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CONCEPTUAL DESIGN REPORT FOR THE ENGINEERED WASTE MANAGEMENT FACILITY VOL 2 OF 2 - (USED AS A REFERENCE IN OU1 FS REPORT APPENDIX G)

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Conceptual Design Report for the Engineered Waste Management Facility

Volume 2 of 2

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio

Doc. Control No.: 06CP03279201
DOE Contract No. DE-AC05-90OR21951
March 27, 1992
Revision No. 0

PARSONS

Fairfield Executive Center
6120 South Gilmore Road
Fairfield, Ohio 45014

PUBLIC ENVIRONMENTAL INFORMATION CENTER
% Westinghouse Mat'l. Co. of Ohio
P. O. Box 398704
Cincinnati, Ohio 45239-8704

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Conceptual Design Report
for the
Engineered Waste Management Facility
Fernald Environmental Management Project
Fernald, Ohio

APPROVED FOR ISSUE
Revision 0

Approved By:

R. Nixdorf, Engineering Manager, PARSONS	2.26.92 Date
S. D. Young, Project Manager, EWMF, PARSONS	2/24/92 Date
G. L. Krieger, Project Manager, EWMF, WEMCO	3/6/92 Date
J.P. Hopper, WEMCO	3/6/92 Date
R. Allen, Project Manager, EWMF, U.S. DOE/FEMP	3/13/92 Date
W.E. Pasko, U.S. DOE/FEMP	3/17/92 Date

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Engineered Waste Management Facility
Volume 2 of 2

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Chas. T. Main, Inc., and Ralph M. Parsons Co., 1990. Preconceptual Design Study - On-Site Low-level Waste Disposal Facility. Prepared for Westinghouse Materials Company of Ohio by Ralph M. Parsons Company and Chas. T. Main, Inc. December 1990.

Westinghouse Materials Company of Ohio, 1990. Conceptual Design Report - Above Ground Engineered Storage (AGES). April 2, 1990.

Note: Federal and State laws, executive orders, regulations, and industry codes and standards referred to in this document are listed in Section 4.

Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
AEA	Atomic Energy Act
AGES	Above-Ground Engineered Storage
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirement
ASCE	American Society of Chemical Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
AWS	American Welding Society
CDR	Conceptual Design Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMA	Crane Manufacturers Association of American
CRT	Cathode Ray Tube
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DOE	Department of Energy
EDF	Engineered Disposal Facility
EPA	United States Environmental Protection Agency
FCC	Federal Communications Commission
FMPC	Feed Materials Production Center
HIC	High Integrity Container
HLRW	High-Level Radioactive Waste
HVAC	Heating, Ventilating, and Air-Conditioning
HW	Hazardous Waste
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers

IES	Illumination Engineering Society
LCLDS	Leachate Collection/Leak Detection System
LLNL	Lawrence Livermore National Laboratory
LLRW	Low-Level Radioactive Waste
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MW	Mixed Waste
NC	Nonsafety Class
NEC	National Electric Code
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
OBE	Operating Basis Earthquake
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCI	Prestressed Concrete Institute
PEL	Permissible Exposure Limits
PTI	Post-Tensioning Institute
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SA	Safety Assessment
SC	Safety Class
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SSI	Soil Structure Interaction
TBC	To Be Considered
TRU	Transuranic Waste
UBC	Uniform Building Code
UPS	Uninterruptable Power Supplies

WMCO Westinghouse Materials Company of Ohio

SUMMARY OF REVISIONS

DATE	REVISION NO.	SUMMARY OF REVISION

SECTION 1

SYSTEM REQUIREMENTS

1.1 Introduction

Various types and quantities of waste are being generated as a result of the remediation of the Feed Materials Production Center (FMPC) in Fernald, Ohio. The remediation of the FMPC facility is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). One of the remedial alternatives for this generated waste is on-site disposal. To accommodate the disposal of these wastes on-site, the Department of Energy has requested that a Conceptual Design Report be prepared for an on-site disposal facility. This facility is known as the Engineered Disposal Facility (EDF).

The purpose of this document is to define the functional requirements for the EDF. The EDF is to be designed in accordance with Federal and State of Ohio regulatory requirements that are deemed to be Applicable, or Relevant and Appropriate Requirements (ARAR) (see Exhibit 1), DOE Orders, FMPC requirements, As Low As Reasonably Achievable (ALARA) principles, and appropriate design standards. Non-promulgated Federal or State advisories/criteria/guidance documents will also be considered during the design of the EDF. The United States Environmental Protection Agency (EPA) has identified several advisories/criteria/guidance documents as To-Be-Considered (TBC). The incorporation of TBC requirements into the EDF design is discretionary and may be subject to DOE/WMCO review/approval.

The EDF is to be located within the FMPC site boundary and provide a total disposal capacity of 2,400,000 cubic yards. This volume is based upon current estimates (see Exhibits 2 and 3) of the amount of waste to be generated during the remediation of Operable Units (OU) 1 to 5. The volume estimate does not account for any waste generated as a result of the decontamination and decommissioning of the production facilities. Therefore, the total disposal capacity requirements may change as additional information is obtained during the Remedial Investigation/Feasibility Study (RI/FS) currently being conducted at the FMPC. An increase or decrease in the projected waste volume may require modification of the design criteria contained in this report.

1.2 Performance Objectives

The primary performance objective of the EDF is to isolate the waste from the environment. As identified in DOE Order 5820.2A, Chapter III and 10 CFR 61, the specific performance objectives for the EDF are as follows:

1) Protect the general population from releases of radionuclides and other contaminants.

2) Protect individuals who may inadvertently intrude onto the site and come in contact with waste materials.

3) Protect site workers during operations.

4) Protect groundwater, surface water, soil, air, plants, animals, and other natural resources in accordance with Federal, State, and local requirements.

5) Ensure that the disposal site is stable after closure.

In order to meet the performance objectives and other regulatory requirements, the EDF will consist of several systems. These systems include a waste form, a containment structure and liner system, a leachate collection and leak detection system, and a final cover. Each system will contribute certain functions to the overall performance of the EDF. These systems are described in Section 2.3 and the functional requirements for each system are provided below.

1.2.1 Waste Form

The functional requirements of the waste form are the following:

1) Reducing the mobility and toxicity of hazardous and radioactive constituents
2) Preventing the formation of leachate
3) Preventing reaction with other systems (leachate collection, containment structures, liners)
4) Obtaining a stable form
5) Providing another protective barrier to contaminant dispersion if other systems fail
6) Facilitating handling
7) Helping ensure operator safety

8) Preventing releases during operation.

1.2.2 Containment Structure and Liner System

The functional requirements of the containment structure and liner system are the following:

1) Providing waste form containment
2) Providing structural support for other subsystems
3) Protecting waste forms from intruders
4) Isolating waste from natural catastrophes (earthquake, tornado, etc.)
5) Preventing releases during operation
6) Providing radiation shielding
7) Mitigating gas releases
8) Capturing any infiltrated water or generated leachate and directing it to the leachate collection system.

1.2.3 Leachate Collection/Leak Detection System

The functional requirements of the leachate collection/leak detection system are the following:

1) To collect any infiltrated water and any generated leachate.
2) To alert operator of liner system failure.

1.2.4 Final Cover

The functional requirements of the final cover are the following:

1) Minimizing rainfall contact with the waste
2) Preventing biosphere interaction with containment structure
3) Providing radiation shielding and to prevent radioactive releases
4) Protecting containment structure from natural catastrophes (earthquake, tornado, etc.)
5) Preventing intrusion into facility.

Upon filling of any portion of the disposal facility to capacity and prior to installation of the final cover, an interim closure may be installed. The functional requirements of this interim closure are the following:

1) minimize stormwater contact with waste
2) limit wind dispersal.

1.3 Waste Characterization

The EDF will be designed to accept the wastes to be generated as a result of the CERCLA removal and remedial actions of the FMPC. The total volume of processed waste requiring disposal at the EDF, including stabilization agents, has been estimated at 2.4 million cubic yards. A summary of this waste volume by operable unit is provided in Exhibit 2. A more detailed waste description is given in Exhibit 3. The waste is classified as either low-level radioactive waste, hazardous waste, or mixed waste. The majority of the waste is low-level radioactive waste with some mixed waste.

The waste will be suitably processed prior to disposal at the EDF to ensure that the waste acceptance criteria identified in Section 1.4 are met. The waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, and disposal. This characterization shall ensure that, upon generation and after processing, the actual physical and chemical characteristics and major radionuclide content are recorded and known during all stages of the waste management process.

Waste characterization data shall be recorded on a waste manifest, as required by DOE Order 5820.2A, Chapter III, and shall include the following information:

1) Physical and chemical characteristics of the waste
2) Volume of the waste (total of waste and any solidification or absorbent media)
3) Weight of the waste (total of waste and any solidification or absorbent media)
4) Quantity of each major radionuclide present
5) Other data necessary to demonstrate compliance with the waste acceptance criteria.

1.4 Waste Acceptance Criteria

This section identifies and provides definitions for the waste materials planned to be accepted at the EDF. The design of the EDF will be based upon the disposal of these acceptable waste materials.

The specific waste acceptance criteria for these acceptable waste materials are identified in Section 1.4.3.

Section 1.4.2 broadly identifies and provides definitions for the waste materials which are precluded from disposal at the EDF. The rationale for the preclusion is also identified. These unacceptable waste categories are also identified under the specific waste acceptance criteria (Section 1.4.3).

The EDF shall accept only low-level radioactive waste, byproduct material, hazardous waste, and mixed waste that is within the physical, chemical, and radioactive limits defined in this Section. The waste will be segregated to ensure that only acceptable waste materials are placed in EDF for disposal.

1.4.1 Waste Materials Acceptable for Disposal

Waste materials acceptable for disposal in the EDF are categorized as follows:

Low-Level Radioactive Waste (LLRW). LLRW is waste that contains radioactivity and is not classified as high-level waste, transuranic waste, byproduct material, or spent nuclear fuel, as defined by DOE Order 5820.2A. To accommodate LLRW, the EDF will be designed in accordance with Nuclear Regulatory Commission (NRC) regulations (10 CFR 61) for Class C waste, DOE Order 6430.1A Division 13, and DOE Order 5820.2A, Chapter III. This design will also allow the disposal of stabilized Class A waste and Class B waste.

Byproduct Material and Naturally Occurring and Accelerator Produced Radioactive Materials. Byproduct materials are defined under 10 CFR 40.4 and DOE Order 5820.2A as consisting of:

1) Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident of to the process of producing or utilizing special nuclear material. For purposes of determining the applicability of the Resource Conservation and Recovery Act to any radioactive waste, the term "any radioactive material" refers only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous waste component of the waste substance will be subject to regulation under the Resource Conservation and Recovery Act.

2) The tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Ore bodies depleted by uranium

solution extraction operations and which remain underground do not constitute "byproduct material."

DOE Order 5820.2A defines naturally occurring and accelerator produced radioactive materials as any radioactive material that can be considered naturally occurring and is not source, special nuclear, or byproduct material or that is produced in a charged particle accelerator.

DOE Order 5820.2A, Chapter IV allows small volumes of these wastes to be managed as low-level waste in accordance with DOE Order 5820.2A, Chapter III. Pursuant to the list of ARARs developed for the EDF, these waste streams are to be managed in accordance with 40 CFR 192.

Hazardous Waste (HW). HW is defined in Subpart D of 40 CFR 261 or is a waste that exhibits any of the hazardous waste characteristics identified in Subpart C of 40 CFR 261. Specific limitations of the type of HW acceptable for disposal will be described in a more detailed waste acceptance criteria section contained within the Conceptual Design Report (CDR). To accommodate HW, the EDF will be designed in accordance with EPA regulations (40 CFR 264 Subpart N) or more stringent Ohio EPA Regulations for landfills and DOE Order 6430.1A Division 13.

Mixed Waste (MW). MW is defined in DOE Order 5820.2A as waste that satisfies the definition of radioactive waste subject to the Atomic Energy Act (AEA) that also contains hazardous waste subject to RCRA. The EDF will be designed to handle any MW which contains a radioactive waste from either of the above two categories (i.e., LLRW and byproduct material) and a hazardous waste. To accommodate the disposal of MW, the EDF will be designed in accordance with EPA regulations (40 CFR 264, Subpart N) for landfills, NRC regulations (10 CFR 61) for Class C waste, 40 CFR 192 for byproduct materials, DOE Order 6430.1A, Chapter 13 and DOE Order 5820.2A, Chapters III and IV. This design will also allow the disposal of stabilized Class A mixed waste and Class B mixed waste.

1.4.2 Waste Materials Unacceptable for Disposal

The following types of waste shall not be accepted for disposal in the EDF:

High-Level Radioactive Waste (HLRW). HLRW is spent nuclear fuel or waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation. Spent nuclear fuel is defined in

DOE Order 5820.2A as fuel that has been withdrawn from a nuclear reactor following irradiation but that has not been reprocessed to remove its constituent elements. Pursuant to DOE Order 5820.2A Chapter II, the EDF will not be used for disposal of HLRW.

Transuranic Waste (TRU). TRU waste is defined by DOE Order 5820.2A as a waste that is contaminated with alpha-emitting transuranic radionuclides (e.g., element number greater than 92) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. In accordance with DOE Order 5820.2A, Chapter II, TRU waste shall be certified in compliance with the Waste Isolation Pilot Plant - Waste Acceptance Criteria, placed in interim storage (if required), and sent to the Waste Isolation Pilot Plant. An FMPC interim storage facility, if required, is not part of the EDF project.

Non-Hazardous and Non-Radioactive Solid Waste. These waste materials meet the definition of a solid waste as defined in Ohio Revised Code (ORC), Chapter 3734.01(E) (Ohio Solid and Hazardous Waste Disposal Law) and Ohio Administrative Code (OAC), Chapter 3745-27.01(xx) (Ohio Solid Waste Disposal Regulations). Since the FMPC is located above an aquifer designated as a Sole Source Aquifer, the disposal of nonhazardous/nonradioactive solid waste at the EDF is prohibited under OAC 3745-27-07(B)(5).

Off-Site and Non-CERCLA Waste. This waste includes waste which is generated off site (i.e., RMI Company Extrusion Plant) as well as on-site waste which is not part of the CERCLA response actions. These waste streams are not covered by the permitting exemption provided in CERCLA Section 121(e) and are therefore not acceptable for disposal at the EDF unless the appropriate federal, state, and local permits are obtained.

Greater than Class C Waste. Greater than Class C waste is LLRW, which does not meet the definition of a Class A, Class B, or Class C waste as defined in 10 CFR 61. Greater than Class C wastes are wastes which are not generally acceptable for near-surface disposal. The waste form and disposal methods must be different and, in general, more stringent than those requirements specific for Class C waste. Greater than Class C waste does not include uranium or thorium tailings/wastes (byproduct as defined in 10 CFR 40.4) in quantities greater than 10,000 kilograms and containing more than five millicuries of radium-226 (see 10 CFR 61.1). In the absence of specific requirements, 10 CFR 61.55(a)(2)(iv) requires that this waste be disposed of in a geologic repository unless a waiver is granted. Since the EDF will not be classified as a geological repository, Greater than Class C Waste is unacceptable.

1.4.3 Specific Waste Acceptance Criteria

In addition to the listed waste types, the wastes to be placed in the EDF must meet the following waste acceptance criteria prior to disposal. These waste acceptance criteria are based upon the requirements established pursuant to 10 CFR 61.56, 40 CFR 264 and to DOE Order 5820.2A Chapter III. Additional site specific acceptance criteria may be added in the future to accommodate disposal operations.

1) The waste material must be classified as an acceptable waste stream pursuant to Subsection 1.4.1 (i.e., LLRW, Byproduct Material, Naturally Occurring and Accelerator Produced Radioactive Materials, HW, or MW).

2) Wastes classified as unacceptable materials (see Subsection 1.4.2) can not be disposed in the EDF (i.e., HLRW, TRU waste, Non-hazardous/non-radioactive Solid Waste, Off-site and Non-CERCLA Waste, and Greater than Class C Waste).

3) Hazardous and mixed waste must comply with the land disposal treatment standards (40 CFR 268) which are invoked as ARARs.

4) Quantities/concentrations of specified radioisotopes in the waste shall meet limits established as a result of the site-specific performance assessment (DOE Order 5820.2A, Chapter III 3.e(a)).

5) Criticality will be controlled by limits on enrichment, quantity of fissile material, concentration of material, and geometry of disposed material (DOE Order 6430.1A Division 1300-4).

6) Waste packages will not exceed radiation dose rate criteria and surface contamination limits as specified in the FMPC Topical Manual FMPC-2084, Radiation Control Manual, Rev.5. Only packages with a surface dose rate of no more than 200 mrem/hr will be accepted (FMPC-2084).

7) Internal heat generation is not a concern with low-level waste and no cooling criteria are required (DOE Order 5820.2A, Chapter III 3.e(5)).

8) The waste must not generate harmful gases, vapors, or fumes in quantities resulting in occupational exposure above the limits identified in 10 CFR 20 (10 CFR 61.56(a)(5)).

9) The chemical and structural stability of the Class B and C waste packages will be such that radiation effects, chemical attacks, microbial activity, and moisture are within limits that shall be determined in the conceptual design phase (10 CFR 61.56(b)(1)).

10) Mixed waste consisting of bulk liquid is prohibited. Mixed solid waste shall not contain any free liquids as determined by the paint filter test. Mixed waste with free liquids can be disposed of in lab packs or specially designed containers. Adsorbents or other methods can be used to eliminate free liquids in a container prior to disposal. (This criterion does not exclude grout slurries, which set to a solid form with no free liquid) (40 CFR 264.314).

11) Liquid LLRW shall be solidified or packed with twice the amount of absorbent required. LLRW bulk solid waste (Class A, B, or C) shall contain less than 1 percent free liquid by volume. Stabilized Class B and C waste is to contain less than 0.5 percent free liquid by volume (10 CFR 61.56(a)(2), 61.56(a)(3), and 61.56(a)(4)).

