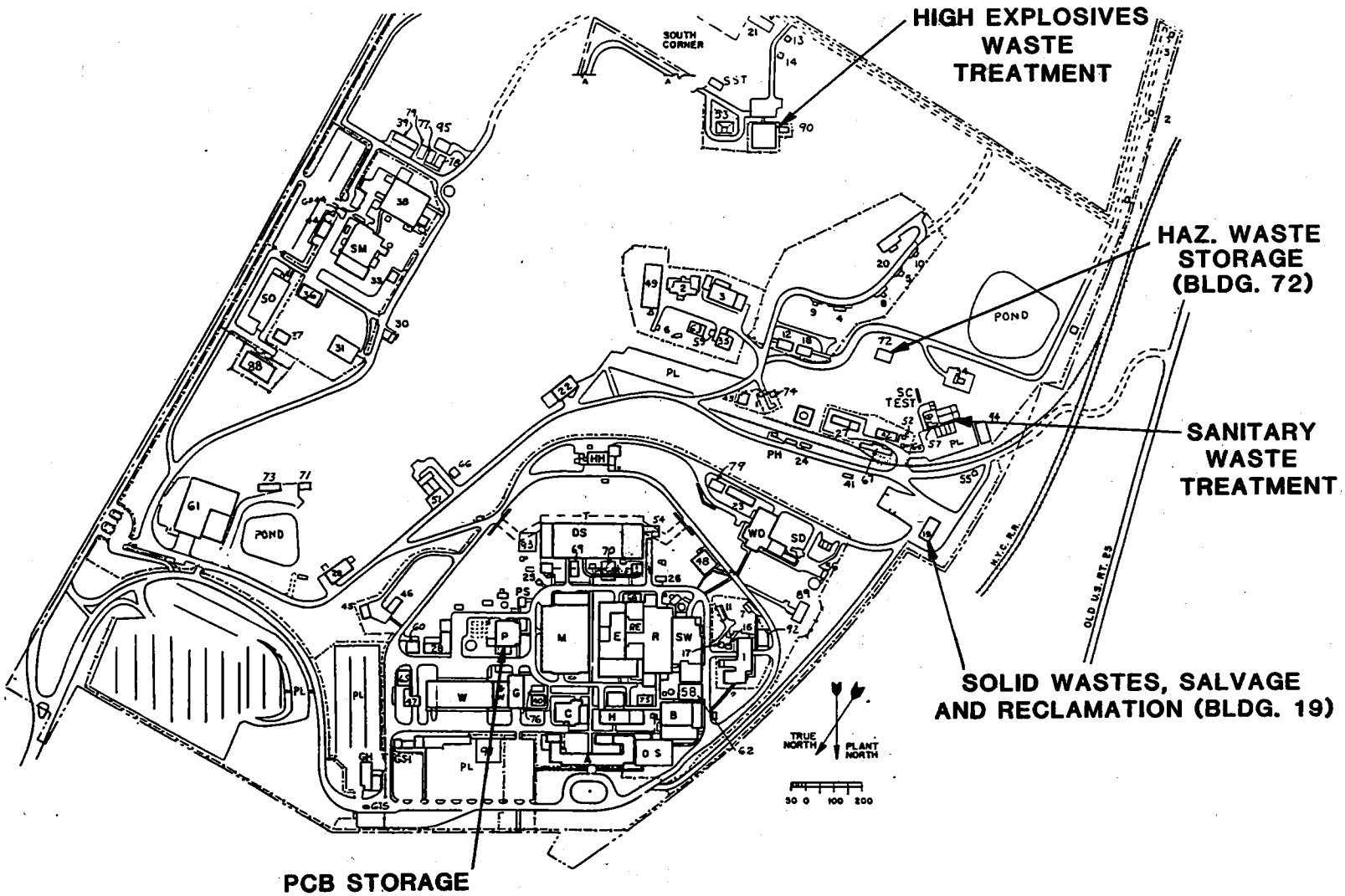


Figure V.5. Waste Managment Locations for Hazardous Wastes.

Table V.1

Planned Future Actions for Category 1
Areas Potentially Contaminated with Oils or Hazardous Substances

Area[a]	Planned Future Actions (PFA)
A	Construction soil material from Bldg T was used as fill material (approx. 17 ft^3) in the area of the sanitary treatment facility. No known hazardous substances were disposed of in this area. (Interviews 1985.) CERCLA Finding--Negative for Federal Facility Site Discovery and Identification Findings (FFSDIF), Preliminary Assessment (PA), and Preliminary Site Inspection (PSI); therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.
B	Landfill operations were initiated when operations started at Mound in 1948 and ceased in the mid 1970s. Landfilled wastes included general refuse, construction materials, solvents, paints, photoprocessing solutions, and plating bath solutions. Radioactive materials were not landfilled. Many of the wastes were destroyed by burning at the time of landfilling. During construction of the overflow pond in 1978, these residual wastes were encountered. The wastes were compacted and confined in a large, sealed landfill in accordance with existing chemical landfill technology (Fig. V-3). Mound notified USEPA Region V on June 9, 1981 of the site as required under CERCLA. The materials are enclosed in a clay liner with provisions for monitoring of leachate. The volume of the landfill enclosure, including overflow pond fill, is 100,000 yd^3. It is estimated that the landfill enclosure may contain 1,000 ft^3 of hazardous substances. There may be residual hazardous substances that were not included in the clay-lined landfill; and landfilled residuals may exist under part of the overflow pond. However, based on the detailed records search, it appears that the probability of significant quantities of hazardous substances existing outside the landfill is remote. Potential exists for ground water contamination due to leakage from the landfill enclosure and movement of hazardous substances not enclosed in the landfill. The current ground water monitoring program may not detect potential movement of hazardous substances and oils away from the landfill area. (Interviews 1985; Monsanto Research Corporation 1985.) CERCLA Finding--Positive for FFSDIF, PA, and PSI; HRS Migration Mode Score 13 (Appendix D). PFA--Area B will be surveyed to determine the extent of contamination of oils and hazardous substances outside the landfill. The leachate monitoring system will be evaluated. Additionally, the potential outside the landfill for ground water contamination from unconfined oils and hazardous substances is being evaluated. Based on results of these CEARP Phase II studies, appropriate action will be taken.

[a]location of designated areas shown in Figure V-1.

Table V.1 (cont)

Area	Planned Future Actions (PFA)
C	Area C was a stagnant water area of about 150 ft in diameter. Lithium containers, probably containing residual lithium carbonate, were dumped in this area during the mid 1950s. Other wastes may have also been dumped in this area, however, the quantity of hazardous substances, if any, would have been limited. It appears that fill has been added to the area. An old warehouse was also located in this area. There is not sufficient information to make a definitive statement on the existence of hazardous substances at area C. (Interviews 1985.) CERCLA Finding--Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score. PFA--A CEARP Phase I supplemental reconnaissance field study will be conducted to determine the presence of hazardous substances and potential for ground water contamination. Based on the results of this study, appropriate action will be taken.
D	Area D served as the leach bed for plutonium operations in PP Bldg. The leach bed received caustic or acidic solutions with plutonium contamination. Residual hazardous substances in the leach bed are probably limited to radioactive contamination. The area is being evaluated under the Site Survey Program. (Interviews 1985; Site Survey Program 1985.) Due to the status of activities (i.e., CEARP Phase IV) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate for this site. PFA--Area D was submitted to and accepted by the USDOE Surplus Facilities Management Program (SFMP). SFMP remedial action is scheduled.
E	A single contractor waste oil dumping event (<5 gal) occurred in area E. Oil contaminated soil was removed and disposed at a USDOE disposal facility. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.
F	During 1963 a chromium plating bath (110 gal) was treated with sodium bisulfide and dumped in a trench at area F. The area is currently covered with an asphalt parking lot and the small amount residual chromium does not pose a health hazard. Additionally, the amount of material dumped is substantially below the 24 hour reportable quantity of 1,000 lbs for chromium. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.

Table V.1 (cont)

Area	Planned Future Actions (PFA)
G	Area G contains plutonium contamination from spilling a solution containing plutonium and is being evaluated under the Site Survey Program. (Interviews 1985; Site Survey Program 1985.) Due to the status of activities (i.e., CEARP Phase IV) a CERCLA Finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate for this site. PFA--Area G has been submitted to USDOE SFMP for remedial action. Further funding is anticipated.
H	Small quantities of wastes from pyrotechnic material operations were dissolved in water and filtered; the filtrate was poured onto the ground for treatment by natural weathering processes (hydrolysis) in the thermal treatment area (Monsanto Research Corporation 1983). Historically the waste stream was less than 10 gal/yr. The waste stream in 1984 consisted of approx 5 gal of liquid, which consisted mostly of detergent with small amounts of solvents (primarily acetone) and trace amounts of reacted pyrotechnic material. Treatment by natural weathering process is no longer practiced. The primary hazardous substance (i.e., acetone) is not stable in the environment and any residual trace substances do not pose a health hazard. Additionally, the amount of acetone treated annually was substantially below the 24-hour reportable quantity of 5,000 lbs. (Interviews 1985; Monsanto Research Corporation 1983.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.
I	Manufacturing operations involving explosives produced limited quantities of industrial liquors with dissolved explosives; the principal process liquid was acetone. Waste liquors (approx. 1,000 gal/yr) containing very small amounts of dissolved explosives (ppm range) were piped to concrete-lined filtering basins and then to an open retaining/settling basin or a leach bed for biodegradation treatment (Monsanto Research Corporation 1983). The concrete-lined basins were dredged every 3 to 4 years and the sludge destroyed by thermal treatment. Filters used at the basins were also destroyed by thermal treatment. Treatment by biodegradation is no longer practiced. The primary hazardous substance (i.e., acetone) and trace quantities of explosives are not stable in the environment. Additionally, the amount of acetone treated annually was roughly equivalent to the CERCLA 24-hour reportable quantity of 5,000 lbs. Residual trace substances probably do not pose a health hazard. (Interviews 1985; Monsanto Research Corporation 1983.) CERCLA Finding--Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode score. PFA--A CEARP Phase I supplemental reconnaissance field study will be conducted to determine the presence of hazardous substances and potential for ground water contamination. Based on results of this study, appropriate action will be taken.

Table V.1 (cont)

Area	Planned Future Actions (PFA)
J	The hillside slope west of Building 38 has been used for placement of construction spoil since the early 1950s (Monsanto Research Corporation 1985). Construction residues (including excavated soil, chunks of concrete, pipes of various sizes and types, metal banding, plumbing fixtures, roofing materials, etc.) have been discarded and bulldozed over the hillside in a random, uncompacted fashion. At the present time, this site encompasses a surface area of approximately four acres. The volume of the spoils material exceeds 100,000 yd^3. The detailed records search, including interviews with Mound employees, failed to confirm that persistent hazardous substances might be present in the construction spoils area with the possible exception of plutonium and thorium (see Table V.1, area D and Table V.3, area 12). During recent years, the site has been expanded to such an extent that the capacity of the area is being exceeded resulting in spoil pile instability and excessive erosion. Two engineering programs were completed to: (1) assess the stability of the construction material disposal area and concepts for disposal of construction spoil, and (2) eliminate the excessive discharge of suspended solids from the hillside. (Interviews 1985; Monsanto Research Corporation 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--The two ongoing engineering programs for management of construction spoil and stabilization of the construction material disposal area will be implemented by MRC.

Table V.2

Planned Future Actions for Category 2
Areas with Potential for Leaks and Spills of Oils or Hazardous Substances

Area	Planned Future Actions (PFA)
Paint Shop	The local area around the paint shop could have been contaminated as a result of leaks and spills or as a result of dumping. Paint shop wastes were disposed in the Mound area B landfill prior to disposal offsite by a commercial vendor and no major spills or leaks have been reported. Therefore, there should not be sufficient residual contamination of hazardous substances to pose an environmental problem in the paint shop area. (Interviews 1985.) CERCLA Finding--Negative for Federal Facility Site Discovery and Identification Findings (FFSDIF), Preliminary Assessment (PA), and Preliminary Site Inspection (PSI); therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.
Powerhouse	The area around the powerhouse could be contaminated as the result of oil spills. No major leaks or spills have been reported in the powerhouse area that would result in sufficient residual contamination of oil to pose an environmental problem. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.
WD Bldg.	The four underground steel holding tanks for radioactive wastes have been subject to corrosion. The tanks have been recoated with epoxy. No major leaks have been reported in the holding tanks for radioactive wastes and their repair on several occasions has ensured that any slow undetectable leaks would have been repaired without significant losses. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated. PFA--No further action is warranted.
Bldg. 61	The Bldg. 61 area was the old heavy equipment area and could have been a spot for dumping waste oil. Dumping of waste oil has not been reported in the Bldg. 61 area and standard operating procedure was to dispose of waste oil in the Mound area B landfill prior to disposal/recycle offsite by a commercial vendor. Additionally, no major spills have been reported in the Bldg. 61 area. Therefore, the likelihood of residual oils in concentrations sufficient to pose environmental problems is remote. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.

Table V.2 (cont)

Area	Planned Future Actions (PFA)
Bldg. G	Garage work is done at Bldg. G and the local area might be contaminated as a result of these activities. Dumping of waste oil has not been reported in the Bldg. G area and prior to utilizing an offsite vendor the standard operating procedure was to dispose of waste oil in the Mound area B landfill. Additionally, no major spills have been reported in Bldg. G. Therefore, the likelihood of residual oils in concentrations sufficient to pose environmental problems is remote. (Interviews 1985.) CERCLA Finding--Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated. PFA--No further action is warranted.

Table V.3

Planned Future Actions for Category 3
Areas Potentially Contaminated with Radioactive Materials

Area[a]	Isotopes	Planned Future Actions (PFA)
1	^{232}Th	1964, 1973. Bulk transfer of thorium from drums to storage basin (Bldg.21). 1965, 1973. Area cleaned up and backfilled with clean soil. Area approximately 136,000 ft^2.
	^{238}Pu	1969. Staged waste drum leaked. Majority of area cleaned up and backfilled. Drainage to the south from this area remains contaminated. Area approximately 10,000 ft^2. PFA--Area 1 was submitted to and accepted by the USDOE Surplus Facilities Management Program (SFMP). Future funding for remedial action is anticipated under SFMP.
2	^{210}Po ^{238}Pu	1965. Disposed of sand contaminated with polonium. Sand resulted from cleaning of metal framework of WD Bldg. sand filters. (Polonium has decayed out.) Area approximately 15,000ft^2. PFA--Based on findings of the Site Survey Program, no further action is warranted.
3	^{232}Th	1965. Storage and redrumming area cleaned and the area backfilled with clean soil. Area approximately 69,000 ft^2. PFA--Area 3 is being submitted under the Site Survey Program for remedial action.
4	^{210}Po ^{60}Co	1965. Waste Disposal Building influent tanks overflowed. Sewage sludge disposal drying pits were also contaminated. (Polonium has decayed out, leaving residual ^{60}Co). PFA--Area 4 was submitted to and accepted by SFMP. Future funding for remedial action is anticipated under SFMP.

[a]Location of Designated areas shown in Fig. V-2.

Table V.3 (cont)

Area[a]	Isotopes	Planned Future Actions (PFA)
4A	^{210}Po ^{238}Pu	1965. Sewage sludge disposal drying pits were contaminated when radioactive waste line broke in Area 5. (Polonium has decayed out --trace plutonium still remains.) Combined area approximately 25,000 ft^2. PFA--Area 4A was submitted to and accepted by SFMP. Future funding for remedial action is anticipated under SFMP.
5	^{210}Po ^{60}Co	1969. Radioactive waste line broke. (Maximum reading was 500 d/m/100 cm^2.)(Polonium has decayed out, leaving residual ^{60}Co.) Area approximately 6,800 ft^2. PFA--Area 5 is being submitted under the Site Survey Program for remedial action.
6	^{210}Po	1964. Disposed of sand contaminated with polonium. Sand resulted from cleaning of metal framework of WD Bldg. sand filters. (Polonium has decayed out.) Area approximately 2,100 ft^2. PFA--Based on findings of the Site Survey Program, no further action is warranted.
7	^{232}Th ^{226}Ra ^{227}Ac ^{228}Th ^{210}Po	1954-1965. Buried empty thorium drums: ^{226}Ra, ^{227}Ac, and ^{228}Th contaminated dirt from SW Cave area; also ^{210}Po contaminated E-31 ventilation exhaust system from T-Bldg. (Polonium has decayed out.) Area approximately 22,000ft^2. PFA--Area 7 is being submitted under the Site Survey Program for remedial action.
8	^{232}Th	1965. Subsurface contaminated dirt from areas 9 and 1. Area approximately 25,000 ft^2. PFA--Area 8 is being submitted under the Site Survey Program for remedial action.

Table V.3 (cont)

Area[a]	Isotopes	Planned Future Actions (PFA)
9	^{232}Th	1965. Thorium storage and redrumming area cleaned up and backfilled with clean soil. Area approximately 40,000 ft^2. PFA--Area 9 is being submitted under the Site Survey Program for remedial action.
10	^{210}Po	1950. Polonium contaminated concrete from Unit 4 Dayton operations. (Polonium has decayed out). Area approximately 13,000 ft^2. PFA--No further action is warranted.
11	^{238}Pu	Prior to 1965. Area was contaminated from SM Bldg. operations. No estimate available for quantity of activity or affected volume. The recent analysis of surface scrapings indicate some degree of contamination. PFA--Area 11 was submitted to and accepted by SFMP. SFMP-funded remedial action is underway.
12	^{232}Th	1965. Subsurface contaminated dirt from Area 1. Area approximately 19,000 ft^2. PFA--Area 12 is being submitted under the Site Survey Program for remedial action.
13	^{210}Po	1950. Polonium-contaminated wood from Unit 4 Dayton operations burned. (Polonium has decayed out to nondetectable levels.) Area approximately 9,000 ft^2. PFA--No further action is warranted.