12) Criteria for the acceptance of bases and acids will be established in the conceptual design phase (40 CFR 264.313).

13) All waste containing pyrophoric materials will be treated or packaged such that the waste is rendered nonflammable (10 CFR 61.56(a)(6) and 40 CFR 264.312).

14) All Class B and C waste forms or containers shall be structurally stable for at least 300 years (10 CFR 61.7(b)(2) and 61.56(b)(1).

15) Cardboard or fiberboard packages are not allowed for Class A, B, and C Waste (10 CFR 61.56(a)(1)).

16) Reactive wastes, explosive wastes, and containerized gases are prohibited (40 CFR 264.312(a)).

17) Ignitable hazardous and mixed waste materials may be placed in the EDF provided that they are placed in non-leaking containers, safely handled, covered daily with soil or other non-combustible materials, and isolated from potential sources of ignition (40 CFR 201.312(b)).

18) Precautions shall be taken to ensure that incompatible mixed wastes are not mixed together which could cause any of the conditions identified in 40 CFR 264.17(b) (40 CFR 264.313).

19) Waste containers must either be 90 percent full or have their volume minimized (shredding, crushing, or other means) prior to being placed into the EDF (40 CFR 264.315). The waste density must be maximized and the void space minimized within the waste container (10 CFR 61.56(b)(3)).

20) The disposal of hazardous wastes F020, F021, F022, F023, F026, and F027, if found at the FMPC, requires an EPA approved management plan (40 CFR 264.317).

21) Class A wastes are to be segregated from Class B and Class C wastes unless they meet the stability requirements listed in 10 CFR 61.56(b) and (10 CFR 61.7(b)(2) and 61.55(a)(2)).

22) Detailed chemical and physical analysis of a representative sample must be obtained prior to disposal of any waste. The frequency, sampling, and analytical procedures shall follow those specified in the Waste Analysis Plan to be prepared at a later date (DOE Order 5820.2A, Chapter III 3.d).

23) Hazardous, biological, pathogenic, and infectious wastes, if found at the FMPC, are to be treated to minimize their hazards (10 CFR 61.56(a)(8)).

24) LLRW must be placed in appropriate disposal containers as specified in Section 2.3.1, which are properly labeled (10 CFR 61.57).

1.5 Major Assumptions

The following are assumed in the design of the EDF:

1) The design of the on-site disposal facility is based upon the vault technology as specified in the "Preconceptual Design Study - On-Site Low-Level Waste Disposal Facility" (MAIN 1990). Refer to Section 2.1 for more information on the selection of this concept.

2) The EDF vaults are intended to be permanent waste disposal facilities. Retrieval of waste from these vaults is a secondary consideration. The vaults will be designed to preserve the option of retrieval. Design of retrieval operations is not within the scope of the current project.

3) As an on-site response action pursuant to CERCLA Section 121(e)(1), the EDF will not require any licenses or permits. However, under the DOE/EPA Consent Agreement, the EDF will

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satisfy any NRC licensing requirements or US EPA/Ohio EPA Permitting Requirements which are identified by the EPA as an ARAR.

4) Sorting, segregating, and treatment of waste materials will be performed by the waste generators. Waste will be sampled and classified as necessary; only verification surveys, not assays, will be required at the EDF.

5) EDF support facilities will be housed in an existing FMPC building. If no suitable existing building can be identified, dedicated buildings will be designed.

6) The waste volumes and classifications presented in Exhibits 2 and 3 form the basis for the design of the EDF. The EDF will be designed to accommodate up to 2.4 million cubic yards of low-level radioactive Class C Waste, hazardous waste, and mixed waste. This volume does not include any waste generated from decontamination and decommissioning of the FMPC production areas. The waste volumes and classifications presented in Exhibits 2 and 3 may change as additional information is generated in the future. The EDF design impacts resulting from these changes will be assessed as the additional information is generated.

7) The EDF design, by complying with identified ARARs, is adequate to protect human health and the environment. This assumption will be verified in a Safety Analysis Report.

8) The EDF will be classified as a Moderate Hazard Nuclear Facility with no process hazards. This assumption will be verified by the Safety Analysis.

9) Leachate removal equipment will be portable/removable.

10) Construction of the disposal vaults will be in nonregulated areas.

11) The preliminary site selected (Exhibit 7) will meet siting criteria. This assumption will be verified by the Site Characterization and Selection Report.

12) Only on-site waste generated from the CERCLA response actions will be accepted at the EDF. Acceptance of RMI waste will require revision of the project scope.

13) The containment structure's design life will be 300 years. Regulatory requirements for design life of the system components are defined in Section 3.1.2.

14) The EDF will be designed to meet the criteria established in 10 CFR 61 for Class C waste.

SECTION 2

DISPOSAL FACILITY DESCRIPTION

2.1 Description of Alternative Concepts

Preconceptual designs were developed for three alternative disposal facility designs (Exhibits 4, 5, and 6). These designs varied the configuration of the principal elements of disposal systems but contained similar approaches to the disposal of the FMPC wastes. A brief description of the three alternate designs is found in the following sections.

2.1.1 Tumulus

The aboveground waste tumulus (Exhibit 6) consists of a facility with bottom double liner with leachate collection/leak detection system constructed at grade, bulk waste deposited above this liner system, and a final cover covering the waste (ASI 1989).

2.1.2 Aboveground Engineered Storage (AGES)

The AGES (Exhibit 5) design consists of a bottom double liner with leachate collection/leak detection, a concrete pad with curb, stacked concrete modules with internal liners for waste containment, and a final cover (WMCO 1990).

2.1.3 Disposal Vault

The disposal vault (Exhibit 4) design consists of a reinforced concrete structure with an internal double liner with leachate collection/leak detection, a concrete roof, bulk or containerized waste disposal above the liner system, and a final cover (MAIN 1990).

2.2 Selected Design Concept

The disposal vault was selected as the reference design concept for the purposes of this document. The vault design has several inherent advantageous features. These features include the following:

1) The massive concrete structure of the vault provides high structural integrity and an additional barrier against the infiltration of water and the release of contaminants.

2) The vault structure protects the waste from contact with stormwater while the vault is being filled.

3) The compartmental nature of vaults allows individual cells to be sealed as soon as they are filled, protecting workers filling adjacent cells from exposure.

4) The vault provides greater flexibility in the nature of waste accepted at the EDF. Unusual shapes and sizes of waste material (e.g., large pieces of contaminated equipment) may be placed in vaults without compromising structural integrity.

5) There is a relatively large amount of experience in the design, construction, and operation of vaults for LLW disposal. Vaults are in use for LLW disposal at the Hanford and Savannah River DOE reservations, and many of the state compacts for LLW disposal are developing designs based on the vault concept.

As a part of the conceptual design process, a study shall be conducted to optimize the design of the disposal facility. The trade-offs between the performance of the disposal facilities and associated cost shall be considered. The design of other similar facilities (both DOE and private) will also be identified as part of the optimization study. The design alternative for the disposal facility will be selected by the DOE.

2.3 EDF Design

The functional requirements for the EDF are based upon FMPC requirements, DOE Orders, federal and State of Ohio regulatory requirements that are deemed to be an ARAR, ALARA principles, and appropriate design standards. Non-promulgated federal or state advisories/criteria/guidance documents will also be considered during the design of the EDF and incorporated as appropriate.

The EPA has identified several advisories/criteria/guidance documents as a To-Be-Considered (TBC). The incorporation of any TBC requirements into the EDF design is discretionary and may be subject to DOE/WMCO review/approval.

The EDF shall be located within the FMPC site boundary at a location to be determined. Exhibit 7 shows a possible location. The EDF shall be sized to handle 2.4 million cubic yards of waste materials. The final size will be determined by the waste characterization studies and the results of the RI/FS process.

As described in Section 2.2, the vault design (Exhibit 4) was selected as the basis for this report. The vault design consists of reinforced concrete, on-grade containment vaults with internal leachate collection and leak detection systems. Waste placed in the vaults will be low-level radioactive waste, byproduct material, hazardous waste, or mixed waste. At closure, a multilayer final cover will be constructed over these vaults. Please see the following sections relating to the specific components for references to the regulations regarding those components. An existing FMPC building will provide a location for instrumentation control panels, office facilities for operators, and storage space for equipment. Building 56, the CP storage warehouse on the north side of the FMPC, and Building 77, the finished product warehouse on the west side, are examples of buildings that are in appropriate locations for the EDF support facilities. The major systems of the EDF are discussed in the following sections.

2.3.1 Waste Form

The waste emplaced in the vaults will be generated by removal and remedial actions associated with the operable units at the FMPC. The waste will be analyzed for chemical constituent concentrations and radionuclide activity by the waste generators in accordance with the waste acceptance criteria given in Section 1.4. Based on available RI/FS data, potential sources of waste that may be placed in the vault are identified in Exhibit 3.

The waste will be treated as required to meet the waste acceptance criteria (see Section 1.4) and be placed into the disposal as either a discrete waste container, a solidified slab, or a grout slurry which will solidify as a monolith within the disposal vault.

Waste containers are pre-manufactured containers in which waste materials will be placed. Waste materials or other additives may be used to fill the waste container in order to achieve the above

specified regulatory requirements. The waste containerization operations will occur at the treatment facility and are therefore not part of the EDF project.

Slabs are blocks of solidified waste. Solidification agents are added to the liquid, semi-solids, and sludge wastes to form a grout slurry. This grout slurry is poured/pumped into forms to allow the grout to solidify into a block. Upon curing, the slab is transported to the EDF for disposal. The solidification and curing operations will occur at the treatment facility and are therefore not part of the EDF project. The waste containers and/or slabs shall be of a size and shape that can be readily transported, handled, and stacked by currently available conventional equipment. The EDF project will provide materials handling equipment and roads that are required to transport the waste containers and/or slabs from the treatment facility to the disposal vaults.

In addition to or in lieu of the slabs, the grout slurry may be pumped directly from the treatment facility to the EDF where the grout slurry will solidify as a monolith in the disposal vaults. The EDF project will provide the pumping station(s), transfer pipe, and ancillary equipment required to transfer the grout slurry from the treatment facility to the disposal vault. The disposal vault design shall also include provisions to allow disposal of the grout slurry.

2.3.2 Containment Structure

The vault system as described in the preconceptual design study (MAIN 1990) consists of multiple vaults (Exhibit 7). The size and number of vaults will be based on the total required disposal capacity of 2.4 million cubic yards. Each vault is divided into several independently constructed cells of approximately equal size. These cells provide the fundamental containment structure for the waste. Either a portion of the wall is left open for containerized waste emplacement or a portion of the roof is left open for grout slurry emplacement. Cells are separated from adjacent cells by concrete walls. The vault structure rests on a concrete slab which slopes toward a drain.

During operations, precipitation is prevented from entering the disposal cell by a permanent concrete or temporary roof. The temporary roof may consist of corrugated sheet metal supported by a truss structure, a fabric cover, or other suitable structure. Upon completion of disposal operations, the temporary roof is replaced with a permanent concrete roof. The concrete roof deck rests on bridge beams constructed across the narrow dimension of the cells. The roof is sloped to allow water runoff.

2.3.3 Liner System

As required by 40 CFR 264.301, the EDF shall contain a double liner system with a leachate collection and a leak detection system. This section describes the requirements for the liner system and Section 2.3.4 describes the leachate collection and leak detection system.

The double liner system shall consist of a top and bottom liner. The liners are to be constructed of materials that prevent the migration of any waste constituent into the top liner and through the bottom liner for a time period equal to the sum of the disposal operations and post-closure care period. The liners are to be chemically resistant to physical contact with the waste and leachate as well as to exposure to sun/elements to prevent failure. 40 CFR 264.301 allows the bottom liner to consist of a recompacted clay layer (minimum of 3 feet thick) which has a permeability no greater than 1×10^{-7} cm/sec.

The installation of the liner system is to be inspected in accordance with the provisions specified in 40 CFR 264.303(a). Synthetic liners (including final cover systems) must be inspected for uniformity, damage, imperfections, seam/joint tightness, tears, punctures, and blisters during installation of the liners. Soil-based/admixed liners (including final cover systems) must be inspected for uniformity, damage, imperfections, lenses, cracks, channels, root holes, and other structural non-uniformities (that may increase the permeability of the liner) during installation of the liners.

The liners shall have sufficient thickness and strength to prevent failure due to pressure gradients (internal static head and external hydraulic forces), climatic conditions, installation stresses, and daily operational stresses. The liners are to be placed upon a suitable foundation or base which adequately supports the liner system and does not fail due to pressure gradients (compression or uplift), or settlement.

2.3.4 Leachate Collection/Leak Detection System

Each cell will be equipped with a leachate collection/leak detection system (LCLDS). The LCLDS consists of a double liner system at the bottom of each cell, a base for protecting the double liner system, leachate collection system for containing and collecting leachate, and leak detection system for monitoring performance of the primary liner. Appropriate level monitors for both the leachate collection and leak detection systems will send a signal to the EDF support facility when leachate is encountered. Liners are sloped to a centralized sump to facilitate leachate collection and leak detection.

As required by 40 CFR 264.301(a), the leachate collection and leak detection systems are to be designed to maintain ≤1 foot of leachate over the lowest point of the bottom liner and to operate without clogging. The materials used for the leachate collection and leak detection systems are to have sufficient strengths to prevent collapse due to loads imposed by the waste materials and final cover, or the movement of operating equipment. The materials used for the leachate collection and leak detection systems are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure.

To allow accumulation and detection of leachate within the LCLDS, a sump/tank shall be provided. The storage capacity shall be sized to achieve efficient operation of the leachate detection and removal systems. The storage must also consider the requirement to maintain ≤1 foot of leachate over the lowest point of the bottom liner. In additional to the sump/tank used for the LCLDS, centralized storage tanks may also be provided to facilitate the management of leachate. The sump/tank systems shall be designed in accordance with the EPA regulations (40 CFR 264 Subpart J) for hazardous waste storage tanks.

2.3.5 Interim Closure

Upon filling of any disposal vault to capacity, interim closure will be performed which will consist of removal of all temporary structures, completion of the leak detection and leachate collection system, and sealing all vault openings. Interim closure must be completed within 180 days (unless an alternate time period is approved by EPA) after reaching final capacity per 40 CFR 264, Subpart G. The current project shall provide all designs and procedures necessary to seal the structures.

2.3.6 Final Cover

Upon completion of waste emplacement in the vaults, a multilayer, low permeability final cover will be placed over the vault with appropriate drainage controls. The cover will consist of compacted backfill over and around the vaults, a layer with permeability equal to or less than the bottom liner system, a drainage layer, and a topsoil cover. In accordance with 40 CFR 264.310, the final cover must (1) minimize infiltration; (2) require minimal maintenance; (3) be sloped to promote drainage, minimize ponding, and minimize erosion/abrasion; (4) accommodate settling/subsidence; (5) provide long-term isolation, and resist degradation by geological processes and biotic activity. The final cover is to have a permeability less than or equal to the bottom liner per 40 CFR 264.310(a)(5). For radioactive Class C waste disposal, 10 CFR 61 requires that the final cover system is to be either:

(1) ≥5 meters thick or (2) have an intruder barrier with a 500-year operating life. Access facilities to the leachate collection and leachate detection systems will be extended to grade.

Final closure of the vaults shall be completed within 180 days (unless an alternate time period is approved by the EPA) after receipt of the final waste volume per 40 CFR 264, Subpart G.

Provisions shall be included in the operating plans to monitor the LCLDs and to remove accumulated water from the LCLDs after final closure during the institutional period. The operating plans shall specify that the leachate collection sumps and leachate detection piping will be sealed at the end of the institutional period or, alternatively, the institutional period will be extended.

2.4 EDF Operation

Phased construction of the EDF shall be based on the expected rate of waste generation from remediation of the operable units. Each vault shall be constructed complete with base pad, walls, roof, liner, and leachate collection/leak detection systems. Portions of the longitudinal exterior wall (including leachate collection/leak detection system, if required) or roof shall be left uncompleted to allow waste emplacement in each individual cell. A road along the open longitudinal wall between adjacent vaults will provide access for placing waste in cells. Cells shall be equipped with appropriate materials handling equipment in accordance with operating plans. These operating plans are to be developed later.

Waste in solid form shall be received in waste containers approved by EDF Operations. In addition, stabilized waste in the form of slabs and waste in the form of grout slurry that will set into a solid mass may also be accepted at the EDF. Waste intended for disposal in the EDF shall be received in a scheduled manner. Waste generators shall obtain permission from EDF Operations prior to shipment of any waste to the EDF. The scheduling of shipments shall allow EDF Operations to insure the availability of unloading/disposal equipment and other resources.

Prior to containerization or shipment, each waste generator/shipper shall assure that the waste meets the waste acceptance criteria. Noncontainerized shipments of irregular size and shape will be discouraged and will only be received at the EDF with prior approval by EDF Operations.

Prior to emplacement of waste into the disposal vaults, each waste container or bulk component and associated radiological survey and analytical information shall be reviewed by personnel from EDF Operations. EDF Operations personnel shall also verify that the waste material was suitably prepared

by the waste generator for emplacement in the EDF. The verification process shall include periodic auditing of the waste generators waste segregation procedures.

Any shipment received in an improperly prepared container, containing unacceptable waste material, or waste with unacceptable radiological survey or analytical results shall not be accepted at the EDF. EDF Operations shall conduct a radiological survey on random containers, components, or lots of bulk material on receipt to verify the radiation dose rate provided by the waste generators.

Each container/component will be positioned within the disposal vaults in a manner to maximize the utilization of the disposal capacity. The design agency, with input from the DOE/FMPC, will provide a plan for the emplacement of waste in each vault such that the useful disposal capacity of each vault shall be maximized.

Waste containers and slabs will be placed into the vaults using a fork lift or an overhead mobile gantry crane. In all cases, the methods and procedures for emplacing the materials shall be performed in a manner to minimize the radiation exposure to the operating personnel.

Waste that is stabilized by the addition of cement, fly ash, or other admixtures and is in the form of grout slurry will be pumped directly from the waste processing area to the EDF. This grout slurry will set into a solid form inside the vault.