Table V.3 (cont)

Area[a]	Isotopes	Planned Future Actions (PFA)
14	^{238}Pu	1969. Radioactive waste line from SM to WD Bldg. broke. Grossly contaminated soil (964 ft^3), removed and shipped to NECO for burial. Area backfilled with clean soil. In August 1974, action to remove all hillside surface soil containing significant levels of contamination was started. Approximately 2,700 ft of soil were removed containing an estimated 35 curies. The area was backfilled with clean dirt and sodded. The soil was shipped to Idaho for retrievable storage. PFA--Area 14 was submitted to and accepted by SFMP. SFMP-funded remedial action is underway.
15	^{226}Ra ^{227}Ac ^{228}Th	1958-1960. Steel crane, tracks, and shielding panels for SW Bldg. Old Room 219 cave are contained under new concrete floor. Area approximately 1,000 ft^2. PFA--Area 15 was submitted to and accepted by SFMP. Remedial action is planned but not yet scheduled.
16	^{238}Pu	1960-1965. Sanitary-sewage septic tank and leach basin for SM Bldg. Core samples will be obtained to determine whether any contamination exists. Area approximately 15,500 ft^2. PFA--Area 16 was submitted to and accepted by SFMP. SFMP-funded remedial action is underway.
17	^{238}Pu	1960-1970. Area under and immediately surrounding SM Building. The contamination is largely the result of activity located beneath the concrete floor of the "hot" side and the previous utilization of low risk tanks outside SM. Area approximately 40,000 ft^2. PFA--Area 17 was submitted to and accepted by SFMP. SFMP-funded remedial action is underway.

Table V.3 (cont)

Area[a]	Isotopes	Planned Future Actions (PFA)
18	^{238}Pu	1971-1974. Sanitary sludge from drying beds used as cover for certain sections of landfill. Subsequent investigations revealed that this material may have been contaminated. Approximately 3,200 ft^3 spread over an area of 60,000 ft^2. This material was packaged and shipped offsite for disposal. PFA--No further action is warranted.
19	^{238}Pu	Area 19 represents a 1-1/2 in underground line and a 2-in underground line that were formerly used to transfer low level and higher level ^{238}Pu contaminated liquid waste from the SM-PP area to WD Bldg. for processing. PFA--Area 19 was submitted to and accepted by SFMP. SFMP remedial action is underway.

Table V.4. Potential CERCLA Sites Identified During CEARP Phase I

Site	USDOE CEARP Phase I		Planned Future Action	
	FFSDIF/PA/PSI[a] Finding	HRS[b] Score	USEPA CERCLA Program Element	USDOE CEARP/CERCLA Order Phase
Category 1[c]				
Area A	Negative	NA[d]	None	None
Area B	Positive	13	None	Confirmation (Phase II)
Area C	Uncertain	NE[e]	None	Installation Assessment (Supplemental Phase I)
Area D	Positive	NA	None	Remedial Action (Phase IV)
Area E	Negative	NA	None	None
Area F	Negative	NA	None	None
Area G	Positive	NA	None	Remedial Action (Phase IV)
Area H	Negative	NA	None	None
Area I	Uncertain	NE	None	Installation Assessment (Supplemental Phase I)
Area J	Negative	NA	None	None
Category 2[f]				
Paint Shop	Negative	NA	None	None
Powerhouse	Negative	NA	None	None
WD Bldg	Negative	NA	None	None
Bldg 61	Negative	NA	None	None
Bldg G	Negative	NA	None	None
Category 3[g]				
Area 1	NA	NA	None	Remedial Action (Phase IV)
Area 2	Negative	NA	None	None
Area 3	NA	NA	None	Remedial Action (Phase IV)
Area 4	NA	NA	None	Remedial Action (Phase IV)

Table V.4 (cont)

Site	USDOE CEARP Phase I		Planned Future Action	
	FFSDIF/PA/PSI[a] Finding	HRS[b] Score	USEPA CERCLA Program Element	USDOE CEARP/CERCLA Order Phase
Area 4a	NA	NA	None	Remedial Action (Phase IV)
Area 5	NA	NA	None	Remedial Action (Phase IV)
Area 6	Negative	NA	None	None
Area 7	NA	NA	None	Remedial Action (Phase IV)
Area 8	NA	NA	None	Remedial Action (Phase IV)
Area 9	NA	NA	None	Remedial Action (Phase IV)
Area 10	Negative	NA	None	None
Area 11	NA	NA	None	Remedial Action (Phase IV)
Area 12	NA	NA	None	Remedial Action (Phase IV)
Area 13	NA	NA	None	None
Area 14	NA	NA	None	Remedial Action (Phase IV)
Area 15	NA	NA	None	Remedial Action (Phase IV)
Area 16	NA	NA	None	Remedial Action (Phase IV)
Area 17	NA	NA	None	Remedial Action (Phase IV)
Area 18	Negative	NA	None	None
Area 19	NA	NA	None	Remedial Action (Phase IV)
Tritium in the Buried Valley Aquifer[h]	NA	NA	None	Compliance and Verification (Phase V)
Plutonium in the Miami-Erie Canal[i]	NA	NA	None	Compliance and Verification (Phase V)

Table V.4 (cont)

Site	USDOE CEARP Phase I		Planned Future Action	
	FFSDIF/PA/PSI[a] Finding	HRS[b] Score	USEPA CERCLA Program Element	USDOE CEARP/CERCLA Order Phase
Historical Monsanto Facilities[j]				
Unit I	Negative	NA	None	None
Unit II	Negative	NA	None	None
Unit III	Negative	NA	None	None
Unit IV	Negative	NA	None	None
Warehouse	Negative	NA	None	None
Marion	Negative	NA	None	None

[a]Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections.
[b]USEPA Hazard Ranking System (for HRS scoring details see Appendix D).
[c]Category 1 (see Section V.A.1.a; Table V.1).
[d]Not Applicable.
[e]Not Evaluated.
[f]Category 2 (see Section V.A.1.a; Table V.2).
[g]Category 3 (see Section V.A.1.a; Table V.3).
[h]See Section V.A.1.b.
[i]See Section V.A.1.c.
[j]See Section V.A.2.

Table V.5

Management of Hazardous Substances and Oils Generated at Mound

Waste Description	Process/Source	Annual Quantity FY-83	Annual Quantity FY-84	Waste Handling
Organic solvents such as acetone, isopropanol, methanol, ethanol, trichloroethylene, and chlorinated fluorocarbons	Various cleaning operations excluding those required for processing explosives	3994 gal	4300 gal	Drums and Safety Cans; picked up weekly; can contents emptied into drums; wastes stored in Bldg. 72 prior to offsite disposal (3 to 24 months residence time)
Waste oils	Machining operations, hydraulic systems, pump oils, used motor oil	1879 gal	3900 gal	Consolidated in 55-gal drums at operating area, and stored in Bldg. 72 for offsite disposal (3 to 24 months residence time)
Discarded excess paints and thinners	Paint shop, outdated paint, cleaning solutions from paint operations	215 gal	330 gal	Consolidated in 55-gal drums at operating area, and stored in Bldg. 72 for offsite disposal (3 to 24 months residence time)
Waste corrosive solutions	Plating operations and other sources	50 gal	290 gal	Consolidated in drums at operating area, and stored in Bldg. 72 for offsite disposal (3 to 24 months) residence time)
Spent plating-bath solutions of chromic acid, cadmium cyanide, nickel sulfate, nickel chloride, electroless nickel, black oxide, and copper cyanide	Plating shop	83 gal	640 gal	Consolidated in drums at operating area, and stored in Bldg. 72 for offsite disposal (3 to 24 months residence time)
EP toxic wastes and polymeric wastes	Various processes	---	620	Picked up weekly and stored in Bldg. 72 prior to offsite disposal (3 to 24 months residence time)

Table V.5 (cont)

Waste Description	Process/Source	Annual Quantity FY-83	Annual Quantity FY-84	Waste Handling
Waste PCBs	From transformers, capacitors, storage cans, microwave ovens, and electronic equipment; also bulk waste from various site operations	0	0	Stored in marked cans or drums, labelled and placed in dikes and covered vaults or controlled storage facility near P-Building (12 months residence time)
Photoprocessing wastes such as spent fixer solution, developers, stop, bleaches and rinses	From various functional groups including Product Development and Environmental Testing, Manuals and Procedure, Drawing Control, General Analytical, ADP Operations, Photography, Industrial Radiography, and Medical Radiography	539 gal	1200 gal	Picked up weekly, consolidated into polyethylene-lined 55-gal drums and stored in Bldg. 72 prior to offsite disposal (3 too 124 months residence time)
Explosive wastes consisting of small amounts of mild detonating fuse (MDF), pyrotechnic materials, rejected components containing small amounts of explosives, and operational wastes such as tissue and cardboard that have been contaminated with explosives or pyrotechnics; also bulk high explosives/pyrotechnics	Generated in production areas throughout facility	770 lb	800 lb	Stored in magazines; small quantities are destroyed by incineration, retorting, and open burning in remote area (24 months residence time)
Radioactive mixed wastes	Biomedical assay	825 gal[a]	2100 gal[b]	Managed per DOE 5480.2 and 5820.2 (3 years residence time)

Table V.5 (cont)

Waste Description	Process/Source	Annual Quantity FY-83	Annual Quantity FY-84	Waste Handling
Laboratory wastes consisting of solvents; flammable corrosive, toxic liquids and solids	Lab R&D and analytical work	900 lb	1500 lb	Packed in steel container with vermiculite prior to offsite incineration or landfilling (3 to 24 months residence time)

[a]Includes ninety-four 55-gal drums of scintillation vials, plus packaging material; pending analyses may show some of these materials to be nonradioactive.
[b]Includes One-hundred and sixteen 55-gal drums of scintillation vials plus packaging materials.