After a cell is filled with waste, the missing wall (including leachate collection/leak detection system if required), or roof section will be closed (interim closure) with concrete. A waste disposal inventory for each vault will be recorded and maintained in accordance with operating plans.

When all the vaults are completely filled, the final cover shall be installed, access to the leachate collection/leak detection systems shall be extended to final grade, and additional systems shall be provided to control stormwater.

Air and groundwater will be sampled and monitored at the perimeter of the facility prior to construction, during construction and operation, and during the institutional control period.

2.5 Periods of Operation and Performance

The identified ARARs impose specific periods of operation and performance effectiveness on the EDF. For the purposes of clarity, these periods of operation may be summarized as follows:

1) The operations period is the time required to construct and fill all the vaults. This period is estimated to be about 30 years.

2) The closure period is the time required to install the final cover. The closure period starts upon receipt of the final waste volume and is not to extend longer than 180 days unless an alternate time period is approved by the EPA, per 40 CFR 264.113(b).

3) The stabilization period is the time after completion of closure during which the disposal site is to be stabilized (i.e., vegetative cover established, repair of erosion or subsidence). The stabilization period is to last a minimum of five (5) years after closure, per 10 CFR 61.29.

4) The institutional period is the time during which institutional controls continue to function on the EDF. During this time, the vaults and cover are maintained as needed, and the leachate collection/leak detection and environmental monitoring systems are operated. The EPA regulations (40 CFR 264.117) require that the post-closure period (combination of the stabilization and institutional periods) last for at least 30 years following completion of final closure. NRC regulations (10 CFR 61.59) state that the institutional period cannot be relied on for a period greater than 100 years. Based upon these two regulatory requirements, it is envisioned that the institutional period will be required to last between 25 and 100 years (10 CFR 61.59 and 40 CFR 264.117).

5) The performance period is the time after the end of the 100-year institutional period when all institutional controls are assumed to be lost. The vaults, cover, and LCLDS are no longer maintained, and all records of the existence of the EDF which might protect the site from other use are assumed to be lost. During this time, the final cover must protect the EDF from intrusion, and the liners must continue to isolate the waste to the extent possible. This period lasts at least 200 years after final closure, and may extend as long as 1,000 years (see Section 3.1.2), per 40 CFR 192.02.

SECTION 3

DESIGN CONSIDERATIONS

This section identifies design considerations for the following:

1) General design requirements
2) Safety
3) Quality Assurance
4) Environmental requirements
5) Mechanical design
6) Civil/structural design
7) Electrical design
8) Process design
9) Instrumentation/control design
10) Fire protection.

3.1 General Design Requirements

3.1.1 Hours of Operation

The EDF will operate three shifts per day, five days a week, as needed to accommodate the rate of waste generation. Operations can occur simultaneously in different vaults. The extent of the simultaneous operations may be limited by the availability of materials handling equipment, disposal capacity, and/or the availability of trained operators. Facilities to allow routine night operations are to be provided by this project.

3.1.2 Design Life

The waste container and/or waste form used for the disposal of Class B or C radioactive waste must maintain its gross physical properties and identity for at least 300 years as required by 10 CFR 61.7(b)(2). Where appropriate, a NRC approved High Integrity Container (HIC) will be used for the disposal of Class B and C waste.

The site characteristics (e.g., groundwater level, flow paths, soil properties, etc.) of the EDF are to considered in terms of the indefinite future and evaluated for at least a 500-year-period, as required by 10 CFR 61.7(a)(2). The transport modelling of the waste constituents within the groundwater will be evaluated as part of the Safety Analysis Report.

Within five years of closure, the disposal site is to be stabilized (i.e., vegetative cover established, no occurrence of erosion or subsidence) per 10 CFR 61.29 so that only minor maintenance is required. Institutional controls (i.e., post-closure monitoring, periodic surveillance, minor maintenance, and access controls) are required for a minimum of 25 years and up to 100 years after the 5-year stabilization period, per 40 CFR 264.117 and 10 CFR 61.59(b), respectively. The specific requirements and duration for this institutional period are to be identified as part of the Remedial Design/Remedial Action (RD/RA) Work Plan. The RD/RA Work Plan is subject to EPA approval pursuant to the DOE/EPA Consent Agreement Section XI.

Allowances for the replacement of monitoring equipment and access controls are not covered by this project. A conceptual maintenance plan will be provided by the design agency. The estimated design life of specific equipment which may need to be replaced during this institutional control period is also to be provided. Provisions for the actual replacement of this equipment will be identified and implemented by the custodian responsible for post-closure care. A recommended replacement schedule for the monitoring systems is provided in Paragraph 3.9.2.5.

The disposal of Class C waste requires that either 5 meters of final cover or an intruder barrier is installed over the waste material. The intruder barrier is to be designed for a 500-year service life, as required by 10 CFR 61.52(a)(2).

EPA considers 40 CFR 192 to be applicable to the material in the K-65 silos. Uranium mill tailings disposal sites are to be effective for a minimum of 200 years and, to the extent reasonably achievable, up to 1,000 years, as required by 40 CFR 192.02(a).

3.1.2.1 Continuation of Services Following FMPC Decommissioning

It is likely that the FMPC will be decommissioned during some period of operations of the EDF. Therefore, provisions shall be made for all utilities and services provided by the FMPC and required during the institutional control period of the EDF to continue following decommissioning of the FMPC. These utilities and services include power, water, sewer, communications, the EDF support facility, parking, and maintenance facilities.

3.1.3 Range of Operations

The EDF shall be designed for the disposal of low-level radioactive waste materials, byproduct materials, hazardous waste, and mixed waste. Waste emplacement will be either through pumping of a slurry or mechanically placing containerized waste or preformed waste slabs into a vault.

3.1.4 Total System Response Time and Error Allowance

The leak detection system for secondary containment of hazardous waste tanks shall have a response time of less than or equal to 24 hours per 40 CFR 264.193(c)(3). The system for removal of liquid from secondary containment of hazardous waste tanks shall have a response time of less than or equal to 24 hours per 40 CFR 264.193(c)(4). The LC/LDS sumps are considered to be tanks under regulation. The leachate collection system shall be designed so that no more than one foot of liquid can accumulate upon the lowest point of the liner system, as required by 40 CFR 264.301(a)(2). Any radiation monitoring equipment shall provide continuous measurement.

3.1.5 Failure Analysis/Failure Mode

Failure analyses and modes shall be evaluated in the Safety Assessment to be performed during conceptual design.

3.1.6 Facility Security Levels

The facility shall be a Property Protected Area in accordance with DOE Order 5632.2. Security fencing requirements are identified in Section 3.6.1.1.

3.1.7 Security Threats

Security threats shall be handled in accordance with FMPC site procedures.

3.1.8 Assembly and Disassembly

Instruments and equipment shall be designed to facilitate assembly and disassembly as required for routine maintenance and replacement.

3.1.9 Repair and Replacement

Instruments and equipment with design lives less than the institutional period shall be repaired and replaced according to a schedule in operating plans. If required, by-pass connections shall be provided to facilitate changeouts. Provisions for the repair and replacement of instruments and equipment will be identified and supplied by the custodian responsible for post-closure care of the EDF.

3.1.10 Waste Generation, Treatment, and Disposal

The design agency shall consider design alternatives and recommend construction practices that will minimize the quantity of waste materials generated during construction of the EDF.

All materials received for emplacement in the vaults shall be prepared for disposal by the generator/shipper. Handling of waste materials during the activities to emplace the materials in the vaults shall be performed using approved EDF procedures and equipment.

During operation and closure of the EDF, all stormwater (contact and noncontact) falling within the EDF boundaries will be collected and treated prior to discharge to the surface water. Stormwater treatment will be provided at the Advance Wastewater Treatment facility (when built). The discharge will need to comply with the requirements identified in Section 3.4.2.5.

Water collected in the leachate collection sumps shall be sampled. The accumulated water will be removed from the leachate collection sump by a portable pump. The water will be pumped into a portable tank and transported to the appropriate location for disposal. The disposal alternatives (i.e., discharge to the environment, on-site treatment and off-site treatment) will be considered in the design of the EDF. The selected alternative must be available during the operational, closure, and institutional control periods.

3.1.11 Maintenance (Accessibility)

The design agency shall provide a conceptual maintenance plan for inspecting and repairing interior walls, floor, and ceilings, as applicable, of the vaults prior to interim closure. The design agency shall also provide a conceptual maintenance plan for inspecting and repairing instruments and equipment throughout the operational and institutional period. Prior to final closure, the exterior

walls and roof of the vaults shall be inspected and repaired as defined in the conceptual maintenance plan. The design agency shall provide a conceptual plan for maintaining the final cover during the institutional control period.

3.1.12 Decontamination and Decommissioning

As a permanent disposal facility that will not be decommissioned, the EDF will not require a Decommissioning Project Plan as specified in DOE 5820.2A, Chapter V. However, there will be a potential for contamination of equipment during the operational phase of the facility. Provisions shall be made to facilitate decontamination of waste handling equipment. All temporary EDF structures/buildings will be decontaminated and decommissioned upon final closure of the EDF.

Contamination of the outer surface of the vaults during operation due to accidental spillage of a waste container or by fugitive radioactive emissions will be removed using existing FMPC procedures.

3.1.13 Chemistry (Including Sampling and Analysis)

FMPC or subcontractor laboratory facilities will be used for chemical and radiological analyses. Existing equipment and procedures will be used for sampling the waste materials and leachate. All sampling and analysis shall be performed under the QAPP existing at the time of the action.

3.1.14 Compatibility with Existing Equipment

The procedures provided for the construction and operation procedures for the EDF shall be compatible with the existing FMPC facilities within the plant required to support the EDF.

3.1.15 Utility Requirements

3.1.15.1 Steam

The EDF construction and disposal operations do not require steam.

3.1.15.2 Cooling Water

The EDF construction and disposal operations do not require cooling water.

3.1.15.3 Process Water

The supply of any process water required during construction shall be considered in the design of the EDF. The EDF disposal operations do not require process water.

3.1.15.4 Domestic Water

Domestic water will be provided at the EDF support facilities (existing).

3.1.15.5 Fire Water

The waste acceptance criteria establishes specific requirements to control the disposal of flammable materials; therefore, extension of the existing fire water system will not be provided during the construction and operational phases of the facility. Fire protection for waste handling equipment shall be provided by portable extinguishers, as required by the fire protection design analysis.

3.1.15.6 Refrigeration

Facilities required for the supply and distribution of any refrigeration for maintaining concrete curing temperature during construction shall be considered in the design of the EDF. The EDF disposal operations do not require refrigeration facilities.

3.1.15.7 Compressed Air

The supply and distribution of compressed air required for construction of the EDF shall be considered. The EDF disposal operations do not require any compressed air.

3.1.15.8 Instrument Air

The EDF construction and disposal operations do not require any instrument air. All instrumentation will be electronic.

3.1.15.9 Breathing Air

Breathing air is not required during normal EDF operations. Breathing air, if required during emergency operations or after an accidental dumping of a container, shall be provided from an approved portable air supply using established FMPC procedures.

3.1.15.10 Inert Gases

The EDF disposal operations do not require inert gases. Any inert gases required for construction will be supplied by the Construction Contractor.

3.1.16 Consumable Requirements

3.1.16.1 Raw Materials

Raw materials required for the construction of the EDF shall be supplied by the construction contractor. Clean materials generated by decommissioning of the FMPC should be considered for use in construction of the EDF where appropriate.

3.1.16.2 Supplies

Construction materials shall be supplied by the construction contractor. Clean materials generated by FMPC decommissioning should be considered where appropriate. A lay-down area for supplies and temporary construction facilities shall be provided.

The supplies for waste containers and materials required for waste treatment shall be provided by the waste generators.

3.1.16.3 Lubricants

Lubricants for the handling equipment shall be in accordance with the manufacturer's recommendations and shall be specified as part of the operation/maintenance plan. Lubricant storage and equipment maintenance shall be conducted at existing FMPC service buildings.

3.1.17 Personnel Services

Any additional personnel services will be provided at the EDF support facility to be located within an existing building. Existing facilities at the ES&H building will also be utilized.

3.1.18 Temporary Construction Facilities

Construction areas shall be considered "clean" areas. Temporary parking areas for the construction personnel and a lay-down area for construction materials shall be provided in the clean area.

Temporary fences shall be provided to isolate the construction area from other ongoing remedial operations as well as to provide security for the construction site. The location of these temporary fences shall not interfere with normal operations in areas adjacent to the construction site. The location of all temporary fences and gates shall conform with FMPC security requirements.

An area for placing excess and borrow excavated soil shall be provided. Provisions shall be made to minimize erosion of the soil into ditches and drainage facilities in the adjacent areas.

Temporary roadways for construction vehicles and equipment shall be provided to allow access to the parking and lay-down areas via a "clean" route. Temporary roadways within the construction and borrow pile storage area shall also be provided. The location of temporary roads shall conform with FMPC security requirements.

3.1.19 Interface Points with Existing Facilities

Domestic water, offices, showers, sanitary facilities, and equipment storage facilities shall be provided in the EDF support facility located within existing FMPC buildings. Each of the new disposal vaults shall be a "stand-alone" facility and will not be directly connected to any other structure in the EDF.

Roadways and surface water drainage facilities furnished by this project shall be compatible with the respective facilities provided by other phases of the remediation effort.

Maintenance on the EDF materials handling equipment will be provided at existing FMPC facilities.

It is likely that the FMPC will be decommissioned during some period of operations of the EDF. Therefore, provisions shall be made for all utilities and services provided by the FMPC and required during the institutional control period of the EDF to continue following decommissioning of the FMPC. These utilities and services include power, water, sewer, communications, the EDF support facility, parking, and maintenance facilities.

3.1.20 Provisions for Future Expansion

Future expansion of the EDF is not considered at this time. Any additional capacity required shall be defined pursuant to future projects.

3.2 Safety

A Safety Assessment (SA) shall be performed for the EDF during the conceptual design phase in order to determine the hazard classification of the facility. The SA shall be performed in accordance with the FMPC Guidelines for the Preparation of Safety Assessments SP-A-01-13 and DOE Orders 5480.5, 5481.1B, 6430.1A, and 4700.1.

For the purposes of the conceptual design activities, including the development of this document, the EDF shall be assumed to be a Moderate Hazard facility as defined in DOE 5481.1B, Chapter II.

A Health and Safety Plan is not needed during the conceptual design phase; however, a Health and Safety Plan for the construction of the EDF is required and shall be consistent with 29 CFR 1910 and DOE/FMPC requirements. The construction of the EDF shall comply with applicable OSHA requirements contained in Title 29 of the CFR.

3.2.1 Components, Systems, and Structures Classifications

As a special facility per DOE Order 6430.1A, the components, systems, and structures of the EDF shall be classified by safety considerations, seismic concerns, and quality assurance requirements. The safety and seismic classifications are described in the following subsections. The quality assurance classification requirements are specified in Section 3.3.

3.2.1.1 Safety Classifications

Components, systems, and structures shall be classified as Safety Class (SC) if their failure may adversely affect the environment, safety, and health by causing or failing to mitigate an uncontrolled release of radioactivity with potential radiological consequences in excess of the radiation protection guidelines in the 5400 series of DOE Orders (see Section 4.2). Specifically, Safety Class items are those systems, components, and structures with the following characteristics:

1) Those whose failure would produce consequences that would exceed the guidelines in DOE Order 6430.1A, Section 1300-1.4, at the site boundary or nearest point of public access
2) Those required to maintain operating parameters within the safety limits specified in the Operational Safety Requirements (OSR) during normal operations and anticipated operational occurrences
3) Those required for nuclear criticality safety
4) Those required to monitor the release of radioactive materials to the environment during and after a Design Basis Accident (DBA)
5) Those required to achieve and maintain the facility in a safe shutdown condition
6) Those that monitor or control the Safety Class items described above.

A list of proposed Safety Class items shall be provided during the conceptual design of the EDF. Safety Class items shall be subject to appropriately higher-quality design, fabrication, and industrial test standards and codes to increase the reliability of the item and to allow credit to be taken for its capabilities in the safety analyses. Safety Class items shall be designed in accordance with DOE Order 6430.1A, Section 1300-3.3.

Other components, systems, and structures shall be classified as Nonsafety Class (NC) if their failure will not adversely affect the environment, safety, or health. The safety classification to which a component, system, or structure is actually designed shall be based on an evaluation of the on-site and off-site radiological consequences of postulated accidents.

3.2.1.2 Seismic Categorization

The EDF structures shall be defined as Category I or Non-category I structures as follows:

1) Category I Structure. Components, systems, and structures shall be designated Category I if, during or following an extreme environmental load (Design Basis Earthquake (DBE) and

Operating Basis Earthquake (OBE)), they would be required to perform either of the following safety functions:

(1) Prevent or mitigate the consequences of an uncontrolled release of radioactivity with potential radiological consequences greater than the limits given in the 5400 series of DOE Orders (see Section 4.2)

(2) Maintain for nuclear criticality safety.

Category I components, systems, and structures shall be designed to withstand loadings resulting from either of the following earthquakes:

(1) Design Basis Earthquake. All Category I components, systems, and structures shall not suffer a loss of safety functions, as described above, following a DBE.

(2) Operating Basis Earthquake. All Category I components, systems, and structures shall have the capability for continued operation without undue risk to health and safety following the occurrence of an OBE. The OBE is a higher-probability earthquake than a DBE, and can reasonably be expected to affect the EDF during the operating life of the facility. The maximum ground acceleration of the OBE is generally considered to be two-thirds of the DBE.

2) Non-Category I Structure. Non-Category I components, systems, and structures include those necessary for the normal operation of portions of the EDF that are not designated as Category I.

3.2.2 Requirements for Design Basis Accidents

Design Basis Accidents are those postulated accidents, or natural forces, and resulting conditions for which the confinement structure, systems, components, and equipment must meet their functional goals. DBAs that shall be considered in the design of the EDF are tornadoes, high winds, earthquakes, winds, fires, floods, and aircraft crashes.