Table V.6

Planned Future Actions for Potential Emissions

Potential Emissions	Planned Future Actions
Hydrologic	
NPDES discharges	Continued compliance with CWA NPDES reporting requirements. The following projects will be implemented to ensure TSS NPDES compliance (1) stabilization of the construction material disposal area (area J, Table V.1), (2) upgrade storm and sanitary sewer drainage systems (Section V.B.3), and (3) separate process water from storm system (Section V.B.5).
Atmospheric	
Powerhouse	Continued compliance with RAPCA requirements.
Paint shop	Continued compliance with RAPCA requirements for organic releases.
Explosives thermal	Continued compliance with RAPCA requirements.
Fire fighter training	Continued compliance with RAPCA notification requirements.
Plastic manufacturing	Continued compliance with CAA NESHAPS reporting requirements for asbestos.
Demolition and renovation of facilities containing asbestos	Continued compliance with CAA NESHAPS requirements.
Radionuclides	Comply with CAA NESHAPS reporting requirements (40 CFR 61, effective May 1985).

Table V.6 (cont)

Potential Emissions	Planned Future Actions
Environment Hazardous substances	Releases of hazardous substances to the environment will be reported as required under CERCLA (40 CFR 302). All concurrent releases of the same substance from a particular facility into the environment must be aggregated to determine if the reportable quantity has been exceeded.

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APPENDIX A - PROFESSIONAL QUALIFICATIONS OF INSTALLATION ASSESSMENT TEAM

BECKER, Naomi M.
- Hydrologist
- Registered Professional Engineer (New Mexico)
- Los Alamos National Laboratory
- B.S. 1974, Geological Science, University of Illinois
- M.S. 1978, Civil and Environmental Engineering, University of Wisconsin, Madison
- Years of Professional Experience: 11
- CEARP Responsibilities: Geology, Hydrology, Water Quality

DEWART, Jean
- Meteorologist
- Los Alamos National Laboratory
- B.S. 1976, Atmospheric Science, University of Washington
- M.S. 1978, Atmospheric Science, Colorado State University
- Years of Professional Experience: 9
- CEARP Responsibilities: Meteorology

FERENBAUGH, Roger W.
- Chemical Engineer, Ecologist
- Los Alamos National Laboratory
- B.Ch.E. 1963, Chemical Engineering, University of Virginia
- M.S. 1965, Chemical Engineering, Rice University
- Ph.D. 1974, Plant Ecology, University of Montana
- Years of Professional Experience: 16
- CEARP Responsibilities: Team Leader, Process Review, Pathway Analysis

NOCHUMSON, David H.
- Environmental Engineer
- Los Alamos National Laboratory
- B.S. 1970, Chemical Engineering, Rutgers University
- M.S. 1972, Environmental Engineering, Harvard University
- Ph.D. 1978, Environmental Engineering, Harvard University
- Years of Professional Experience: 9
- CEARP Responsibilities: Air Quality

PURTYMUN, William D.
Geohydrologist
Registered Professional Geologist (California)
Los Alamos National Laboratory
B.S. 1958, Geology, University of New Mexico
Years of Professional Experience: 27
CEARP Responsibilities: Geology
Hydrology
Water Quality

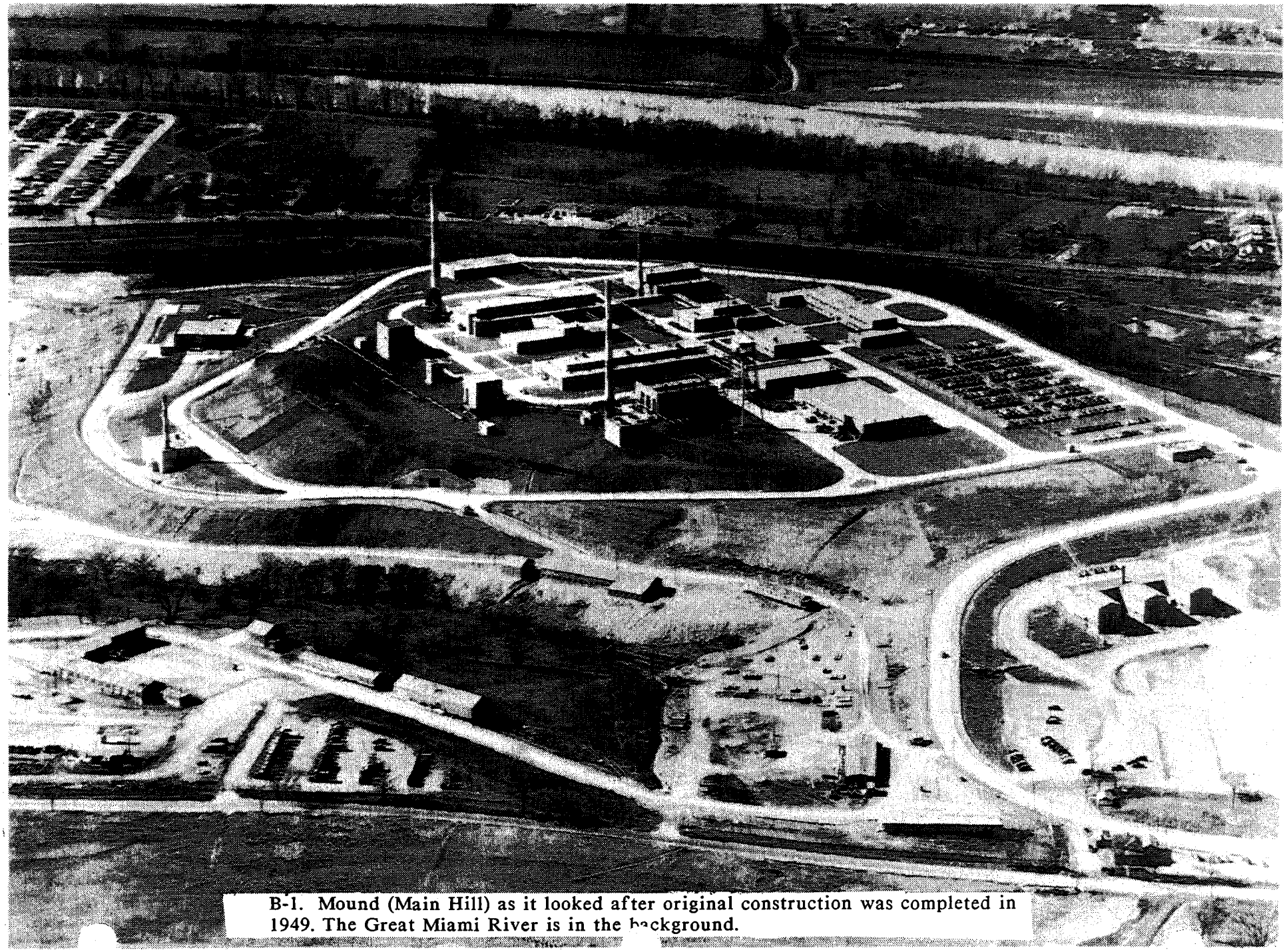
REA, Kenneth H.
Terrestrial Ecologist
Los Alamos National Laboratory
B.S. 1969, Wildlife Science, New Mexico State University
M.S. 1972, Range Science, New Mexico State University
Ph.D. 1976, Range Ecology, Utah State University
Years of Professional Experience: 16
CEARP Responsibilities: Team Leader
Interviewer
Pathway Analysis

STOKER, Alan K.
Environmental Engineer
Los Alamos National Laboratory
B.S. 1965, Physics, Occidental College
M.S. 1974, Environmental Engineering, Stanford University
Engineer 1975, Environmental Engineering, Stanford University
Years of Professional Experience: 13
CEARP Responsibilities: Reviewer

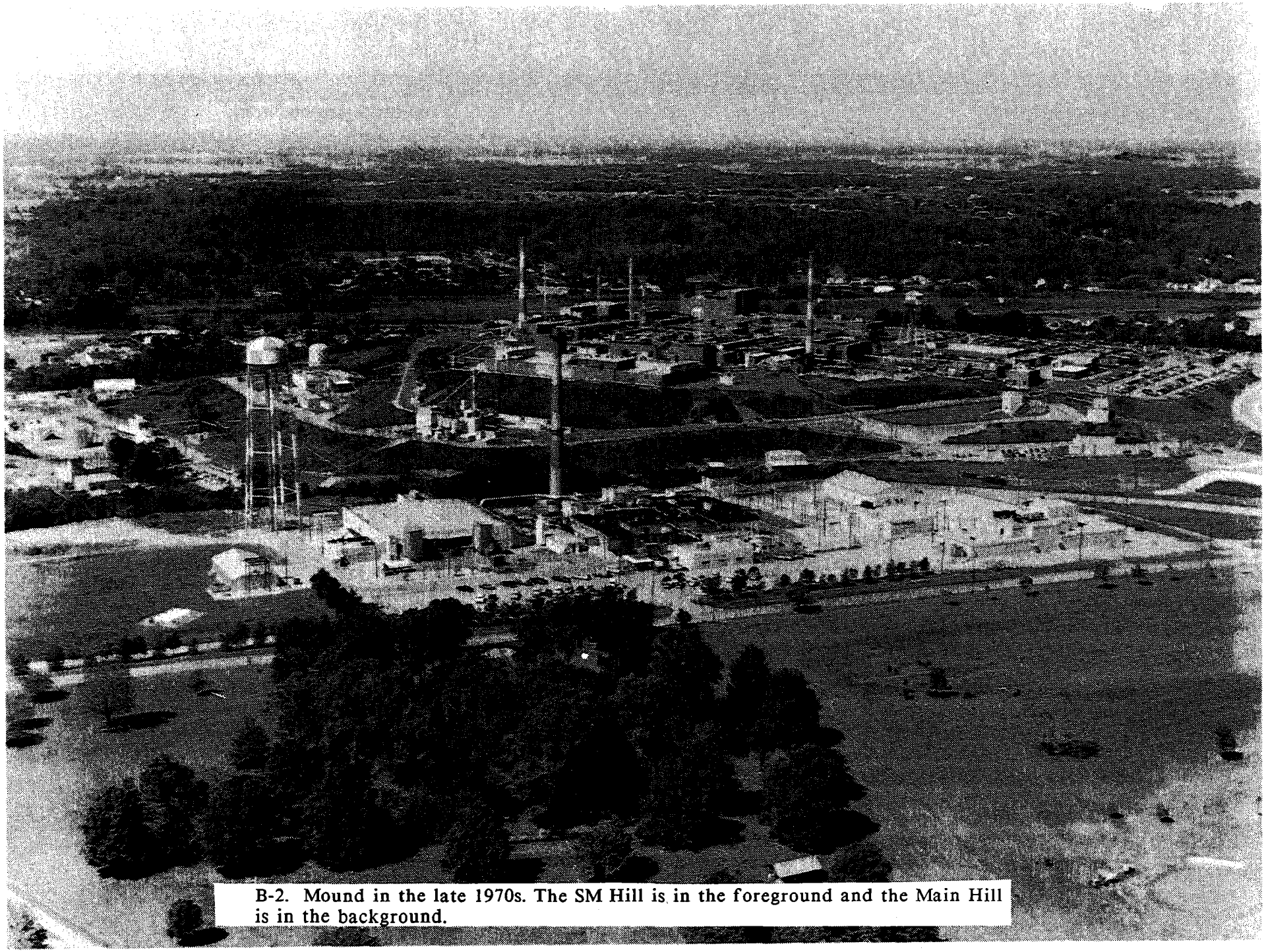
VOCKE, Robert W.
Aquatic Biologist, Environmental Scientist
Los Alamos National Laboratory
B.S. 1972, Fisheries and Wildlife Biology, Iowa State University
M.S. 1974, Botany, Iowa State University
Ph.D. 1978, Water Resources, Iowa State University
Years of Professional Experience: 10
CEARP Responsibilities: Project Leader and Manager
Team Leader
Pathway Analysis

APPENDIX B

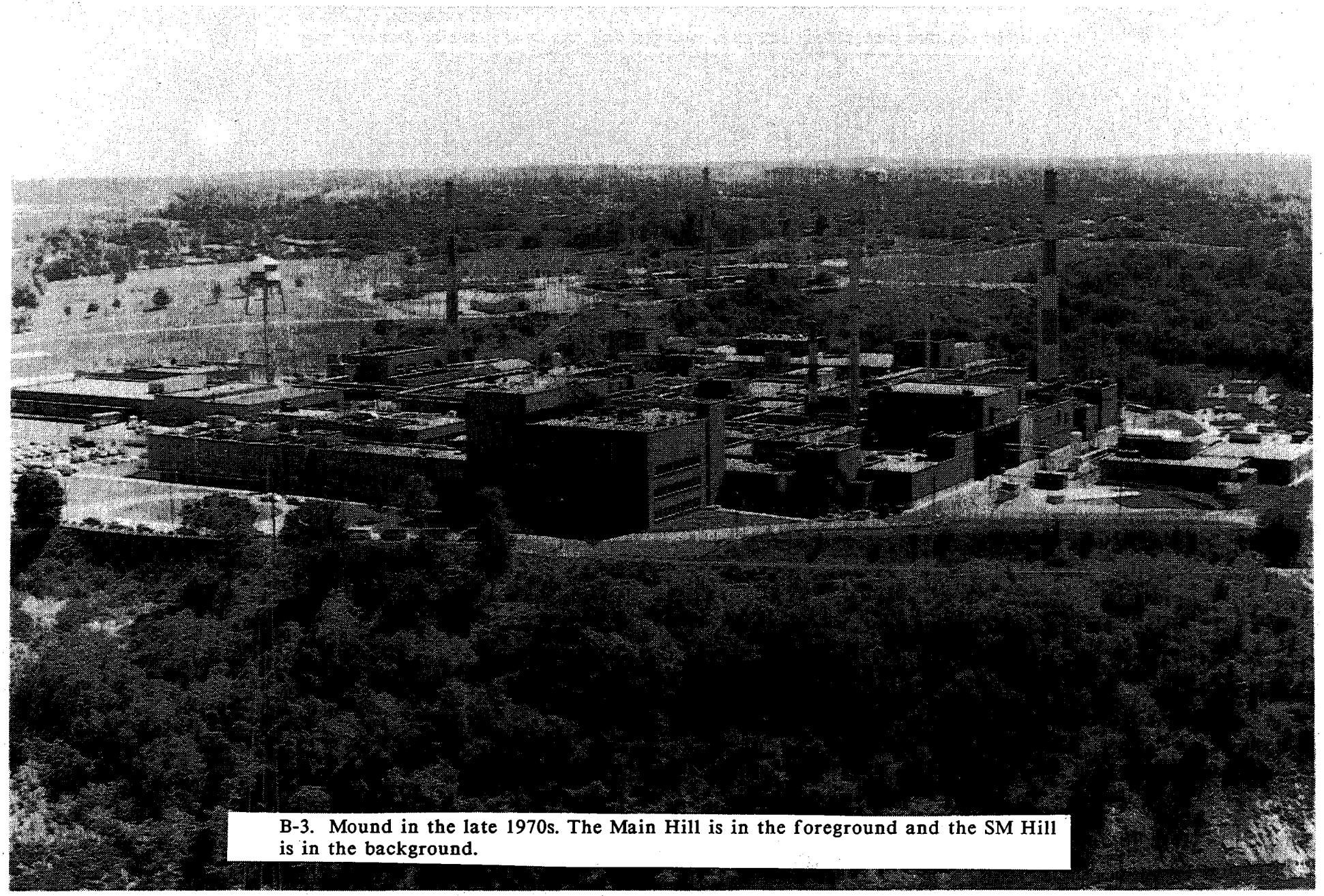
PHOTOGRAPHS



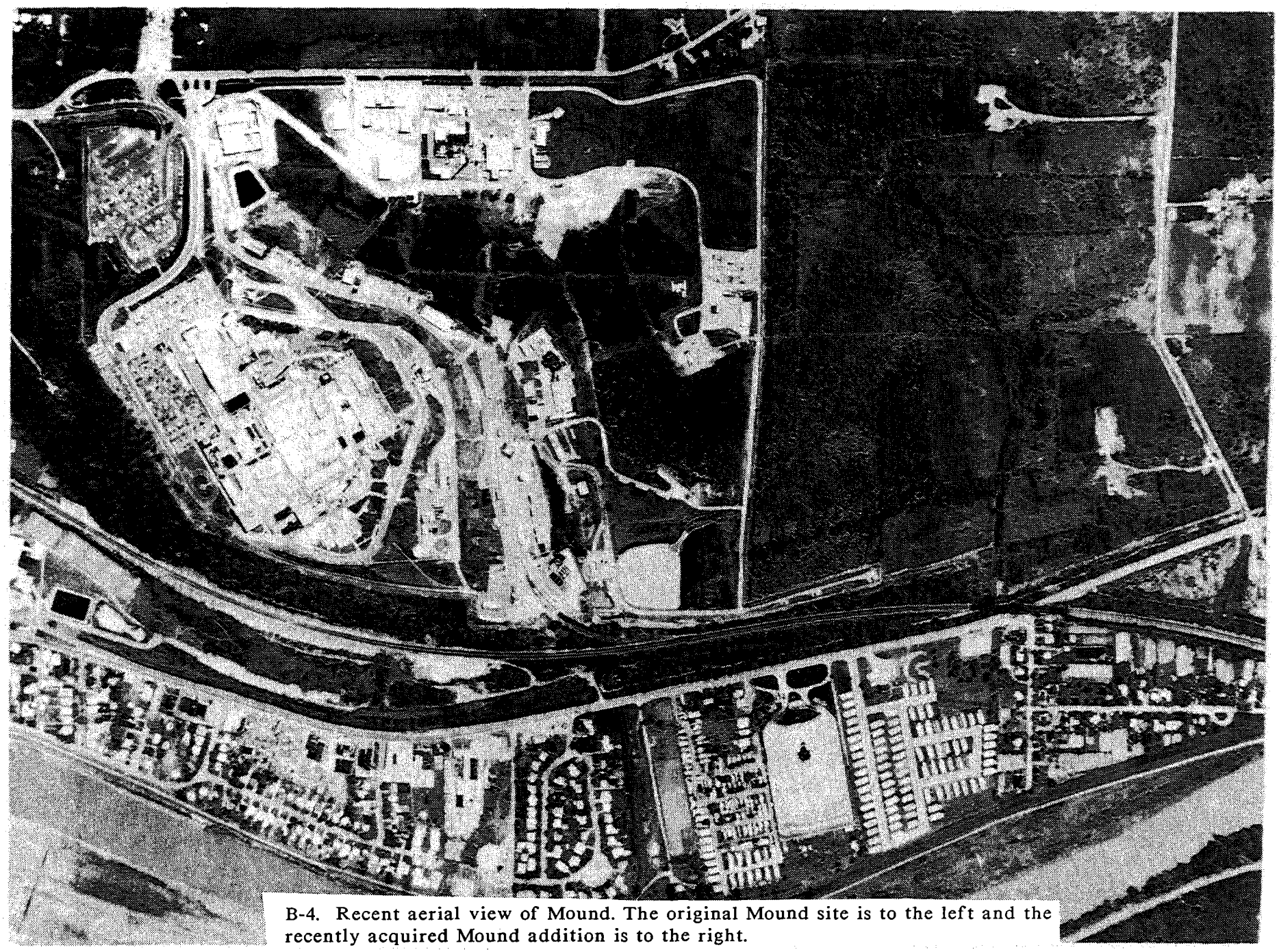
B-1. Mound (Main Hill) as it looked after original construction was completed in 1949. The Great Miami River is in the background.