Each structure shall be designed for a Design Basis Earthquake in accordance with Section 3.6.2. The design shall consider the earthquake resistance of the EDF while in the operational phase, after interim closure, and after final closure.

The EDF shall be designed for extreme wind loads as specified in Section 3.6.2 of this document.

The design shall consider the possibility of fires as required by the recommendations of the Fire Protection Design Analysis. The EDF design shall consider the possibility of fire during the waste emplacement period. Post-closure fire effects and consequences shall be controlled through administrative controls.

Even though the FMPC site is located above the 100-year floodplain, the EDF design shall consider the possibility of flooding and subsequent damage.

The EDF design shall consider the consequences of an aircraft crash.

3.2.3 Nuclear Safety

The EDF shall provide radiation protection for its operating personnel and the public by using ALARA principles in the facility design and by the use of sufficient radiation shielding.

As required by 10 CFR 20.101, the occupational radiation dose per calendar quarter in **restricted areas** is as follows: 1) Whole body (i.e., head and trunk, active blood forming organs, eyes, or gonads) - 1¼ rems, 2) Hands, forearms, feet and ankles - 18¾ rems, 3) Skin - 3½ rems.

As required by 10 CFR 20.103, process or engineering controls shall be utilized in **airborne radioactivity areas** to limit, to the extent practicable, the concentration of radionuclides to acceptable levels (i.e., an individual is not to be exposed (inhalation and skin absorption) to radioactive materials which would exceed the limits specified in 10 CFR 20 Appendix B, Table I for any 13 week 40 hours/week period); otherwise, other controls are required.

As required by 10 CFR 20.105, the occupational radiation dose (whole body) limits for **unrestricted areas** is as follows: 0.5 rem for any period of one calendar year, 2 mrem for any 2-hour period, or 100 mrem for any consecutive 7-day period. [NOTE: The requirements of 10 CFR 20.104 limit the exposure levels for persons under 18 years old to 10 percent of the above levels for occupational radiation dose and the limits specified in 10 CFR 20 Appendix B, Table II for inhalation and skin absorption.]

Calculations will be performed as part of the Safety Analysis Report to ensure that the EDF design will maintain these occupational exposure limits. If required and practicable, engineering controls

will be provided to maintain exposure below specified limits; otherwise, recommendations for a control program will be provided.

Monitoring of personnel shall follow existing FMPC procedures.

3.2.3.1 Radiation Sources

The dominant radiation sources in the EDF will be the waste forms that will be disposed. The radioactive sources will dictate the shielding requirements for the facility area. The waste containers and slabs shall be designed so that the total radiation exposure is less than 200 mrem/hr at contact with the container's outside surface.

3.2.3.2 Shielding

Reduction of radiation exposure shall be one of the design objectives of the EDF. As such, the facility design and equipment layout shall include design considerations for operation and maintenance to meet the intent of the ALARA design philosophy for radiation exposure.

Shields shall be provided to protect the operators, other personnel working in the area, visitors, and intruders from excessive radiation exposure from the emplaced waste. Shielding shall reduce the radiation dose to one-fifth (1/5) the limits specified in DOE Order 5840.11 as required by DOE Order 6430.1A, Division 1300-6. The maximum exposure to any operating personnel shall be 5 mrem/hr for intermittent exposures (individual occupancy less than 10 percent of work day) and less than 0.5 mrem/hr for continuously occupied areas.

Any shielding penetrations shall be designed to incorporate steps or offsets to eliminate any direct line-of-sight streaming paths through the shield.

3.2.3.3 Radiation Zoning

The radiation zoning for the EDF shall follow the suggested zoning in the DOE's ALARA guidance documents DOE/EV 1830-T5 and PNL-6577.

3.2.3.4 Nuclear Criticality and Safety

Criticality is not expected to be a concern in the EDF because of the low levels of fissile material in the waste packages and the waste forms that shall be received. Administrative practices shall be used to control the amount and location of fissile materials placed into the EDF. These practices will include waste acceptance criteria, fissile material limits, mass limits, and a waste segregation plan. The waste acceptance criteria shall specify the maximum permissible concentration of fissile material permitted in a waste package.

3.2.3.5 Radioactive Materials Containment

The EDF shall be capable of containing radioactive material within the waste package during waste emplacement and shall have a monitoring system capable of detecting releases of radioactive material as required in the 5400 series of DOE Orders (see Section 4.2). Operating personnel and the public (as measured at the site boundary) shall be protected from release of radioactive particulate material and gases that expose them to doses greater than those defined in the 5400 series of DOE Orders (see Section 4.2), 10 CFR 20, 10 CFR 61, and 40 CFR 192.

The EDF shall be designed to minimize the potential of radioactive material leakage due to the degradation of vault structure and waste form. The vault structure will be designed to withstand degradation from external and internal initiating events. Vaults that contain mixed waste shall be designed to withstand potentially degrading environment created by exposure to the hazardous constituents and the radiation induced by-products.

3.2.4 Industrial Health and Safety

All buildings, systems, and equipment in the EDF shall be designed to comply with all pertinent safety standards. Special safety design requirements for this facility are the following:

1) Safety showers and eyewash stations shall be provided in areas where personnel are exposed to chemicals, radioactive contamination, and other industrial hazards. These shall be connected to a potable cold water system. Drainage for these facilities shall be contained, connected to the sanitary sewer system, or to the radioactive waste system, depending on the potential hazard of the waste solution. Portable, self-contained safety showers and eyewash stations may be used, if appropriate.

2) Noise levels shall be limited to less than 70 dba in areas of continuous occupancy and to 85 dba for 8-hour exposure to other personnel access areas.
3) Floors subject to wetting shall be treated with nonskid materials or otherwise constructed with nonskid features.
4) Emergency standby lighting shall be provided to illuminate indoor exits from facilities in case of electric power outage.
5) A "fail-safe" philosophy shall be adopted in the design of the facilities. Failure or malfunction of any single system or single component shall not initiate a failure that can result in injury to personnel or damage to the surrounding environment.
6) Existing facilities shall be used for industrial first aid.
7) Cranes shall be accessible for inspection and maintenance.
8) Process reagents and decontamination solutions (such as acids and caustics, metal salt solutions, oxidizing solutions, and others) shall be stored and handled in accordance with applicable standards.
9) The EDF shall be divided into ventilation zones, based on relative potential for exposure of personnel to airborne radionuclides. Exhaust systems shall be provided at all critical areas within the building.
10) Storage facilities shall be provided in the area for use for all reagents, chemicals, protective clothing, first-aid and safety supplies, and breathing equipment.
11) The building shall be grounded to a site grounding grid. All instruments shall be attached to a separate grounding loop that shall be connected at a single point to the site grounding grid.
12) Piping, vessels, and equipment shall have external insulation applied for the protection of personnel from injury where operating temperatures exceed 50 degrees C. The extent of this safety insulation shall be a minimum of 2 meters above and 1 meter away from accessible areas. Thermal insulation shall meet the requirements of NFPA 90A and shall be 100 percent asbestos-free.
13) Spray shields shall be provided over flanges and valves on pipelines conveying hazardous solutions or vapors.
14) Rotating machinery shall be provided with protective guards to meet OSHA standards.

3.2.5 Emergency Planning Requirements

The emergency preparedness plan for the EDF operations, including the storage of emergency equipment, shall be consistent with the current FMPC Emergency Preparedness Plan (Topical Manual FMPC - 2046).

3.2.6 Personnel Access, Requirements, and Limitations

Access to the vaults shall be in accordance with EDF operating procedures. No special requirements have been identified at this time, but they will be included in the Project Health and Safety Plan as outlined by site operating procedures.

3.3 Quality Assurance

A Quality Assurance (QA) Program shall be developed and implemented to meet the requirements of DOE 5700.6B and ANSI/ASME NQA-1-1989, in accordance with a Quality Level established by the DOE.

As a special facility, the components, systems, and structures of the EDF shall be classified with regards to a level of quality. Quality levels are established in accordance with the following criteria (Westinghouse Site Policy and Procedure FMPC-711, Revision 1, Issue Date 12/15/89, Quality Levels):

Quality Level 1

1) Any failure which results in a nuclear criticality.

2) Any release of corrosive material which could cause damage sufficient to cause release of radioactive material, resulting in radiation exposure of off-site or on-site personnel which exceed prescribed limits.

Quality Level 2

1) Any failure where a radioactive material release could occur and result in radioactive exposure of off-site or on-site personnel not in excess of established limits.

2) Any failure where a toxic material release could occur and result in injury or exposure to off-site or on-site personnel not in excess of established limits.

3) Any design of equipment where high reliability is required to prevent or mitigate consequences of release of radioactive or toxic materials.

4) Any equipment or service where special provisions are needed to assure that inspection or examination information on one-of-a-kind items is not jeopardized or lost.

Quality Level 3

1) Release of radioactive material does not appear as a credible failure consequence.

2) Any failure where a toxic material release could occur and result in injury or exposure to off-site or on-site personnel not exceeding acceptable levels.

3) Any equipment where 100 percent availability is necessary to assure safe operation or to avoid significant loss of production, where long lead times are involved in acquiring the equipment because of complexity, cost, or other factors.

4) Any design of equipment where reliability in excess of that provided by standard commercial items is needed for safety or production requirements.

5) Any equipment where special manufacturing and fabricating requirements are needed and are covered in customized drawings and specifications.

6) Any equipment fabricated to a drawing with three decimal place tolerances supplied to the fabricator.

7) Any equipment where evidence of standard fabrication, inspection, or test operations is needed.

8) Any equipment where acceptability is based on performance of difficult or extensive test or inspection operations.

9) Those items which in the event of failure may cause costs in excess of $250,000.

Quality Level 4

1) Items having negligible effect on safety and reliability.

2) Any equipment which is routinely available as standard items.

3) No added inspection required.

4) Replacement cost is not in excess of $50,000.

3.4 Environmental Requirements

3.4.1 Design Requirements

The construction and operation of the EDF shall comply with the ARARs identified in Exhibit 1. Test borings and abandoned monitoring wells shall be sealed to prevent contaminants from entering the groundwater in accordance with OAC 3745-9-10.

3.4.2 Gaseous, Liquid, and Solid Discharge Limitations

Discharges of radionuclides and hazardous constituents will be limited in accordance with the ARARs identified for the EDF and DOE Orders. These limitations are summarized below for each environmental medium. Modelling shall be conducted to verify that the design of the EDF will satisfy the below listed discharge limitations.

3.4.2.1 General - Radionuclides

In accordance with DOE Order 5820.2A Chapter III, the external exposure to the waste and concentrations of radioactive material which may be released into the surface water, groundwater, soil, plants and animals shall not result in an effective dose equivalent greater than 25 mrem/yr for any member of the public. As specified in 10 CFR 61.41, the maximum radioactive release to the environment shall comply with ALARA principles and shall not expose any member of the public to an annual dose exceeding an equivalent of 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any other organ. These release limits are to be met during the operations, closure, stabilization, and institutional control periods. Additional limitations for radionuclides are specified below.

3.4.2.2 Air Discharges - Radionuclides

During EDF operations, the release of radionuclides to the atmosphere shall comply with the requirements of 40 CFR 61 Subpart H, 40 CFR 61 Subpart Q, 40 CFR 192.02, and 10 CFR 61.43.

The design shall ensure that the combined radionuclide emissions (excluding Radon-220 and Radon-222) from the EDF and all other FMPC emission sources will not cause any member of the public to receive in any year an effective dose equivalent exceeding 10 mrem/yr (above background) per 40 CFR 61 Subpart H and DOE Order 5820.2A Chapter II, 3.a.(2). This limit is for an effective dose equivalent as calculated per the International Commission on Radiological Protection's Publication Number 26. Modelling and sampling procedures are specified in 40 CFR 61.93.

In accordance with 40 CFR 61 Subpart Q, 40 CFR 192.02, and DOE Order 5820.2A Chapter II, 3.a.(2), no more than 20 pCi/m^2-sec of Radon-222 (as an average for the entire source) shall be emitted into the air from the EDF.

As required by 10 CFR 61.43, air effluents are to be controlled so that the radionuclide concentrations do not exceed the levels specified in 10 CFR 20.105, 10 CFR 20.106, and 10 CFR 20 Appendix B Table II.

3.4.2.3 Air Discharges - Conventional Pollutants

During the construction and operation of the EDF, measures shall be taken to control the discharge of conventional air pollutants as specified in OAC 3745-15-07, OAC 3745-17-05, and OAC 3745-17-08.

In accordance with OAC 3745-15-07, the emission or escape into the open air from any EDF source which endangers the health, safety, or welfare of the public or causes unreasonable injury or damage to property shall be prohibited.

In accordance with OAC 3745-17-05, the significant and avoidable deterioration of air quality surrounding the EDF shall be prohibited.

In accordance with OAC 3745-17-08, visible fugitive dust emissions generated during grading, loading, construction, or other operations which emit fugitive dust shall be minimized or eliminated.

3.4.2.4 Wastewater Discharges - Radionuclides

Wastewater effluents are to be controlled so that the radionuclide concentrations do not exceed the levels specified in 10 CFR 61.41, 10 CFR 20.105, 10 CFR 20.106, and 10 CFR 20 Appendix B

Table II. If the wastewater discharges to a sanitary sewerage system, the standards contained in 10 CFR 20.303 apply.

3.4.2.5 Wastewater Discharges - Toxic/Conventional Pollutants

All wastewater discharges, including stormwater, shall comply with the requirements established in 40 CFR 122, OAC 3745-1-07, and OAC 3745-33-04 during construction, operation, and closure of the EDF.

3.4.2.6 Groundwater Discharges - Radionuclides

Discharge of radionuclides to the groundwater shall comply with the requirements of DOE Order 5820.2A as identified in Section 3.4.2.1.

Pursuant to CERCLA Section 121(d)(2)(A)(ii) and 40 CFR Section 300.430(e)(2)(i)(B), the Maximum Contaminant Levels (MCLs) for radioactivity established under 40 CFR 141.15 and 141.16 are specified to be relevant and appropriate for attainment in situations where remedial actions are being taken to cleanup ground and surface waters that are potential drinking water sources. In accordance with the ARARs identified for the EDF, these MCLs are to be utilized to develop design-based performance criteria for the EDF to ensure that the underlying aquifer is adequately protected. The performance criteria is to be established from modelling results. The radionuclide MCLs are as follows:

RADIONUCLIDE	LIMIT
Combined radium-226 and 228	5 pCi/l
Gross alpha particle activity (including radium-226, but excluding radon and uranium)	15 pCi/l
Beta particle and photon (i.e., gamma) radioactivity from man-made radionuclides (Limit is for the annual dose equivalent to the whole body or internal organ)	4 mrem
Tritium	20,000 pCi/l
Strontium-90	8 pCi/l

3.4.2.7 Groundwater Discharges - Hazardous Constituents

In accordance with the groundwater protection standard of 40 CFR 264.92, the EDF shall be designed to ensure that the hazardous constituents (40 CFR 264.93) are not detected in the groundwater (in the uppermost aquifer underlying the EDF) at the point of compliance (40 CFR 264.95) in excess of the limits established pursuant to 40 CFR 264.94 during the compliance period (40 CFR 264.96).

3.4.2.8 Groundwater Discharges - Organic/Inorganic Pollutants

Pursuant to CERCLA Section 121(d)(2)(A)(ii) and 40 CFR Section 300.430(e)(2)(i)(B), the MCLs and non-zero Maximum Contaminant Level Goals (MCLGs) are specified to be relevant and appropriate for attainment in situations where remedial actions are being taken to cleanup ground and surface waters which are potential drinking water sources. The MCLs are for organic and inorganic pollutants and are established under 40 CFR 141.11, 141.12, 141.61, and 141.62 for public drinking water supplies. The MCLGs are for organic and inorganic pollutants and are listed under 40 CFR 141.50 and 141.51. In accordance with the ARARs identified for the EDF, these MCLs and MCLGs are to be utilized to develop design-based performance criteria for the EDF to ensure that the underlying aquifer is adequately protected. The performance criteria is to be established from modelling results. The MCLs and MCLGs are shown in Table 3-1.

3.4.3 Environmental Monitoring

The atmosphere and groundwater shall be monitored according to 40 CFR 61 Subpart H, 40 CFR 61 Subpart Q and 40 CFR 264 Subpart F.

Area radiation monitors shall be located appropriately throughout the facility to alert operations personnel to unusual radiation levels. Audible and visual alarms shall be automatically activated at the control room. Air monitors and samplers shall be provided to collect samples of airborne particulates for analysis of radioactivity that might be released from the disposal structures. All monitoring systems shall be capable of measuring the process parameters related to system integrity, radiological safety, and retrievability over the full range of levels anticipated during normal or credible abnormal conditions. All potentially contaminated work areas shall be provided with personnel monitoring equipment for use in checking all personnel for contamination upon leaving the work areas. A monitoring system shall be provided to monitor the loss of ventilation.

Table 3-1

Pollutant	Limit (mg/l)
Arsenic	0.05 (MCL)
Barium	1.00 (MCL)
Cadmium	0.010 (MCL) - 0.005 (MCLG)
Chromium	0.05 (MCL)
Lead	0.05 (MCL)- 0.02 (MCLG)
Mercury	0.002 (MCL) - 0.002 (MCLG)
Nitrate	10.0 (MCL)
Selenium	0.01 (MCL)
Silver	0.05 (MCL)
Fluoride	4.0 (MCL) - 4.0 (MCLG)
Endrin	0.0002 (MCL)
Lindane	0.004 (MCL)
Methoxychlor	0.1 (MCL)
Toxaphene	0.005 (MCL)
2,4-D	0.1 (MCL)
2,4,5-TP Silvex	0.01 (MCL)
Total Trihalomethanes	0.1 (MCL)
Benzene	0.005 (MCL) - 0 (MCLG)
Vinyl chloride	0.002 (MCL) - 0 (MCLG)
Carbon tetrachloride	0.005 (MCL) - 0 (MCLG)
1,2-Dichloroethane	0.005 (MCL)
Trichloroethylene	0.005 (MCL)
1,1-Dichloroethylene	0.007 (MCL) - 0.007 (MCLG)
1,1,1-Trichloroethane	0.20 (MCL) - 0.20 (MCLG)
para-Dichlorobenzene	0.075(MCL) - 0.75 (MCLG)
Ethylbenzene	None (MCL) - 0.7 (MCLG)
Toluene	None (MCL) - 2.0 (MCLG)

As required by 40 CFR 264 Subpart F, groundwater monitoring wells are to be provided at the point of compliance in sufficient numbers and locations to allow detection of contaminant migration from the EDF into the upper most aquifer.

Groundwater monitoring is to be initiated prior to operating the EDF to establish baseline water quality information. Construction activities are to be phased so that the immediate area surrounding the monitoring well is not disturbed.

Monitoring of trucks and equipment delivering waste material and other materials to the EDF during operations shall be monitored using the existing FMPC procedures. Refer to Section 3.9 for component requirements.

3.5 Mechanical Design

3.5.1 Required Mechanical Systems

3.5.1.1 Liner System

The disposal vaults will be provided with a double liner system in accordance with 40 CFR 264 Subpart N.

The sumps and piping systems that comprise the leachate collection/leak detection system will be designed as double-walled tanks in accordance with 40 CFR 264 Subpart J. The leachate collection piping will be double-walled with provisions for leak detection. Leachate collection and leak detection piping systems shall not be interconnected. The leachate collection and leak detection piping systems shall be constructed of corrosion-resistant materials and shall provide for easy accessibility to remove liquids from the sumps. The piping shall comply with the provisions for ancillary equipment described under 40 CFR 264 Subpart J. The LCLDS shall be designed to operate in sub-freezing weather.

3.5.1.2 Heating, Ventilation, and Air Conditioning

A ventilation system shall be provided for the removal of exhaust gases from the materials handling equipment within the occupied enclosed disposal cells. This ventilation system is not to be designed to control radionuclide emissions. The control of airborne radionuclides will be provided by the

waste containerization and/or waste form. Radiological surveying for external surface contamination will also be conducted at the treatment facility to prevent the release of airborne radioactive contaminants.

The heating, ventilating, and air-conditioning (HVAC) systems shall provide an environment necessary for personnel comfort and safety in the EDF support facilities, if required. The EDF shall be ventilated as required to maintain the applicable requirements for dilution ventilation of DOE Order 6430.1A, Section 1550-1.5.5. Ventilation air shall satisfy all OSHA air quality requirements and permissible exposure limits (PEL) established by 29 CFR 1910 and the American Conference of Government Industrial Hygienists. The design air quantities and transport velocities shall be calculated in accordance with the ASHRAE Systems Handbook, ASHRAE Applications Handbook, ACGIH Manual, and 29 CFR 1910.

3.5.1.3 Pumps

A portable pump and collection system shall be provided to remove water from the leachate collection and leak detection systems during the construction, operation, closure, and institutional control phases of the EDF.

3.5.1.4 Heat Exchanger

No heat exchanger will be provided by this project.

3.5.1.5 Tanks

If required, centrally located tanks may be provided to facilitate management of the leachate removed from the LCLDs. These tanks will also be designed in accordance with 40 CFR 264, Subpart J.

3.5.1.6 Valves

No valves have been identified for this project.

3.5.1.7 Filters

No filters will be provided by this project other than those included as part of the HVAC System described in Section 3.5.1.2.

3.5.1.8 Materials Handling Equipment

Equipment to off-load waste material from trucks, transport it to the vault, and place it in the vault shall be provided by this project. The selection of the waste handling equipment shall be based on the nature of the waste delivered to the EDF, i.e., containers, slabs, or grout slurry.

3.5.1.9 Remote Handling Devices

No remote handling or robotic devices have been identified for this project at this stage. All waste is assumed to be contact-handled.

3.5.2 Mechanical Design Considerations

3.5.2.1 Vibration

Fans required for the ventilation system for the EDF may require vibration isolators and flexible duct work connectors. Noise levels shall satisfy the requirements listed in the ASHRAE handbooks as required by DOE Order 6430.1A, Divisions 1550-2.5.1.

3.5.2.2 Seismic

Loading of any materials handling equipment on the vault shall satisfy the UBC lateral force provisions using the ground response spectra specified in Section 3.6.2.2.

3.5.2.3 Pressure

No pressure requirements have been identified for the project.

3.5.2.4 Thermal

No thermal requirements have been identified for the project.

3.5.2.5 Accessibility for In-Service Inspection

No in-service inspection of any equipment has been identified for the project.

3.5.2.6 Corrosion Allowance

A corrosion allowance to a minimum of 100 years service of all fixed, nonreplaceable components shall be included in the design of all equipment.

3.5.2.7 Remote Handling/Operation/Maintenance

No remote handling capabilities have been identified for the project.

3.5.2.8 Limiting Dimensions/Tolerances

The dimensions of each vault shall provide adequate tolerances for placement of a standardized container design.

3.6 Civil/Structural Design

3.6.1 Required Civil Systems

3.6.1.1 Fences and Gates

Additional permanent fences and gates will be required for the project. The security fencing for the EDF will be integrated with the existing FMPC security fencing. The security fence will control the unknowing or unauthorized entry of persons or livestock onto the active portion of the EDF as required by 40 CFR 264.14 and 10 CFR 61.42. Signs must be posted at each entrance to the active portion and at other locations as required by 40 CFR 264.14(c).

Temporary security fencing shall be provided to isolate the construction area from the adjacent operating vaults. The temporary fence and the construction thereof shall not interfere with the waste emplacement operations in the adjacent, previously constructed vaults. FMPC Safeguards and Security shall review and approve the location of all temporary fences.

3.6.1.2 Roads and Walkways

All weather roads, a minimum of 20 feet wide as required by NFPA-241, shall be provided from the existing service roads to the unloading areas for the EDF. These roads and the unloading area shall be able to handle maximum anticipated loads and comply with the requirements of FMPC standards. Gravel or crusher run stone shall be the preferred materials for construction of the roads and unloading areas. Asphaltic or concrete roads and unloading areas may be used in areas where the designer believes that aggregate construction will provide an inadequate road base or surface. Asphaltic and concrete roads shall comply with the requirements of AASHTO-GDHS-84 (DOE Order 6430.1A, 0250-3) in addition to FMPC standards.

The unloading area shall be of sufficient size to accommodate a minimum of one parked truck and sufficient area surrounding the truck(s) for movement of the materials handling equipment. The unloading areas should be located near the respective vaults such that movement of the materials handling equipment will be minimized.

Excavated slopes with grades steeper than 2:1 shall be designed such that mowing of vegetation on the slopes is not required.

Walkways may be provided within the EDF, as appropriate. Any walkways provided shall comply with the requirements of DOE Order 6430.1A, Section 0250-2. No accommodations for the handicapped are required.

The location of all roadways and walkways shall conform with FMPC security requirements.

3.6.1.3 Railroads

No additional railroad facilities have been identified by this project. Existing rail facilities with an additional spur could be used to transport material.

3.6.1.4 Ditches and Drains

Ditches and drains for the removal of surface water provided by this project shall connect to and shall be compatible with the existing drains and ditches. These drainage facilities shall be designed in accordance with the requirements of 10 CFR 61, 40 CFR 264.301, and DOE Order 6430.1A, Section 0270-2. The drainage control systems will be designed to accommodate a minimum of a 25-year, 24-hour, storm event per 40 CFR 264.301 and RM-FMPC-2069. The drainage ditch gradients shall be limited to prevent erosive velocities as required by 10 CFR 61.51. The existing drainage system will be upgraded, as required.

Drains and gutters for the roofs/covers shall be discharged into storm sewers, stabilized ditches, splash blocks, or paving as required by DOE Order 6430.1A, Section 0760-2.3.2. Stormwater is to be managed as specified in Section 3.1.10.

3.6.1.5 Parking

No additional parking is required for this project, except as described in Section 3.1.18.

3.6.1.6 Landscaping

All excavations shall be designed with provisions for erosion control and soil stabilization in ditches, fill areas, slopes, embankments, etc., per DOE Order 6430.1A, Section 0210. Ground covers, riprap, or rock baskets shall be used to eliminate the need to mow slopes that exceed 2:1 and in areas where the mower operators have a potential for receiving more than 25 mrem/year radiation exposure.

General landscaping shall comply with the requirements of FMPC site standards and DOE Order 6430.1A, Section 290 except that ground covers, riprap, or rock baskets shall be used to eliminate the need to mow slopes that exceed 2:1 and in areas where the mower operators have a potential for receiving more than 25 mrem/year radiation exposure.

3.6.1.7 Vault

The design of the disposal vaults shall provide containment for waste forms and shall provide engineered barriers to reduce the migration of radionuclides from the EDF boundaries to acceptable limits as defined in 10 CFR 61.23(e), 61.30(a)(2), and DOE Order 5820.2A, Chapter III, throughout the 100-year institutional life of the facility. In this regard, the multiple containment systems for the disposal vaults shall be provided as defined in DOE Order 6430.1A, Section 1324-6.

The containment structure shall be a concrete vault. Concrete specifications for the vaults shall meet the performance requirements of minimizing water intrusion through the matrix and wall cracks and maximizing durability. The walls of each vault shall rest on a monolithic reinforced concrete mat. This mat shall minimize the effect of differential settlements and provide positive protection for the internal liner and leachate collection system (see Section 3.5.1 for leachate collection system).

Each cell shall have an interim opening on the side or top to allow loading of waste. The openings shall have temporary closures, lighting, and ventilation. Temporary emergency access doors between cells shall also be provided.

Each vault shall be covered to minimize rainfall infiltration during operations and during interim, final, and post-closure periods. The roof shall also be protected to prevent weathering prior to final closure. The roof shall be designed to shed and prevent the infiltration of rainwater. The roof shall support the placement of a typical closure cap. The vault shall be designed to prevent a positive head of water around the sidewalls and floor.

Both design and construction shall provide measures to reduce concrete cracking to the maximum extent practical. The design and construction of EDF vaults shall incorporate the following features:

1) Concrete design shall conform to ACI 319 and to ACI 349.

2) Sumps and pipes for the leachate collection system shall be embedded in concrete base slab and side walls of the vaults.

3) Reinforcing steel dowels, concrete joints, and double liner joints shall provide for future installation of the interim closure walls.

4) Steel reinforcing bars for all concrete structures including the vault structures and interim closure shall comply with the requirements of ASTM A615, A616, or A617. The specification of reinforcing bars shall be in compliance with the respective ACI standards. ACI 349 does not permit the use of reinforcing bars manufactured to the requirements of ASTM A616 or A617.

5) As required by DOE Order 6430.1A, Section 0111-2.8.5, the minimum linear coefficient of shrinkage for concrete shall be assumed to be 0.0002 inch/inch unless a detailed analysis is conducted. The theoretical displacement shall be computed as the product of the linear coefficient of shrinkage and the length of the member being considered.

6) Combined loads, allowable stresses, and strength requirements for the EDF building including interim cover caps as applicable, shall be designed as stipulated in the Uniform Building Code (UBC) as required by DOE Order 6430.1A, Section 2.10.

7) Control joints for the concrete structures shall be designed and placed in such a manner to avoid structural distress, uncontrolled cracking, and water leakage from thermal expansion and contraction, concrete shrinkage, and movements due to earthquakes as required by DOE Order 6430.1A, Section 0111-3.3.

8) Foundations shall comply with the requirements of DOE Order 6430.1A, Section 0111-23.4 and Section 0235.

9) All steel components shall comply with an ASTM specification for applicable component material and shape. Welding filler materials shall comply with the applicable specification of the American Welding Society.

10) Welded joints shall comply with the requirements of the Structural Welding Code, AWS D1.1.

11) All steel surfaces, internal or external to the structures, shall be galvanized or painted using a compatible primer and top coat system.

12) The design shall prevent a positive head of water from forming around the sidewalls and beneath the floor or concrete pad for each vault. The design shall provide a passive technique for verifying the absence of a water head.

13) Structural design shall be based on the requirements of DOE Order 6430.1A, Section 0111. Design of concrete shall be by strength design methods per ACI 318. Structural steel design shall be in accordance with the AISC - 9th Edition, specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

3.6.1.8 Final Cover

A permanent final cover shall be provided to close the EDF. The final cover shall be designed in accordance with 40 CFR 264.310 and 10 CFR 61 to prevent biosphere interaction with the containment structure, protect the containment structure from natural catastrophes, and help prevent intrusion into the facility. The final cover shall be designed to function over the institutional period.

The final cover shall be designed as a multilayer system with layers for berming the containment structure, for preventing infiltration, for promoting drainage, and for protecting low permeability layers from the biosphere. The final cover shall be appropriately graded to prevent water ponding. Drainage swales and structures shall be provided to prevent surface drainage from flowing onto the final cover and to minimize erosion. The final cover shall be provided with a vegetative or inert cover to minimize erosion.

The design of the concrete vaults shall include provisions to accommodate and support a final closure cap. Final closure may occur after all vaults have been filled, or may occur in stages, as individual vaults are filled. Upon completion of the stabilization period, the radiation limits specified in 10 CFR 20.105 (0.5 rem for any period of one calendar year, 2 mrem for any 2-hour period, or 100 mrem for any consecutive 7-day period) shall not be exceeded at the surface of the final cover (see 10 CFR 61.52(a)(6)). The design of the final closure cap shall assure that the effective dose equivalent received by individuals who intrude into the facility after the end of institutional control will not exceed 100 mrem/year or 50 mrem for a single acute exposure as required by DOE Order 5820.2A, Chapter III.

3.6.2 Civil/Structural Design Considerations

3.6.2.1 Usage Category

The EDF facility is assumed to be classified as a Moderate Hazard Nuclear Facility per UCRL15910. Moderate hazard facilities are defined as facilities where confinement of contents is necessary for

public or employee protection. They include facilities involving the handling or storage of significant quantities of radioactive or toxic material.

3.6.2.2 Seismic

Earthquake loads shall comply with UCRL-15910 per DOE Order 6430.1A, Sections 0111-2-7 and 0111-99-04 for a Moderate Hazard Nuclear Facility.

The analysis of the structure shall be based on the Ground Response Spectrum of NRC Regulatory Guide 1.60, anchored to a DBE peak ground acceleration of 0.13 g horizontal. Based on typical soils properties at FMPC, the effect of Soil Structure Interaction (SSI) should be considered. Damping values for structural analysis and ARS generation (if required) shall be consistent with NRC Regulatory Guide 1.61.

3.6.2.3 Wind/Tornado

EDF vaults at Final Closure will be subgrade structures. During operating and interim closure conditions, depending on existing grades, vaults shall be designed for wind and tornado loads. Extreme wind and tornado wind speed data will be taken from site specific requirements of UCRL-15910. For Moderate Hazard facilities at the FMPC these requirements are

1) 87 mph with an importance factor of 1.0 for extreme wind
2) 139 mph for tornado winds (including 1.0 importance factor).

Tornado design for unvented structures shall include the effects of atmospheric pressure changes defined in UCRL 15910.

Wind load design for buildings and other exposed structures will be based on the analytical procedures given in ASCE 7-88 (formerly ANSI A 58.1). The basic wind speed to be used for the location of the building or other structure shall be 90 miles per hour per the Ohio Basic Building Code, 1989. Exposure "C" will be used for all construction. Shielding from adjacent buildings, trees, etc., shall not be considered.

The velocity pressure coefficients, gust response factor, drag coefficients, internal and external coefficients, and design pressure shall be determined in accordance with the procedure given in ASCE 7-88. Tornado missile design requirements for above ground structures shall be designed to prevent

tornado missile penetration to the missiles defined in UCRL-15910. The missiles considered shall be from the Moderate Hazard category.

3.6.2.4 Soil Properties

Available data on soil properties for the proposed EDF facility site are insufficient. A comprehensive soils testing program will be initiated and results evaluated.

3.6.2.5 Structural Loads

The structure for the EDF shall be designed for structural loads as prescribed in ASCE 7-88 in accordance with DOE Order 6430.1A, Section 0111-2. Dead loads and live loads for the roof shall be calculated based on the unit weights of materials and construction assemblies given in ASCE 7-88. The EDF shall be designed in accordance with the requirements for normal loads plus loads resulting from appropriate earthquake or other natural hazard phenomena. Normal dead and live loads shall be considered in combination with individual occurrence of DBA loads or natural hazard phenomena. Normal dead and live loads based on specific use, equipment loads, etc., shall be determined. In no case shall the design load be less than that specified in ASCE 7-88 for a comparable structure.

The minimum requirements for the foundation design shall meet the seismic criteria for the hazard level classification of the facility as specified in DOE Order 6430.1A, Section 0111-3.4.

The concrete structures shall satisfy the requirements of ACI 318, ACI 349, and 40 CFR 249 as specified in DOE Order 6430.1A, Sections 0111-99.0.8 and 0301-1. Structural members shall resist the appropriate combinations provided in UCRL 15910. Precast concrete shall comply with PCI MNL-116 or PCI MNL-120 and the PTI Post-Tensioning Manual as specified in DOE Order 6430.1A, Section 0340.

3.6.2.6 Missile Protection

Above ground structures shall be designed to prevent tornado missile penetration to the missiles defined in UCRL-15910. The missiles considered shall be from the Moderate Hazards category.

3.7 Electrical Design

3.7.1 Required Electrical Systems

3.7.1.1 Electricity

Electricity will be required to supply power during construction and operation (i.e., ventilation) of the EDF and for lighting. Power can be obtained from the process area power grid adjacent to the EDF site which has substantial excess capacity. Required power is 480V, three-phase, 60 cycle, with sufficient capacity to support the construction and operation of the EDF. The design should allow for the extension of the lines to accommodate development of the EDF during construction.

The transmission poles and lines shall be located to minimize the impact on excavations and clearances for access to/from the disposal vaults required for future development of the EDF pursuant to a Site Master Plan.