B-2. Mound in the late 1970s. The SM Hill is in the foreground and the Main Hill is in the background.



B-3. Mound in the late 1970s. The Main Hill is in the foreground and the SM Hill is in the background.



B-4. Recent aerial view of Mound. The original Mound site is to the left and the recently acquired Mound addition is to the right.

APPENDIX C

MONITORING PROGRAMS

The MRC Environmental Control Program has been in operation since work began at Mound in 1949. A summary of the current monitoring program is presented in Table C.1. These monitoring activities include the collection of air, water, foodstuff, soil, and sediment samples out to a distance of 28 mi around the facility. Samples are analyzed for potentially toxic pollutants, including radioisotopes handled at Mound. Data obtained by the environmental monitoring program are used to ensure that operations at Mound are conducted so that emissions comply with applicable emission and environmental standards and to provide a local background or base line for comparison in the event of an accidental release.

A comprehensive, unclassified environmental monitoring report is issued annually. These annual reports contain details on the MRC quality assurance program, sampling techniques, analytical techniques, and results. A summary report is distributed to individuals in political and administrative positions within the general area.

C.I. Quality Assurance

An essential part of the quality control program is the analysis of reference samples from a reliable outside laboratory. During 1984, MRC analyzed samples from the USDOE Environmental Measurements Laboratory (EML) for trace radionuclides. MRC also participated in the 1984 USEPA Quality Assurance Program for Water Analysis, and in a Monsanto Company quality control program for 1984.

C.II. Nonradioactive

Region V of the USEPA has issued a NPDES discharge permit for liquid effluent streams at Mound. MRC is required to characterize its effluent water by analyzing samples collected at four onsite locations (Table IV.3.). A 24-h composite, flow proportional sample, and grab sample are collected from discharges 001-A, 001-B, and 002. An 8-h composite, time proportional sample is collected from discharge 001-C. Monitoring the flow from one well (i.e., discharge 003) that is periodically pumped as a part of the Potable Water Standards Project is also required (Styron 1983).

Mound's drinking water supply is categorized by Ohio EPA as a major, noncommunity public water supply system. The MRC sampling program is discussed in Section IV.F., Safe Drinking Water Act.

C.III Radioactive

C.III.1. Water. Water sampling locations along the banks of the Great Miami River were selected according to guidelines recommended by the USEPA. The locations, shown in Fig. C.1. provide samples that are representative of river water after adequate mixing of effluent from Mound has occurred. Water samples are collected and filtered in the field at these locations 5 days per week, and analyzed for ^{238}Pu and tritium. Water samples for quarterly analyses are obtained by compositing daily samples. Weekly samples are analyzed for tritium. Uranium-233, 234, and 238 are also monitored at the river water sampling locations. Seven offsite surface water locations are sampled quarterly for plutonium and tritium (Fig. C.1.). Drinking water from communities in the surrounding area is sampled and analyzed quarterly for tritium. Drinking water from private wells is also analyzed for tritium (Fig. C.1.). Three private wells and Miamisburg city water are sampled and analyzed quarterly for ^{238}Pu.

C.III.2. Air. In 1984, the offsite air-sampling network consisted of 15 continuously operating air-sampling stations used for sampling both tritium oxide and plutonium (Fig. C.2.). Ten sampling stations are located within a 1 mi radius of Mound, and four samplers are located in or near population centers. The remaining sampler (No. 119) is approximately 28 mi from Mound in the prevailing wind direction. This sampler receives no measurable contribution from operations at Mound and serves as a base line sample for computing environmental levels.

Two types of samples are collected at each sampling station. A particulate sample from a high-volume air sampler is collected for ^{238}Pu analysis. A sample from a bubbler-type sampler is collected for tritium oxide analysis. Plutonium-238 analyses are performed on a monthly composite for three sampling locations (Nos. 122, 123, and 124), and on quarterly composites for the other offsite locations.

An onsite network consisting of five continuous, high-volume air samplers is used to monitor air quality (Fig. C.3.).

C.III.3. Biota and Sediment. Samples of plants and animals are collected to determine whether there is significant uptake and concentration of radionuclides by biota. Samples are collected in Miamisburg, Centerville, and Bellbrook. Centerville and Bellbrook are in the prevailing wind direction from Mound at a distance of 5 mi and 10 mi, respectively. Fish are collected in the Great Miami River. Sediment samples are collected from the river and surface water sample locations shown in Fig. C.1.

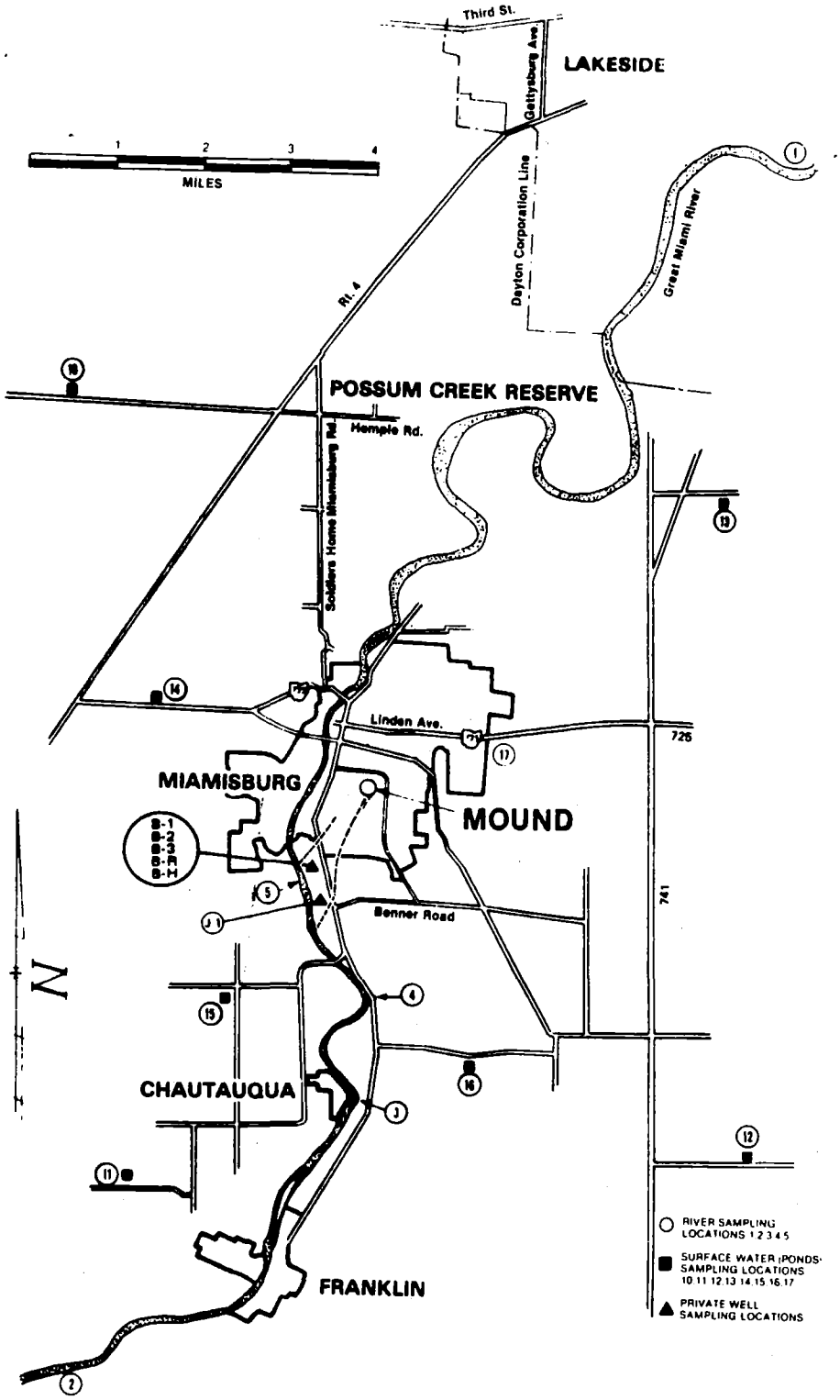


Figure C.1. Offsite Water Sampling Locations.