The capacity or the lines will be sized to supply the power required for the

1) Construction of eight (8) vaults simultaneously
2) Security lights.

Design of the overhead electrical service supply shall comply with DOE Order 6430.1A, Section 1630-2 including the requirements of ANSI C2. The sizing of the power capacity shall comply with FMPC site specific requirements. Both 110V and 220V service shall be supplied.

3.7.1.2 Power Sources, High Lines, Substations

Any electrical equipment and wiring used in the design shall comply with the requirements of the National Electrical Code, NFPA-70. Conductors shall be enclosed in electrical metal tubing per DOE Order 6430.1A, Section 1605-2.1.2 except that flexible conduit shall be used for connections to equipment subject to vibration (DOE Order 6430.1A, Section 1605-2.1.3). Conductors shall comply with the requirements given in DOE Order 6430.1A, Section 1605-2.2. Receptacles shall comply with FS W-C-596 and be equipped with ground fault features that comply with NFPA-70 per DOE Order 6430.1A, Section 1605-2.3.

3.7.1.3 Emergency Power Requirements/Uninterrupted Power

Emergency power required during operation shall be provided by FMPC using existing site emergency generating equipment. Uninterrupted power requirements for critical monitoring systems associated with the EDF are stated in Subsection 3.9.2.12. Uninterruptable Power Supplies (UPS) shall consist of a regulated power supply with a battery system backup complete with an inverter. UPS power source shall originate at a dedicated Instrument Power Distribution panel.

3.7.1.4 Lighting

Interior lighting for the vaults shall comply with the Illumination Engineering Society (IES) Lighting handbook and FMPC site standards. General lighting shall be a minimum of 10-foot candles based on lighting requirements for stockroom handling bulky materials. Nonuniform lighting shall comply with 41CFR101-20.112.2 and IEEE 739, as required by DOE Order 6430.1A, Section 1655-1 and Section 1694. All light diffusers and lenses shall be constructed of noncombustible materials, DOE Order 6430.1A, Section 1655-3. The design may provide portable or detachable lights that can be relocated easily as the vault is filled. Alternately, the lighting system may be disconnected from the power supply lines and abandoned in place at the discretion of the DOE.

Emergency lights for the vaults shall comply with NFPA 101 and NFPA 110 as required by DOE Order 6430.1A, Section 1655-3. Lighting in areas adjacent to cells being loaded in and used as emergency exits shall generally be illuminated to a minimum of 5-foot candles.

3.7.1.5 Process Computers

No computers have been identified by this project for Process Control.

3.7.1.6 Monitoring Equipment

Electrical requirements for equipment and instrumentation for monitoring radiation fields and the water level in the LCLDs shall be specified.

3.7.2 Electrical Design Considerations

3.7.2.1 Input/Output Parameters

No design requirements have been identified for this project.

3.7.2.2 Power Source Parameters

Electrical power required for the ventilation, lighting, and instrumentation in the EDF and for construction shall be determined.

3.7.2.3 Control System Parameters

No design requirements have been identified for this project.

3.7.2.4 Electrical Separation

No design requirements have been identified for this project.

3.7.2.5 Grounding

Grounding shall comply with NFPA-70 and IEEE-142 as required by DOE Order 6430.1A, Section 1639-1.

3.7.2.6 Interior Electrical Systems

Interior electrical systems shall comply with DOE Order 6430.1A, Section 1640.

3.7.2.7 Insulation

No design requirements have been identified for this project.

3.7.2.8 Heat Tracing

No design requirements have been identified for this project.

3.7.2.9 Environmental Qualifications

All electrical components will be designed for general use, outdoor service.

3.7.2.10 Redundancy, Reliability, and Independence

Refer to Subsection 3.9.2.12 for the uninterruptable power supply requirements for this project.

3.7.2.11 Equipment Availability and Spare Part Requirements

No design requirements have been identified for this project. It is anticipated that power distribution and lighting systems will require replacement on a 25-year cycle.

3.8 Process Design

3.8.1 Required Process System

No process systems are required for this project.

3.8.2 Process Design Considerations

No design requirements have been identified for this project.

3.9 Instrumentation/Control Design

3.9.1 Required Instrumentation/Control Systems

3.9.1.1 Environmental Monitoring Equipment

A continuous sample collection system shall be installed to monitor contaminants in and around the EDF. The sampling system shall include, but not be limited to, air, leachate, and groundwater monitoring for both toxic substances and radionuclides. In addition, radiation detectors shall be provided to continuously measure radiation flux intensity at the EDF perimeter. All ancillary controls (such as level, pressure, temperature, and flow) shall be provided to complete the sampling system.

Where real time analysis instruments are utilized with extractive type sampling systems, the extractive sampling system shall be installed complete with an automatic grab sampler. All monitoring instruments shall be equipped with an alarm output to actuate whenever a threshold has been exceeded for a measured variable. All measured variables shall be retained in storage by means of a data acquisition system. The data acquisition system will provide real time measured variable displays via a cathode ray tube (CRT) display. Alarm conditions and equipment failures shall be printed out in a "shift log" format on a daily basis, as a minimum. As determined in Title I Design of this project, certain measured variables will be monitored and alarmed by separate (outside of the data acquisition system) means for redundancy purposes. All monitoring equipment which generates alarms will be kept in an energized state for normal or acceptable measured variable conditions. In this way, alarms will be generated for "out of spec" conditions as well as loss of power to instruments.

3.9.1.2 Leak Detection

Each vault or cell in the EDF will be provided with a leachate collection system and leak detection system as stated in Subsections 2.1.3 and 2.3.4. The LCLDs will include all of the necessary piping and tanks to collect liquid which may accumulate between the vault liners. Level detection instruments (point type sensors) will be installed in the leachate collection piping, tanks and sumps to alarm the operators of liquids present. Alarms shall be generated via the data acquisition system and "separate means" as described above.

3.9.1.3 Telephones/Alarm System

The EDF will require the installation of telephone lines for data and voice service. The plantwide alarm and paging system will be extended to provide those services to the EDF.

3.9.2 Instrumentation/Control Design Considerations

3.9.2.1 Human Engineering Considerations on Controls and Information Displays

Not applicable to this project.

3.9.2.2 Diagnostic and Prognostic Capabilities

Not applicable to this project.

3.9.2.3 Response Time

Not applicable to this project.

3.9.2.4 Control Logic

Any logic diagrams for the sample collection and analysis system shall be provided by the successful vendor as part of his documentation package.

Control logic functions shall be provided to determine the sequence and frequency of the samples collected.

3.9.2.5 Maintenance and Spares

All installed instruments and controls shall have ten percent (10%) spares for maintenance use. It is anticipated that the instruments and control for the sample collection and analysis system and the perimeter monitoring system will be completely replaced every ten years.

3.9.2.6 Periodic Testing and Test Connections

The system installed for the control of the sample collection shall be tested on a monthly basis for two entire sample collection cycles.

3.9.2.7 Calibration - Accuracy and Frequency

The sample collection and analysis systems shall be spot checked for zero and span calibration points on a monthly basis. The spot checks shall be scheduled to ensure that every instrument sensor has been checked for zero and span settings at least once every six months. Accuracy checks shall be performed on a system-wide basis annually. These requirements apply to the perimeter radiation sensors and the ancillary controls.

3.9.2.8 Processing Capabilities

Not applicable to this project.

3.9.2.9 Data Communication

Sample collection and analysis readings as well as signals from the perimeter radiation sensors shall be sent to the EDF support facility via remote analog/digital input multiplexers and designated data quality telephone lines. The operator interface shall be a CRT display terminal. In addition, a printer shall be provided for the purpose of alarm and shift log generation.

3.9.2.10 Environmental Qualifications

Monitoring equipment shall be for general use, outdoor service.

3.9.2.11 Data Storage and Retrieval

Data from the sampling collection and analysis system as well as the perimeter monitoring shall be stored on computer magnetic disk. The display terminal shall be provided with a compatible disk drive.

3.9.2.12 Redundancy, Reliability, and Independence

An uninterruptable power supply (UPS) system shall be provided to provide backup power to the radiological monitoring equipment for eight hours after loss of primary power. The UPS system will also provide backup power to the data acquisition system for 24 hours after loss of primary power. UPS system capacity will be determined during Title I and Title II design for this project.

3.9.2.13 Equipment Availability and Spare Part Requirements

Instruments and control systems provided shall have manufacturer support for a minimum of ten years. This project shall provide a recommended spare parts list for the instrument and control systems as part of Title II design.

3.10 Fire Protection

3.10.1 Required Fire Protection Systems

3.10.1.1 Suppression and Detection

Fire suppression and detection requirements shall comply with the recommendations of the Fire Protection Design Analysis.

3.10.1.2 Portable Equipment

Fire extinguishers shall be provided on all heavy equipment (fork lift or crane) for suppression of Classes B and C (liquid and electrical) and equipment fires.

Additional manual support equipment required shall comply with the recommendations of the Fire Protection Design Analysis.

3.10.1.3 Fire Alarms

Radio frequency transmitting fire alarms may be considered. Radio Fire Alarm Control Centers associated with the system shall comply with DOE Order 6430.1A, Section 0110-99.8.6 and DOE Order 5300.1B as required by DOE Order 6430.1A, Section 0110-99.8.5. Antennas shall be provided with lightning protection in accordance with MIL-HDBK-419 as required by DOE Order 6430.1A, Section 1630-99.0. The design shall be approved by FMPC Safeguards and Security and an approval for the use of a radio transmitter may be required from the Federal Communications Commission (FCC).

3.10.2 Fire Protection Design Considerations

3.10.2.1 Life Safety Requirements

Life Safety Requirements shall be applicable to the design of the vaults provided by this project unless specifically modified or changed by the results of the Fire Protection Design Analysis. Recommendations of the Fire Protection Design Analysis when approved and issued shall take precedence to the life safety requirements provided by this document.

The design of the EDF as it affects the operations shall satisfy all applicable requirements of 29 CFR 1910. NFPA-101 shall apply where the 29 CFR 1910 does not apply or where NFPA 101 exceeds the requirements of 29 CFR 1910 documents (refer to DOE Order 6430.1A, Section 0110-2.1). After interim closure, no personnel entry to the EDF is planned and the design need not provide any specific life safety requirements after interim closure.

3.10.2.2 Compartmentalization

No design requirements have been identified for this project.

SECTION 4

LAWS, REGULATIONS, DOE ORDERS, CODES, AND STANDARDS

Unless specified otherwise in the design specifications, drawings, or purchase order, the applicable revision for DOE Orders, FMPC site requirements and other federal, state, and industry regulations, standards, or specifications shall be the revision in effect on the date of the start of design.

4.1 Federal, State, and Local Requirements

On-site Response Actions

Pursuant to CERCLA Section 121(e)(1) and the DOE/EPA Consent Agreement Section XIII, the DOE is not required to obtain any Federal, State, or local permits for response actions conducted entirely on-site. Therefore, a permit for the EDF would not be required. The Consent Agreement requires that on-site response actions must still satisfy the substantive Federal and State requirements that would have been included in any permits. The Consent Agreement also requires that the DOE identify the permits which would otherwise be required, associated permitting requirements, and how the on-site response action will comply with these associated requirements.

The discharge of any effluents (i.e., leachate and stormwater) to an off-site surface water body would need to be permitted since the discharge does not qualify as an on-site response action. Modifications will need to be submitted for any on-site EDF activity which affects an existing permit (i.e., NESHAP, NPDES, and RCRA) issued to the FMPC.

The DOE must satisfy all ARARs identified for the EDF by the EPA and OEPA. These ARARs include Federal and State environmental standards; clean-up standards; and control standards that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site (applicable ARAR); or standards that specifically address a sufficiently similar problem or situation (relevant and applicable ARAR). Local regulations do not constitute an ARAR under CERCLA unless incorporated into a State regulation or enforced by the State. No local ARARs have been identified. The DOE must explain how the EDF will satisfy each final ARAR.

To date, the EPA has not approved a final list of ARAR requirements for the EDF. The design criteria currently identified in this document for the EDF is based upon the draft list of EDF ARARs, Revision 2, dated February 25, 1991. The design criteria may need to be revised in response to EPA's final approved list of ARARs. The design related ARARs are provided as Exhibit 1. For each ARAR, the regulatory citation, a summary of the regulatory requirement, and the implementation/compliance strategy are provided. The ARAR design criteria are also incorporated within this report for each of the appropriate system descriptions.

Nonpromulgated federal or state advisories/criteria/guidance documents will also be considered during the design of the EDF and incorporated as appropriate. The EPA has identified several advisories/criteria/guidance documents as a To-Be-Considered (TBC). The incorporation of any TBC requirements into the EDF design is discretionary and may be subject to DOE/WMCO review/approval.

Off-site Activities

Permits must be obtained for any off-site activity (i.e., leachate/stormwater effluents, waste shipment from FMPC). The DOE must notify the EPA in writing of all permits required for all off-site activities. Upon request of the EPA, the DOE is to provide copies of all such permit applications and any other documents related to the permitting process.

Remedial Design/Remedial Action

In accordance with the DOE/EPA Consent Agreement Section XI, DOE is to submit to the EPA a Remedial Design (RD) and Remedial Action (RA) Work Plan. The RD Work Plan is to include the schedule for the implementation of the tasks and report submittals required to complete the remedial design. The design schedule for the EDF is to be a part of the RD Work Plan prepared by the Operable Units as appropriate. The RD Work Plan is to be submitted to EPA within 60 days of finalization of the Record of Decision (ROD) for each OU.

In accordance with the design schedule provided to EPA in the RD Work Plan, DOE must prepare and submit the RA Work Plan. The RA Work Plan is to include the following plans:

1) A sampling and analysis plan which includes a QAPP, and field sampling plan
2) A health and safety contingency plan
3) A plan for satisfaction of permitting requirements

4) A groundwater monitoring plan
5) An operations and maintenance plan
6) A schedule for implementation of the RA Work Plan (including submission of required reports).

The RD/RA Work Plans are to be developed in conformance with the ROD, the Statement of Work, the National Contingency Plan (40 CFR 300), EPA RD/RA guidance and policy applicable at the time of the final ROD date, and any additional guidance documents provided by the EPA.

4.1.1 Federal Laws, Executive Orders, and Regulations

The EDF project shall comply with the following Federal Laws, Executive Orders, and regulations. The below list includes both identified ARARs and other non-environmental requirements which affect the design and operation of the EDF. The specific environmental requirements are identified in Exhibit 1.

Federal Laws and Executive Orders

CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
Executive Order 11988	Floodplain Management
Executive Order 11990	Protection of Wetlands
FWCA	Fish and Wildlife Coordination Act
NEPA	National Environmental Policy Act
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
UMTRA	Uranium Mill Tailings Radiation Control Act

Federal Regulations

10 CFR 20 NRC Standards for Protection Against Radiation

10 CFR 61 NRC Licensing Requirements for Land Disposal of Radioactive Waste

10 CFR 1021 DOE National Environmental Policy Act Implementing Procedures

10 CFR 1022 DOE Floodplain/Wetland Management Policy

29 CFR 1910 Occupational Safety and Health Standards

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

40 CFR 122 National Pollutant Discharge Elimination System

40 CFR 125 Criteria and Standards for the National Pollutant Discharge Elimination System

40 CFR 129 Toxic Pollutant Effluent Standards

40 CFR 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants

40 CFR 141 National Primary Drinking Water Regulations

40 CFR 142 National Secondary Drinking Water Regulations

40 CFR 192 Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings

40 CFR 249 Guideline for the Federal Procurement of Cement and Concrete Containing Fly Ash

40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

41 CFR 101 Federal Property Management Regulations

Ohio Laws

ORC 3704 Ohio Air Pollution Control Law

ORC 3734 Ohio Solid and Hazardous Waste Management Law

ORC 6111 Ohio Water Pollution Control Law

Ohio Regulations

OAC 3745-50 to 69 Ohio Hazardous Waste Management Regulations

OAC 3745-01 Ohio Water Quality Standards

OAC 3745-09 Ohio Water Well Standards

OAC 3745-15 Ohio General Provisions on Air Pollution Control

OAC 3745-17 Ohio Particulate Matter Standards

OAC 3745-20 Ohio Asbestos Emission Control from Renovation, Demolition and Disposal Operations

4.2 DOE Orders

All applicable DOE Orders (environmental as well as nonenvironmental) related to the EDF design must be complied with independent of CERCLA requirements unless specifically released from so doing by the DOE. A list of the DOE Orders which are applicable to the design of the EDF are identified in the following list. Some of these DOE Orders prescribe clean-up standards, environmental standards, or standards of control and therefore are classified as TBC (see Section 4.1) under CERCLA Section 121.

2250.1C	Cost and Schedule Control Systems Criteria
4700.1	Project Management System
5400.1	General Environmental Protection Program
5400.3	Hazardous and Radioactive Mixed Waste Program
5400.5	Radiation Protection of the Public and the Environment
5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.5	Safety of Nuclear Facilities
5480.7	Fire Protection
5480.11	Radiation Protection for Occupational Workers
5481.1B	Safety Analysis and Review System
5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities
5500.2A	Emergency Notification, Reporting, and Response Levels
5500.3	Reactor and Nonreactor Nuclear Facility Emergency Planning, Preparedness, and Response Program for DOE Operations
5500.4	Public Affairs Policy and Planning Requirements for Emergencies
5633.3	Control and Accountability of Nuclear Materials
5700.6B	Quality Assurance
5820.2A	Radioactive Waste Management
6430.1A	General Design Criteria

4.3 Applicable Industry Codes and Standards and Other References

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO-GDHS-84 A Policy on Geometric Design of Highways and Streets

American Conference of Governmental Industrial Hygienists (ACGIH)

Manual for Recommended Practice for Industrial Ventilation

TLVs: Threshold Limit Values and Biological Exposure Indices

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 349 Code Requirements of Nuclear Safety Related Concrete Structures

ACI 350R Concrete Sanitary Engineering Structures

American Institute of Steel Construction (AISC)

AISC M011 Manual of Steel Construction

American Iron and Steel Institute (AISI)

Manual for Structural Applications of Steel Cables for Buildings

Specifications for the Design of Cold-Formed Steel Structural Members

ASTM

A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A616	Standard Specification for Deformed and Rail-Steel Bars for Concrete Reinforcement
A617	Standard Specification for Deformed and Axle-Steel Bars for Concrete Reinforcement

American Nuclear Society (ANS)

ANS 6.4	Guidelines on the Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants
ANS 6.4.2	Specification for Radiation Shielding Materials

American National Standards Institute (ANSI)

ANSI A58.1	Building Code Requirements for Minimum Design Loads in Buildings and Other Structures
ANSI C2	National Electrical Safety Code

American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)

ASHRAE	Applications Handbook
ASHRAE	Equipment Handbook

American Welding Society (AWS)

D1.1	Structural Welding Code - Steel
D1.3	Structural Welding Code - Sheet Steel

Crane Manufacturers Association of American (CMAA)

CMAA-70 Specification for Electric Overhead Traveling Cranes

Department of Energy

DOE/EV/1830-T5 A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA), April 1980

PNL-6577 Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels That Are As Low As Reasonably Achievable (ALARA), July 1988

UMTRA-DOE/AL 400503.00 Remedial Action Planning and Disposal Cell Design - To Comply with the Proposed EPA Standards (40 CFR Part 192), January 1989.