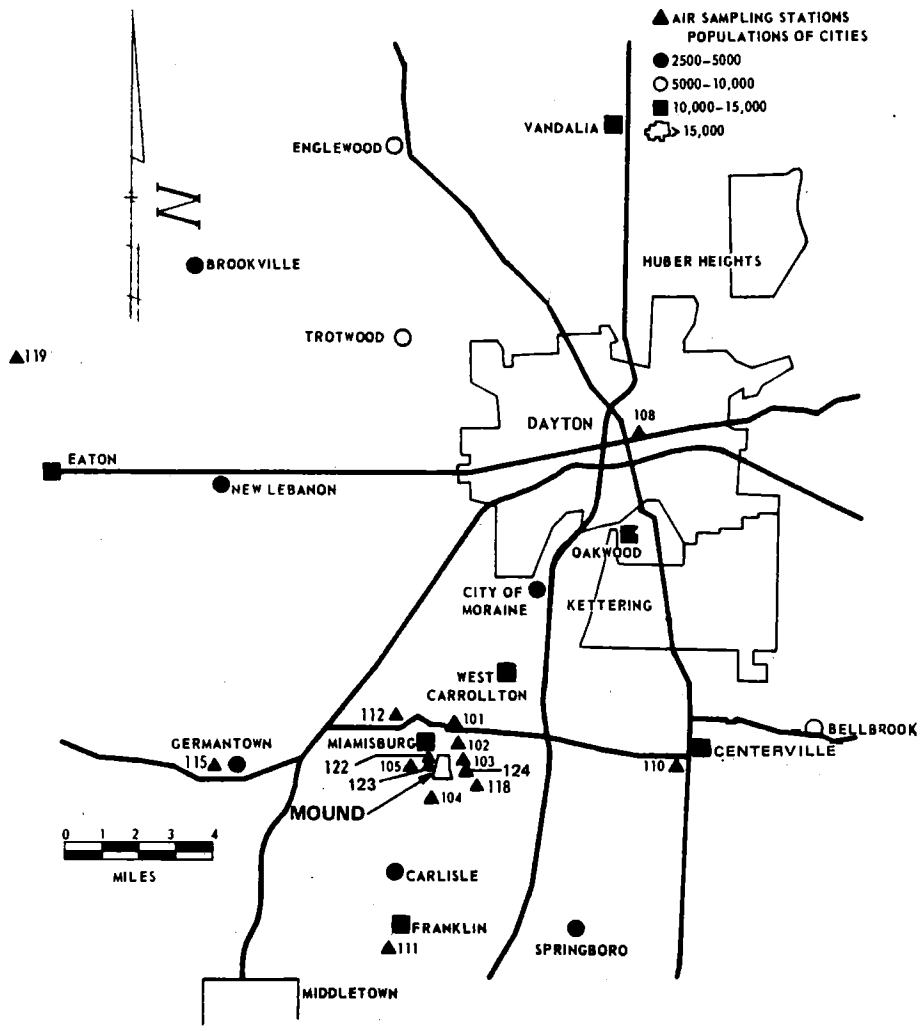


Figure C.2. Offsite Air Sampling Locations.

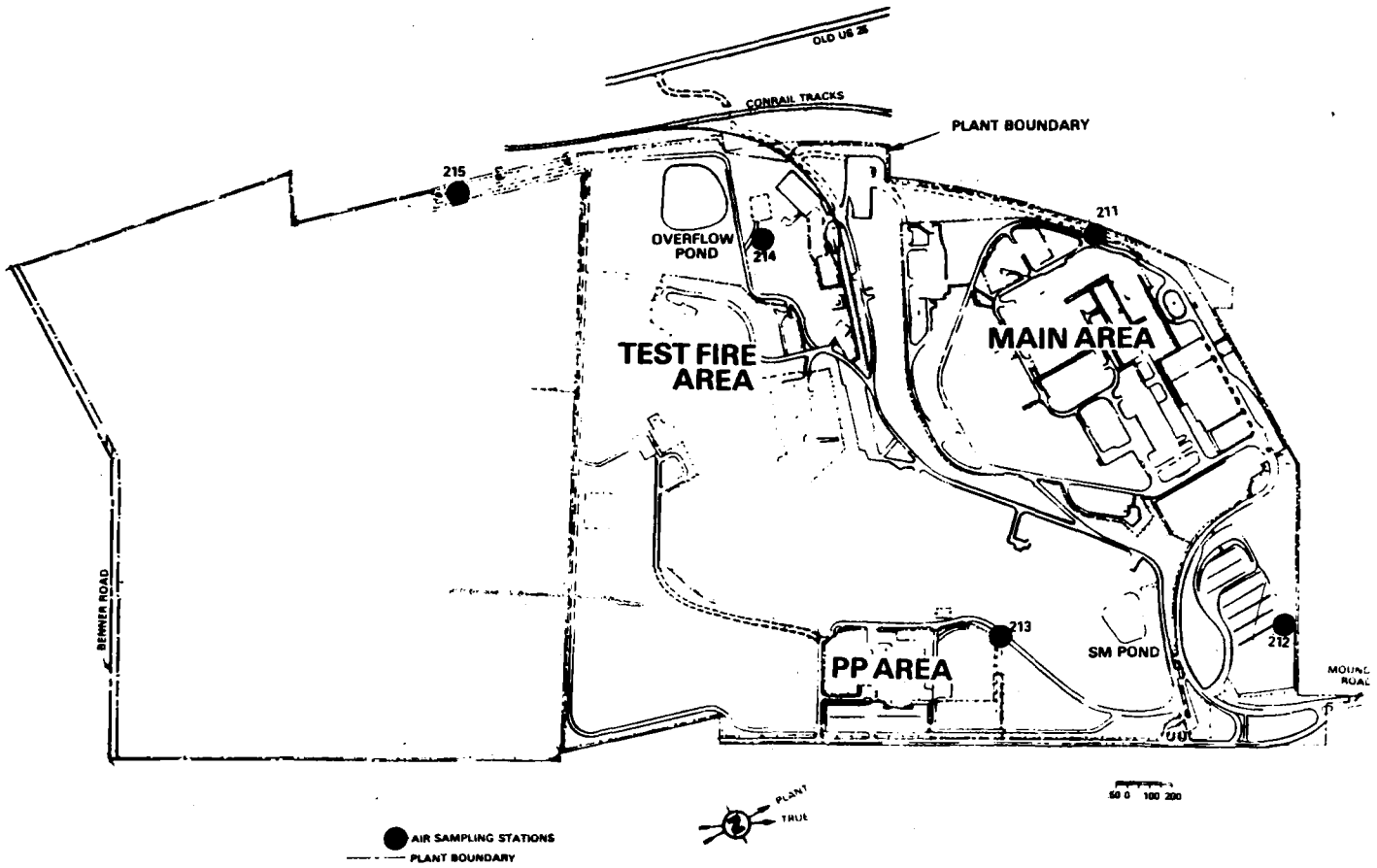


Figure C.3. Onsite Air Sampling Locations.

Table C.1

MRC Environmental Monitoring Program

	Sampling Frequency	Parameter Measured
Air Surveillance		
Offsite		
15 locations	Weekly	HTO, Pu, particulate
Onsite		
5 locations	Weekly	HTO, Pu, particulate
Stack Emission		
15 locations	Daily	HT, HTO, Pu, U
Water Surveillance--Offsite		
River		
5 locations	Daily	HTO, Pu, U
Pond		
7 locations	Monthly	HTO, Pu, U
Municipal Drinking Water		
12 locations	Quarterly	HTO, Pu
Well Water		
5 locations	Monthly	HTO, Pu
Water Surveillance--Onsite		
Effluent Water		
3 locations	Daily	Flow, suspended solids, BOD_5, fecal coliform, pH, oil and grease, COD, residual chlorine, dissolved solids, cyanide, chromium, cadmium, nickel copper, HTO, Pu, U
Sediment Surveillance--Offsite		
River		
5 locations	Quarterly	Pu
Pond		
7 locations	Quarterly	Pu
Vegetation and Foodstuff Surveillance		
Vegetation		
3 locations	Semiannually	HTO, Pu
Foodstuffs		
3 locations	Annually	HTO, Pu
Environmental Level Surveillance		
Four Mediums		
6 locations	Quarterly	HTO, Pu

APPENDIX D

HAZARD RANKING SYSTEM SCORE FOR MOUND

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (P.L. 95-510) requires federal agencies to identify to the USEPA inactive sites under their control that may be sources of environmental contaminants. Such sites could include inactive waste disposal sites, facilities, or other locations that were contaminated by hazardous waste in the past. As one means of establishing the relative importance of such sites, the USEPA promulgated the Hazard Ranking System (HRS) as Appendix A of 40 CFR 300. The relative ranking of sites at various installations can serve to highlight particular problems or suggest priorities for further investigation.

The HRS was designed by the USEPA to be used to "evaluate the relative potential of uncontrolled hazardous substance facilities to cause health or safety problems, or ecological or environmental damage," (Sec. 1.0, 40 CFR 300, App. A). The following excerpts from the regulation indicate some of the limitations of the system:

"The HRS is a means for applying uniform technical judgment regarding the potential hazards presented by a facility relative to other facilities. It does not address the feasibility, desirability or degree of cleanup required."

"The HRS does not quantify the probability of harm from a facility or the magnitude of the harm that could result, although the factors have been selected in order to approximate both those elements of risk. It is a procedure for ranking facilities in terms of the potential threat they pose..."

The HRS assigns three hazard mode scores to a site. These include: (1) a migration mode score that reflects the potential for harm to humans or the environment from migration of a hazardous substance by either ground water, surface water, or air pathways; (2) a fire/explosion score that reflects the potential for harm from substances that can explode or cause fires; and (3) a direct contact mode score that reflects the potential for harm from direct contact with hazardous substances at the site. The score for each mode is obtained by evaluating a series of factors that characterize the potential of the facility to cause harm. Each factor receives a numerical value according to a predetermined

scale; the factor values are weighted and combined to yield final scores according to set rules. The migration score was used by the USEPA in establishing the National Priorities List of facilities in the private sector for initial attention under CERCLA. The fire and explosion and direct contact mode scores are intended by the USEPA to identify facilities requiring emergency action.