UMTRA-DOE/AL 050424.0002 Technical Approach Document - Revision II, December 1989.

UMTRA-DOE 350124 Project Surveillance and Maintenance Plan, September 1985.

UMTRA-DOE/AL 163 Plan for Implementing EPA Standards for UMTRA Sites, January 1984.

Institute of Electrical and Electronics Engineers (IEEE)

IEEE 141 Recommended Practice for Electric Power Distribution for Industrial Plants

IEEE 142 Recommended Practice for Grounding Industrial and Commercial Power Systems

IEEE 739 Recommended Practice for Energy Conservation and Cost Effective Planning in Industrial Facilities

Illuminating Engineering Society of North America

IES	Lighting Handbook

National Fire Protection Association (NFPA)

NFPA-70	National Electric Code (NEC)
NFPA-101	Life Safety Code
NFPA-110	Standard for Emergency and Standby Power Systems
NFPA 241	Safeguarding Construction, Alteration, and Demolition Operations

Prestressed Concrete Institute (PCI)

MNL-116	Manual for Quality Control for Plants and Production of Prestressed Concrete Products
MNL-120	Design Handbook

Post-Tensioning Institute (PTI)

Post-Tensioning Manual

Steel Deck Institute (SDI)

Publ. 25	Design Manual for Composite Decks, Form Decks, and Roof Decks
Publ. DDM01	Diaphragm Design Manual

Steel Joist Institute (SJI)

Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders

International Conference of Building Officials (ICBO)

UBC Uniform Building Code

Lawrence Livermore National Laboratory (LLNL)

UCRL 15910 Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards

U.S. Environmental Protection Agency

Health Effects Assessment Summary Tables (HEAST)

EXHIBIT 1
ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

Exhibit 1 presents the regulatory design, construction, operation and closure requirements for the Engineered Disposal Facility (EDF). These regulatory requirements are based upon the list of Applicable, or Relevant and Appropriate Requirements (ARARs), Revision 2, dated February 25, 1991, developed for the EDF.

The ARARs developed for the EDF were divided into five different categories as identified below. For each ARAR, the regulatory citation, a summary of the regulatory requirement, and the implementation/compliance strategy are provided.

Administrative - Administrative requirements, in general, are not ARARs but are listed in Exhibit 1 to alert DOE of potential impacts to existing programs.

Design - Design requirements are those items which must be incorporated within the design plans. Each design requirement is divided and sorted by the individual design engineering discipline responsible for implementation of the requirement. Non-promulgated Federal or State advisories/criteria/guidance documents will also be considered during the design of the EDF. The EPA has identified several advisories/criteria/guidance documents as TBCs. The incorporation of TBC requirements into the EDF design is discretionary and may be subject to DOE review and approval. The design requirements also include siting constraints which are to be verified as part of the siting investigation. A Site Selection Report will be generated to demonstrate compliance with the siting constraints.

Modelling - Modelling requirements are those items which relate to chemical or radioactive exposure levels. Compliance with these requirements are normally verified by using a model. The modelling results could impact the design of the EDF; therefore, the modelling is performed in conjunction with design. The design parameters specified by other ARARs are assumed to produce acceptable modelling results; this assumption will be verified as part of the Safety Analysis Report.

Operational and Plan - Operational and Plan requirements are those items which relate to the operations and post-construction activities of the EDF. Some of these items may not be ARARs but are included in Exhibit 1 for completeness. The implementation of these requirements may need to be addressed in the RA Work Plan which is to be submitted to EPA for approval. The Remediation Contractor is responsible for the actual implementation of any operational or plan requirements.

The ARARs are also separated by hazardous and radioactive waste requirements in the event that the EDF is designed to have different disposal structures for each type of waste.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.37 [OAC 3745-54-37]	Arrangements must be made with the local authorities to ensure proper emergency planning procedures.	Administrative - DOE - Procedures will be consistent with existing arrangements. These arrangements will be described in the RD/RA Work Plan.
40 CFR 264.193 [OAC 3745-55-93]	Secondary containment systems (including leak detection and removal systems) must be provided for each tank and ancillary equipment to prevent release of any hazardous waste to the environment in the event of a spill or leak. The specific design requirements are identified in 40 CFR 264.192.	Design - All Disciplines (Environmental lead) - Design details for secondary containment system will be developed in conjunction with the tank design. If tank is place underground the Underground Storage Tank provisions may become applicable.
40 CFR 264.301(c) [OAC 3745-66-01]	The EDF shall contain a double liner system with a leachate collection and a leak detection system.	Design - All Disciplines - The design details will be incorporated into the design drawings.
10 CFR 61.52(a)(7) & 40 CFR 264.309 [OAC 3745-66-09]	At least three permanently surveyed benchmarks referenced to USGS or NGS control points shall be established at FMPC to facilitate surveys.	Design - Civil - The establishment of these benchmarks with be included within the construction bid package.
10 CFR 61.52(a)(8) & 61.53(d)	A buffer zone shall be established around the EDF to allow detection of radionuclides (environmental monitoring) and, if needed, to permit mitigation prior to release beyond the FMPC boundary.	Design - Civil/Geotechnical - A monitoring buffer zone will be established as part of the EDF design.
40 CFR 264.14 [OAC 3745-54-14] & 10 CFR 61.42	A physical barrier (i.e., fence) or 24-hour surveillance system must be provided to control the unknowing or unauthorized entry of persons or livestock onto the active portion of the EDF. Signs (legible from a distance of 25 feet) must be posted at each entrance to the active portion and at other locations as required by 40 CFR 264.14(c).	Design - Civil - The EDF is to be contained within the security fencing of the FMPC. Signs to be posted as required.
40 CFR 264.301(a) [OAC 3745-66-01]	The materials used for the leachate collection and leak detection systems are to have sufficient strengths to prevent collapse due to loads imposed by the waste materials and final cover, or the movement of operating equipment. The leachate collection and leak detection systems are to be designed to maintain ≤1 foot of leachate over the lowest point of the bottom liner and to operate without clogging.	Design - Civil - The appropriate strength calculations will be performed and a statement of the system's acceptability will be included in the RD Wok Plan. The design details will be incorporated into the design drawings.
40 CFR 264.301(a) [OAC 3745-66-01]	The liners shall have sufficient thickness and strength to prevent failure due to pressure gradients (internal static head and external hydraulic forces), climatic conditions, installation stresses, and daily operational stresses. The liners are to be placed upon a suitable foundation or base which adequately support the liner system and not fail due to pressure gradients (compression or uplift), or settlement.	Design - Civil/Geotechnical - The appropriate calculations will be performed and a statement of the liner's acceptability will be included in the RD/RA Work Plan.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.301(f) & (g) [OAC 3745-66-01], 10 CFR 61.50(a)(5) & (6), & 10 CFR 61.51(a)(5) & (6)	The drainage system surrounding the EDF must be capable of preventing run-on (non-contaminated storm water) from coming into contact with the waste materials during the peak flow of a 25-year storm event. The upstream drainage areas are to be minimized to decrease the amount of run-on. A run-off (contaminated storm water) retention system must be provided and have a volume ≥24-hour, 25-year storm. The size of the run-off area should be minimized to reduce the amount of potential contaminated storm water. The disposal area should be well drained and free of areas subject to flooding or ponding. The drainage ditch gradients shall be limited to prevent erosive velocities.	Design - Civil - The drainage systems will be sized using the Rational Method for calculating peak flows and runoff volumes. Drainage system and erosion controls will also comply with any specific requirements of the Butler/Hamilton County Soil Erosion Control documents. Calculations will be available for inclusion in the RD/RA Work Plan.
40 CFR 264.303(a) [OAC 3745-66-03]	Synthetic liners (including final cover systems) must be inspected for uniformity, damage, imperfections, seam/joint tightness, tears, punctures and blisters during installation of the liners. Soil-based/admixed liners (including final cover systems) must be inspected for uniformity, damage, imperfections, lenses, cracks, channels, root holes, and other structural non-uniformities (that may increase the permeability of the liner) during installation of the liners.	Design - Civil/Environmental/Geotechnical - A QA/QC program will be developed in accordance with the material supplier's specifications, FMPC requirements, and standard industrial practices. The QA/QC program will be part of the construction bid package for liner installation and will also be incorporated into the RD/RA Work Plan.
40 CFR 264.310(a) [OAC 3745-11] & 10 CFR 61.42, 61.51(a)(1) & 61.52(a)(2)	The final cover must (1) minimize infiltration, (2) require minimal maintenance, (3) be sloped to promote drainage, minimize ponding, and minimize erosion/abrasion, (4) accommodate settling/subsidence, (5) have a permeability ≤ the bottom liner system, (6) provide long-term isolation, and resist degradation by geological processes and biotic activity. For radioactive Class C waste disposal, the final cover system is to be either: (1) ≥5 meters thick or (2) have an intruder barrier with a 500 year operating life.	Design - Civil/Geotechnical - Final cover design plans will be developed to meet these requirements.
10 CFR 61.50(a)(2), (3) & (11)	The EDF must be capable of being characterized, modeled, analyzed and monitored. The impacts of future development (including existing nearby facilities and activities) and population growth will have on the EDF should be considered.	Design - Environmental - NRC regulatory guidance, such as NUREG-1199, will be reviewed to assist with interpreting the implementation of this requirement.
40 CFR 122.41 [OAC 3745-33-05] & 40 CFR 122.44 [OAC 3745-33-04]	Any wastewater discharge from the EDF to a surface water body must comply with all the requirements of the NPDES program, including monitoring and record keeping. Also applicable are technology-based effluent limitations and standards based under Section 301 of the CWA and technology-based controls for toxic pollutants.	Design - Environmental/Process - Effluent limitations and monitoring requirements for any proposed wastewater discharges will be determined during Title I design and will be consistent with the existing FMPC NPDES requirements.

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EXHIBIT 1

ENGINEERED DISPOSAL FACILITY REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.18(b) [OAC 3745-54-18], 10 CFR 61.50(a)(5), 10 CFR 1022, & Executive Orders 11988 & 11990	For hazardous waste disposal, the EDF shall not be located in a 100-year floodplain unless the EDF is designed, constructed, operated, and maintained to prevent washout of any hazardous waste. For radioactive waste disposal, the EDF can not be located in a 100-year floodplain, coastal high-hazard area, or wetland. The EDF shall be located outside of a floodplain or wetland if possible. Under 10 CFR 1022, adverse impacts to floodplains and wetlands are to be avoided. If it is necessary to locate the EDF within a floodplain or wetland, the effect from the EDF must be minimized. A floodplain or wetland assessment must be published in the Federal Register prior to taking any action within the floodplain/wetland to allow time for public review and comment. Under Executive Order 11988, the potential effects of any Federal action that will occur in a floodplain must be evaluated. The DOE must consider alternatives to avoid adverse effects and incompatible development in floodplains. If the DOE decides that the only practicable alternative requires siting in a floodplain, the action must be designed to minimize potential harm to the floodplain and a public notice (with prescribed contents) and opportunity for public comment provided. Under Executive Order 11990, Federal agencies are to avoid construction within a wetlands unless there are no practicable alternatives and all practicable measures are included in the construction project to minimize any impacts to the wetland. Early review of the proposed action is to be provided to the public.	Design - Environmental/Civil - Areas which are within a 100-year floodplain or wetland will be avoided. The evaluation criteria identified in Executive Orders 11988 and 11990, 10 CFR 1022, and NEPA guidance documents will be utilized to evaluate and demonstrate compliance for any activities which may be within a floodplain or wetland. Compliance with these requirements will be described within the Site Selection Report.
40 CFR 264.95 [OAC 3745-54-95] & 264.97 [OAC 3745-54-97]	Groundwater monitoring wells are to be provided at the point of compliance in sufficient numbers and locations to allow detection of contaminant migration from the EDF into the upper most aquifer.	Design - Environmental/Geotechnical - Monitoring wells locations will be established based upon the EDF site layout. The locations and construction details will be consistent with established FMPC standards. The monitoring program will be initiated prior to constructing the EDF to obtain baseline information for the establishment of a monitoring program.
10 CFR 61.50(a)(10)	For radioactive waste disposal, areas subject to surface geological processes (i.e., mass wasting, erosion, slumping, landslides, and weathering) which significantly affect the ability of the EDF to meet the performance objectives shall be avoided.	Design - Geotechnical - Existing information will be utilized to confirm that the EDF is not located where surface geological processes which could impact the integrity of the EDF or otherwise not permit compliance with the performance objectives. If present, additional design requirements may need to be specified. Compliance with this requirement will be described within the Site Selection Report.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
10 CFR 61.50(a)(4)	Areas that contain known natural resources which, if exploited, cause a failure of the EDF such that the performance objectives would not be meet, are to be avoided.	Design - Geotechnical - A record/file search and review will be conducted to determine if any such known natural resources exist at the FMPC. If such resources are present, the performance objective impacts will be considered. Findings will be discussed in the RD/RA Work Plan. Compliance with this requirement will be described within the Site Selection Report.
10 CFR 61.50(a)(7) & (8)	Radioactive waste disposal is not to occur within the water table fluctuation zone. The EDF is to be designed to prevent the discharge of groundwater from the hydrogeologic unit into the disposal cell.	Design - Geotechnical - Geological and hydrogeological information will be obtained to ensure that these provisions will be meet. Compliance with this requirement will be described within the Site Selection Report.
40 CFR 264.18(a) [OAC 3745-54-18] & 10 CFR 61.50(a)(9)	For hazardous waste disposal, the EDF shall not be located within 200 feet of a fault which has had displacement in the Holocene time. For radioactive waste disposal, areas subject to tectonic processes (i.e., faulting, folding, seismic activity, and vulcanism) which significantly affect the ability of the EDF to meet the performance objectives shall be avoided.	Design - Geotechnical - Existing information will be utilized to confirm that the EDF is located beyond 200 feet of this type of fault and is not in a tectonic area. If present, additional design requirements may need to be specified. Compliance with this requirement will be described within the Site Selection Report.
40 CFR 264.192(a)(5) [OAC 3745-55-92]	Tank systems will be designed to ensure the foundations support the load of a full tank, tanks are anchored to prevent floatation, and withstand frost heave.	Design - Geotechnical/Civil/Mechanical - Design calculations will be provided and included with the assessment report.
40 CFR 264.192(c) [OAC 3745-55-92]	Underground tanks and components must be backfilled with a non-corrosive, porous, homogeneous substance. The backfill material must be placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.	Design - Geotechnical/Mechanical - The backfill materials will be specified on the design drawings and specifications.
OAC 3745-09-10	Upon completion of testing, test holes must be filled with grout or other material to prevent contaminants from entering groundwater, or converted into a well. Wells which are neither use for supplying groundwater nor use for monitoring (i.e., quality, quantity, or water level measures) must be filled with grout or other material to prevent contaminants from entering groundwater, or maintained in accordance with OAC 3745-9-09.	Design - Geotechnical - All test holes which are installed as part of an EDF siting investigation will either be closed or converted into a monitoring well in accordance with OAC 3745-9-10. Any existing monitoring wells within the EDF boundaries that required to be abandoned or replaced will be closed as required by OAC 3745-9-10. Provisions for sealing test holes and abandoning monitoring wells will be specified within the design package.
40 CFR 264.32 [OAC 3745-54-32]	Unless demonstrated otherwise, the following equipment must be provided: 1) an internal communications or alarm system, 2) telephone or two-way radio to summon emergency assistance, 3) portable fire extinguishers, spill control equipment, and decontamination equipment, and 4) water at adequate volume and pressure.	Design - Instrumentation/Environmental/Fire Protection - Specific equipment needs will be consistent with FMPC and existing RCRA Part B requirements. The equipment requirements or demonstrations will be included in the RD/RA Work Plan.