The migration mode score is a composite of the separate scores for each of the three migration routes: groundwater, surface water, and air. Each migration route score is calculated by multiplying selected factors for route characteristics, containment, waste characteristics, and potentially affected targets to arrive at a value on a normalized 0 to 100 scale. The overall migration mode score is the root mean square of the three route scores, which emphasizes the highest scoring route, and is also on a 0 to 100 scale. Higher scores are expected to indicate a greater potential for problems. However, as suggested by the acknowledged limitations, the migration mode scores are useful principally for ranking sites for priority of follow-up actions and do not quantify risk.

The HRS is applied to the Mound landfill (category 1 area B--the site landfill), which has the potential to contain significant quantities of nonradiological hazardous substances (Table D.1.). The Mound landfill is discussed in Section V.A., Potential CERCLA Sites--Inactive or Former Disposal Facilities/Activities/Spills and Leaks. The Migration Mode Scores for the landfill is 13.

Table D.1. HRS Migration Mode Scores for Mound Site Landfill

FACILITY NAME: Mound -- Landfill

FIELD OFFICE: Dayton Area Office

EPA REGION: V / Chicago, IL

PERSON(S) IN CHARGE OF SITE: James A. Morley, Area Manager
U.S. Department of Energy

NAME OF REVIEWER: Robert W. Vocke DATE: December 20, 1985

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Landfilled wastes were enclosed in a clay liner with provisions for monitoring leachate. It is estimated that the landfill may contain 1,000 ft3 of hazardous substances (e.g., solvents, photoprocessing solutions, and plating bath solutions). Radioactive materials were not placed in the enclosure. No releases have been detected. Landfilled residuals do not pose potential problems for direct contact or fire and explosion and are not further evaluated for these parameters. [See Sec. V.A.1.a (category 1 area B), and Table V.1.]

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	12.85	0.00	12.85
Sgw =	22.22	0.00	22.22
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

Table D-1 (cont)

GROUNDWATER ROUTE WORKSHEET Site: Mound -- Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI-PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED RELEASE	0 45	0	1	0	45	3.1	No observed release (Friedman 1985, personal communication).
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2. ROUTE CHARACTERISTICS						3.2	
A. Depth to Aquifer of Concern	0 1 2 3	3	2	6	6		<20 ft (Dames and Moore 1976A, Figure 21 Piezometric Surface).
B. Net Precipitation	0 1 2 3	2	1	2	3		Approx 6" (USDOE 1979, page 2-61; USEPA 1984, page 13).
C. Permeability of the Unsaturated Zone	0 1 2 3	2	1	2	3		Thin phase glacial till (USDOE 1979, page 2-40, 2-43).
D. Physical State	0 1 2 3	3	1	3	3		Assumed to contain some liquid (Interviews 1985; Monsanto Research Corporation 1984, page 6-6).
TOTAL ROUTE CHARACTERISTICS SCORE				13	15		
3. CONTAINMENT	0 1 2 3	1	1	1	3	3.3	Clay liner and leachate collection system (Monsanto Research Corporation 1984; Section V, Figure V.3, page V-22).
4. WASTE CHARACTERISTICS						3.4	
Chemical							
A. Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed to include at least some persistent organic solvents; quantity assumed to be no more than 1,000 cubic ft (Interviews 1985).
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	2	1	2	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		No radioactive substances present (Interviews 1985).
B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				20	26		
RADIOACTIVE				0	26		
5. TARGETS						3.5	
A. Ground Water Use	0 1 2 3	3	3	9	9		Wells <3 mi (USDOE 1979, page 2-56, 2-60).
B. Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	40	1	40	40		Distance <2,000 ft (USDOE 1979, page 2-60). Population >10,000 (USDOE 1979, page 2-30).
TOTAL TARGETS SCORE				49	49		

6. CALCULATION

If Line 1 is 45, Multiply 1 x 4 x 5

If Line 1 is 0, Multiply 2 x 3 x 4 x 5

CHEMICAL	12740	57330
RADIOACTIVE	0	57330

7. NORMALIZATION

Divide Line 6 by 57330 and Multiply by 100

CHEMICAL Sgw =	22.22	100.00
RADIOACTIVE Sgw =	0.00	100.00
MAXIMUM Sgw =	22.22	100.00

NOTE: NE means not evaluated.

Table D-1 (cont)

SURFACE WATER ROUTE WORKSHEET Site: Mound -- Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI-PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release (Friedman 1985, personal communication).
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2. ROUTE CHARACTERISTICS						4.2	
A. Facility Slope and Intervening Terrain	0 1 2 3	3	1	3	3		Slope >8% (Monsanto Research Corporation 1984, Figure 6.0).
B. 1-yr. 24-hr. Rainfall	0 1 2 3	2	1	2	3		2.5" (USEPA 1984, page 33).
C. Distance to Nearest Surface Water	0 1 2 3	3	2	6	6		<1,000 ft [The Mound discharge is a perennial offsite stream (Friedman 1985, personal communication).]
D. Physical State	0 1 2 3	3	1	3	3		Assumed to contain some liquid (Interviews 1985; Monsanto Research Corporation 1984, page 6-6).
TOTAL ROUTE CHARACTERISTICS SCORE				14	15		
3. CONTAINMENT	0 1 2 3	0	1	0	3	4.3	Adequate landfill cover assumed from construction description (Monsanto Research Corporation 1985;
4. WASTE CHARACTERISTICS						4.4	Sec. V, Figure V.3, page V-22).
Chemical							
A. Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed to include at least some persistent organic solvents; quantity assumed to be no more than 1,000 cubic ft (Interviews 1985).
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	2	1	2	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		No radioactive substances present (Interviews 1985).
B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				20	26		
RADIOACTIVE				0	26		
5. TARGETS						4.5	
A. Surface Water Use	0 1 2 3	2	3	6	9		Recreation uses <3 mi (USDOE 1979, page 2-53).
B. Distance to Sensitive Environment	0 1 2 3	0	2	0	6		No wetlands or critical habitat (USDOE 1979, page 2-68).
C. Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 35 40	0	1	0	40		No population served having intake <3 mi (USDOE 1979, page 2-53).
TOTAL TARGETS SCORE				6	55		
6. CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7. NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Ssw =				0.00	100.00		NOTE: NE means not evaluated.
RADIOACTIVE Ssw =				0.00	100.00		
MAXIMUM Ssw =				0.00	100.00		

Table D-1 (cont)

AIR ROUTE WORK SHEET Site: Mound -- Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI-PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED RELEASE	0 45	NE	1	0	45	5.1	
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, the Sa = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2. WASTE CHARACTERISTICS						5.2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	NE	1	0	3		
B. Toxicity	0 1 2 3	NE	3	0	9		
C. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 2 5 8 12 16 20	NE	1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3. TARGETS							
A. Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	NE	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C. Land Use	0 1 2 3	NE	1	0	3		
TOTAL TARGETS SCORE				0	39		
4. CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5. NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Ground Water Route	(Sgw)	22.22	0.00	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		493.83	0.00	
Square Root of Sum		22.22	0.00	
TOTAL MIGRATION SCORE	(Sm)	12.85	0.00	Square Root of Sum Divided by 1.73

Table D-1 (cont)

DIRECT CONTACT WORKSHEET Site: Mound -- Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI-PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED INCIDENT	0 45	NE	1	0	45	8.1	
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2. ACCESSIBILITY	0 1 2 3	NE	1	0	3	8.2	
3. CONTAINMENT	0 15	NE	1	0	15	8.3	
4. WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	NE	5	0	15	8.4	
Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5. TARGETS							
A. Population Within a 1-Mile Radius	0 1 2 3 4 5	NE	4	0	20	8.5	
B. Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
TOTAL TARGETS SCORE				0	32		

6. CALCULATION

If Line 1 is 45, Multiply 1 x 4 x 5

If Line 1 is 0, Multiply 2 x 3 x 4 x 5

CHEMICAL	0	21600
RADIOACTIVE	0	21600

7. NORMALIZATION

Divide Line 6 by 21600 and Multiply by 100

CHEMICAL Sdc =	0.00	100.00
RADIOACTIVE Sdc =	0.00	100.00
MAXIMUM Sdc =	0.00	100.00

NOTE: NE means Not Evaluated.

Table D-1 (cont)

FIRE AND EXPLOSION WORKSHEET Site: Mound -- Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI-PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED RELEASE	1 3	NE	1	0	3	7.1	
2. WASTE CHARACTERISTICS						7.2	
A. Direct Evidence	0 3	NE	1	0	3		
B. Ignitability	0 1 2 3	NE	1	0	3		
C. Reactivity	0 1 2 3	NE	1	0	3		
D. Incompatibility	0 1 2 3	NE	1	0	3		
E. Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3. TARGETS						7.3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D. Land Use	0 1 2 3	NE	1	0	3		
E. Population Within 2-Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F. Buildings Within 2-Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4. CALCULATION							
Multiply 1 x 2 x 3							
		CHEMICAL		0	1440		
		RADIOACTIVE		0	1440		
5. NORMALIZATION							
Divide Line 4 by 1440 and Multiply by 100							
		CHEMICAL Sfe =		0.00	100.00		NOTE: NE means Not Evaluated.
		RADIOACTIVE Sfe =		0.00	100.00		
		MAXIMUM Sfe =		0.00	100.00		

APPENDIX E

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