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EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.301(a) & (c) [OAC 3745-66-01]	The top and bottom liners shall be constructed of materials which prevent the migration of any waste constituent into the top liner and through the bottom liner for a time period equal to the sum of the disposal operations and post-closure care period. The liners are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure.	Design - Materials Specialist - The rationale for material selection will be described in the RD/RA Work Plan.
40 CFR 264.301(a) [OAC 3745-66-01]	The materials used for the leachate collection and leak detection systems are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure.	Design - Materials Specialist - The rationale for material selection will be described in the RD/RA Work Plan.
40 CFR 264.192(a)(3) [OAC 3745-55-92]	A corrosion evaluation shall be performed for tank systems or components in which the external shell of a metal tank or any external metal component will be in contact with the soil or with water. The corrosion evaluation will include those items listed in 40 CFR 264.192(a)(3).	Design - Mechanical - A corrosion evaluation will be conducted as part of the design/selection of any metal tanks and/or tank components. Any corrosion protection requirements will be specified on the design drawings and specifications.
40 CFR 264.192(a)(4) [OAC 3745-55-92]	Underground tank systems (including underground pipes) shall be protected against adverse affects by vehicular traffic by either design or operational measures.	Design - Mechanical/Geotechnical/Civil - A design calculation will be prepared to demonstrate that the tank system is adequately protected. If required, operational controls regarding vehicular traffic will be noted on the appropriate design documents and DOE will be notified.
40 CFR 264.192(b) [OAC 3745-55-92], 40 CFR 264.192(d) [OAC 3745-55-92], & 264.192(f) [OAC 3745-55-92]	The installation of the tank system is to be inspected by an independent, qualified installation inspector or an independent, qualified registered professional engineer for structural damage or inadequate construction/installation (i.e., weld breaks, punctures, scrapes of protective coatings, cracks, and corrosion). The installation of any required corrosion protection system that is field fabricated must be supervised by an independent corrosion expert. The tank and ancillary equipment must be leak tested prior to being covered, enclosed or placed into service.	Design - Mechanical - This requirement will be incorporated into the specification for the tank installation. An installation report will be required to be prepared by the inspector/engineer. Any required repairs and field fabrication of a corrosion protection system will be documented in the installation report. The installation report will be certified in accordance with 40 CFR 270.11(d).
40 CFR 264.192(e) [OAC 3745-55-92]	Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. API Publication 1615 (Nov. 1979), ANSI B31.3, and ANSI B31.4 may be used, where applicable, for the installation of piping systems.	Design - Mechanical - The appropriate support and protection will be specified on the design drawings and specifications.
40 CFR 264.194 [OAC 3745-55-94]	The tank is to be equipped with spill prevention devices (i.e., check valves, dry disconnect couplings) and overfill controls (i.e., liquid level probes, high level alarms, interlocks to stop inflow, or a bypass system to a standby tank). For open top tanks, sufficient freeboard shall be maintained to prevent overtopping by wave or wind action or by precipitation.	Design - Mechanical/Instrumentation - The appropriate mechanical and instrument controls will be specified on the design drawings and specifications.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.31 [OAC 3745-54-31]	The EDF must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.	Design - N&SS - The design of the EDF will be evaluated as part of the Safety Analysis Report. A statement to address this item will be included in the RD/RA Work Plan.
10 CFR 20.105 & 20.106 [10 CFR 61.43]	The radionuclide concentrations in air and wastewater effluents are to be limited to the levels specified in Appendix B, Table II or 10 CFR 20.303 (wastewater effluent discharges to a sanitary sewerage system).	Design - Process - These radionuclide effluent limitations will be utilized as the basis for process design.
OAC 3745-01	Design must ensure that the construction/operation of the EDF does not violate the minimum water quality requirements for the Great Miami River. The EDF shall not be a source of floating debris, materials producing odor, and/or color change, and substances in toxic concentrations. The specific water use designation for the Great Miami River and Paddy's Run is identified in OAC 3745-1-21. The corresponding water quality criteria is listed in OAC 3745-1-07. "Mixing Zones" may be established for each discharge pursuant to OAC 3745-1-06.	Design - Process/Environmental - Where possible, existing wastewater outfalls and discharge limitations will be utilized for any wastewater generated as a result of EDF operations (i.e., leachate). If any new wastewater discharges to either the Great Miami River or Paddy's Run are required to be established, a mixing zone demonstration will be prepared to ensure that the water quality criteria (OAC 3745-1) will be obtained. This mixing zone demonstration may be required to be included with the RD/RA Work Plan.
40 CFR 141 [OAC 3745-81]	Pursuant to CERCLA Section 121(d)(2)(A)(ii) and 40 CFR 300.430(e)(2)(i)(B), MCLs and non-zero MCLGs established under the Safe Drinking Water Act are specified to be relevant and appropriate for attainment in situations where remedial actions are being taken to cleanup ground and surface waters which are potential drinking water sources. The MCLs for inorganic pollutants are established under 40 CFR 141.11 [OAC 3745-81-11] and 40 CFR 141.62 [OAC 3745-81-12]. The MCLs for organic pollutants are established under 40 CFR 141.12 [OAC 3745-81-12] and 40 CFR 141.61. The MCLs for radioactivity are established under 40 CFR 141.15 [OAC 3745-81-15] and 40 CFR 141.16 [OAC 3745-81-16]. The MCLGs for inorganic and organic pollutants are established under 40 CFR 141.50 and 40 CFR 141.51.	Modelling - Geotechnical - In accordance with the ARARs identified for the EDF, the MCLs and non-zero MCLGs will be utilized to develop design-based performance criteria for the EDF to ensure that the underlying aquifer is adequately protected. A groundwater transport model will be used to determine if the regulatory specified EDF design requirements are adequate to meet the MCLs and non-zero MCLGs. If these regulatory levels are not adequate, additional design criteria for the EDF will be specified. It is anticipated that this modelling will be conducted during the Title I design effort.

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EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
10 CFR 20.101, 20.103(a), 20.103(b) & 20.104 [10 CFR 61.43]	The occupational radiation dose per calendar quarter in **restricted areas** is as follows: 1) Whole body (i.e., head and trunk, active blood forming organs, eyes, or gonads) - 1¼ rems, 2) Hands, forearms, feet and ankles - 18¾ rems, 3) Skin - 7½ rems. To the extent practicable, process or engineering controls shall be utilized in **airborne radioactivity areas** to limit the concentration of radionuclides to acceptable levels (i.e., an individual is not to be exposed (inhalation and skin absorption) to radioactive materials which would exceed the limits specified in Appendix B, Table I for any 13 week 40 hours/week period); otherwise, other controls are required. The occupational radiation dose limits for **unrestricted areas** is as follows: 1) Whole body - 0.5 rem for any period of one calendar year, 2 mrem for any one hour period, or 100 mrem for any consecutive 7 day period. [NOTE: The exposure levels for persons under 18 years old are 10% of the above levels for occupational radiation dose and the limits specified in Appendix B, Table II for inhalation and skin absorption.]	Modelling - N&SS - Calculations will be performed as part of the Safety Analysis Report to ensure that the EDF design will maintain these occupational exposure limits. If required and practicable, engineering controls will be provided to maintain exposure below specified limits; otherwise, recommendations for a control program will be provided. This information will incorporated as part of RD/RA Work Plan.
10 CFR 61.41	The maximum radioactive release to the environment shall comply with ALARA principles and shall not expose any member of the public to an annual dose exceeding an equivalent of 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any other organ.	Modelling - N&SS - Calculations will be performed as part of the Safety Analysis Report to ensure that the EDF design will maintain these environmental exposure limits. This information will incorporated as part of RD/RA Work Plan.
10 CFR 61.52(a)(6)	Upon completion of the post-closure period, the radiation limits specified in 10 CFR 20.105 shall not be exceeded at the surface of the final cover.	Modelling - N&SS - The design of the EDF will be evaluated as part of the Safety Analysis Report. A statement to address this item will be included in the RD/RA Work Plan.
40 CFR 61.192 & 40 CFR 192 Subpart A & C	As required by 40 CFR 61.192, no more than 20 $\rho Ci/m^2$-sec of Radon-222 (as an average for the entire source) shall be emitted into the air from the EDF. The provisions of 40 CFR 192.02 requires that the radon controls shall be designed to be effective for at least 200 years and up to 1000 years. The radon control design is to provide reasonable assurance that releases of Radon-222 to the atmosphere will not exceed an average (for the entire disposal site surface and for at least a one year period) release rate of 20 $\rho Ci/m^2$-sec. Guidance regarding the design and implementation of this radon control standard is provided in 40 CFR 192 Subpart C.	Modelling - N&SS - Calculations will be consistent with the existing NESHAP program requirements, the implementation guidance provided in 40 CFR 192 Subpart C, and the requirements identified in the DOE UMTRA guidance documents. Results will be part of the Safety Analysis Report and be addressed as part of RD/RA Work Plan.
40 CFR 61.92 & 61.93	The off-site public exposure (ambient air) to radionuclide emissions (excluding Radon-220 and 222) shall be limited to 10 mrem/yr (above background). This limit is for an effective dose equivalent as calculated per the International Commission on Radiological Protection's Publication No. 26. Modelling and sampling procedures are specified in 40 CFR 61.93.	Modelling - N&SS - Calculations will be integrated with existing NESHAP program, including any emission testing notifications required under 40 CFR 61.13. Results will be part of the Safety Analysis Report and be addressed as part of RD/RA Work Plan.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
10 CFR 20.101(b), 20.102, 20.103(c) to (f), 20.104, 20.107, 20.108, 20.201, 20.202, 20.203, & 20.204 [10 CFR 61.43]	An individual in a restricted area may receive a total occupational dose (whole body) up to 3 rems during any calendar quarter provided that the individual's accumulative whole body dose is less than 5(N-18), where N is the age of the individual. The exposure levels for persons under 18 years old are 10% of the above levels for occupational radiation dose and the limits specified in Appendix B, Table II for inhalation and skin absorption. Precautionary procedures (i.e. increased surveillance, limitation of working times, respiratory protection) can be used to limit intake of airborne radioactive materials. [Note: Special requirements are specified for respiratory programs. Radiation exposure records are to be maintained. Medical surveillance and monitoring are to be used to assess radiation exposures. Warning signs are to be posted and administrative controls are to be implemented for restricted areas.	Operational - DOE - Existing DOE programs will be followed to limit worker radiation exposure in lieu of 10 CFR 20.
10 CFR 61 Subpart G	**FOR RADIOACTIVE WASTE DISPOSAL:** The operating record is to include the following reports: (1) disposal records (location, quantity, date, waste package condition and radiation levels, any required repacking, and manifest discrepancies), and (2) radiation monitoring results.	Operational - DOE - The operating record and reports, if required, will identified in the RD/RA Work Plan. The EDF operating record and reporting will be integrated with any existing FMPC program. Each required report form will have instructions for placing a copy of the completed form into the EDF Operating Record.
40 CFR 264.301(h) & (i) [OAC 3745-66-01], 10 CFR 61.52(a)(4), (5), (9) & (10)	The run-on and run-off control systems are to emptied and managed expeditiously after storm events to maintain design capacities. The wind dispersal of any particulate matter is to be controlled. Void space between waste packages is to be minimized during disposal operations and filled to reduce future subsidence within the EDF. Partial closure activities (closure of individual disposal units) are to be initiated upon reaching capacity. On-going operations are not to impact any areas which have been closed.	Operational - DOE - Any required operational procedures will be identified in the RD/RA Work Plan. The need to fill between waste packages to prevent subsidence will be considered as part of the EDF design.
40 CFR 264.71, 264.72 & 264.76 [OAC 3745-54-71, 72 & 76]	The State of Ohio manifest system is to be utilized for any off-site shipment of hazardous wastes from the EDF. The manifest procedures and reports (including manifest discrepancies and unmanifested acceptance) specified under 40 CFR 264.71, 264.72 and 264.76 are to be followed.	Operational - DOE - Manifesting procedures and reports, if required, will identified in the RD/RA Work Plan. The EDF manifesting program will be integrated with any existing FMPC program.
40 CFR 264.73, 264.74, 264.75, 264.77, 264.195(d), 264.309 & 264 Appendix I [OAC 3745-54-73, 74, 75 & 77]	**FOR HAZARDOUS WASTE DISPOSAL:** The operating record is to include the following reports: (1) as-built drawings of the location, dimension, and depth of each disposal cell with respect to permanently surveyed benchmarks, (2) disposal records (type, quantity, location, and manifest number) for each waste shipment, (3) waste analysis, (4) contingency plan incidents, (5) groundwater monitoring results, (6) annual waste minimization certification, (7) LDR treatment/generator certifications, (9) inspection reports, and (10) training records. The operating record is to be available for on-site inspection by EPA/OEPA. A biennial report is to be submitted to EPA/OEPA in accordance with 40 CFR 264.75.	Operational - DOE - The operating record and biennial reports, if required, will identified in the RD/RA Work Plan. The EDF operating record and biennial reporting will be integrated with any existing FMPC program. Each required report form will have instructions for placing a copy of the completed form into the EDF Operating Record.

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EXHIBIT 1

ENGINEERED DISPOSAL FACILITY REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 61.94 & 61.95 [OAC 3745-54-94 & 95]	An annual report must be submitted to EPA headquarters and regional offices by June 30. This report includes the monitoring results as recorded in DOE's Effluent Information System and the effective dose equivalent calculations, as required by 40 CFR 61.93, for the previous year. Records as specified under 40 CFR 61.95 must be maintained for at least 5 years.	Operational - DOE - This reporting requirement will be integrated with the existing record keeping and reporting system established for the currently issued NESHAP permits. Requirement will be addressed in the RD/RA Work Plan.
OAC 3745-15-07, OAC 3745-17-05 & OAC 3745-17-08	As specified in OAC 3745-15-07, the emission or escape into open air from any source whatsoever in such a manner or in such amounts as to endanger the health, safety, or welfare of the public or to cause unreasonable injury or damage to property shall be declared a public nuisance and is prohibited. The significant and avoidable deterioration of air quality shall be prohibited as required by OAC 3745-17-05. As required by OAC 3745-17-08, the visible emissions of fugitive dust generated during grading, loading, or construction operations, and other practices which emit fugitive dust are to minimized or eliminated.	Operational - DOE - During construction and operation of the EDF, precautions (such as controlling dust emissions, prohibiting open burning, etc) will be taken to prevent the occurrence of a public nuisance, to minimize or eliminate visible fugitive dust emissions, and to avoid the significant deterioration of air quality.
OAC 3745-20-06 [40 CFR 61.154]	No visible emissions are allowed during the disposal of asbestos waste unless the provisions of OAC 3745-20-06(B) are meet [includes waste handling and operational restrictions, and the posting of warning signs]. The regulatory requirements of 40 CFR 763 Subpart G (Asbestos Abatement Projects) may also be relevant and appropriate for the disposal to asbestos material at the EDF.	Operational - DOE - it is envisioned that the disposal operations at the EDF will be conducted without causing the release of visible emissions to the atmosphere. Therefore, provisions for posting warning signs will not be addressed as part of the EDF design.
10 CFR 61.55, 61.56, & 61.52(a)(11)	**FOR RADIOACTIVE WASTE DISPOSAL:** Wastes are classified as either Class A, B, C, or greater than Class C in accordance with 10 CFR 61.55. Class A wastes are to be segregated unless they meet the stability requirements listed in 10 CFR 61.56(b). Greater than Class C cannot be placed into the EDF, 10 CFR 61.55 requires that these wastes be placed in a geologic repository. Class A, B and C wastes disposal criteria are as follows: 1) cardboard or fiberboard packages are not allowed for disposal, 2) liquid waste shall be solidified or packed with twice the amount of absorbent required, 3) solid wastes shall contain ≤1% (volume) free liquids, 4) explosive waste are prohibited, 5) waste which generate gases, vapors, or fumes in quantities resulting in an occupational exposure above the 10 CFR 20 limits is prohibited, 6) pyrophoric wastes must be rendered (treated or packaged) nonflammable, 7) gases are to be packaged so that pressure ≤1.5 atm @ 20°C and activity ≤100 Ci/container, 8) hazardous, biological, pathogenic, and infectious wastes are to be treated to minimize their hazards, and 9) waste packages are to be labelled (Class A, B, or C). Additional disposal criteria for Class B and C are as follows: 1) the waste shall be treated or packaged to maintain structural stability (physical dimensions and form) under disposal conditions (overburden weight, equipment loads, moisture, microbial attack, and radiation and chemical exposure), 2) stabilized waste are to contain ≤0.5% (volume) free liquids, and 3) maximize waste density and minimize the void space within the waste container. Only waste containing or contaminated with radioactive materials is to be placed into the EDF.	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP. The capabilities of the on-site laboratory, if built, will be considered during the development of the WAP. Existing radioactive waste characteristics and classifications will be used to prepare the WAP.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 125.100 & 40 CFR 125.104	The EDF shall be operated under Best Management Practices (BMP) for toxic pollutant effluents as defined under 40 CFR 125. The toxicity of the pollutants, quantity of the pollutants used/produced/discharged, history of NPDES violations, history of significant leaks or spills of hazardous pollutants, potential for adverse impact of public health, and other relevant factors shall be considered when developing the BMP plan.	Plan - Environmental - The BMP plan for the EDF will be developed during Title I design and will be consistent with the existing FMPC BMP plan (Topical Manual FMPC/SUB-011, Feb. 1988). The BMP plan for the EDF may be required to be submitted to EPA as part of RD/RA Work Plan.
40 CFR 136.1 to 40 CFR 136.4	The test procedures listed in 40 CFR 136 are required to be followed for monitoring any wastewater effluent discharged from the EDF. The specific monitoring parameters are determined pursuant to the NPDES permitting process. Test procedures exist for biological, inorganic, non-pesticide organic, pesticide, and radiological constituents. The required containers, preservation techniques, and holding times are also specified under 40 CFR 136. The use of alternate test procedures can be granted by the EPA.	Plan - Environmental - An effluent monitoring plan will be developed during Title I design for the discharge of any EDF wastewater. This monitoring plan will be consistent with existing FMPC procedures. Any required in-line sampling/monitoring equipment will be specified as part of the design package.
40 CFR 264 Subpart G, 264.197 & 264.310(b), & 10 CFR 61.59(b)	A closure plan, which describes the procedures to be followed when closing the EDF (including tanks and installation of the final cover), and a post-closure plan, which describes the maintenance activities (final cover repairs, leachate collection/removal operation, groundwater monitoring, inspections/surveillance, drainage system maintenance, surveyed benchmark maintenance), are to be submitted along with the design information. The post-closure care period is to extend for a minimum of 30 years and is not to be relied upon for more than 100 years.	Plan - Environmental/N&SS - The closure and post-closure plan will be developed consistent with FMPC goals. The plan will be part of the RD/RA Work Plan.
40 CFR 264 Subpart D	A Contingency Plan and Emergency Procedures are to be developed for the EDF in accordance with 40 CFR 264 Subpart D. The emergency procedures will include procedures for notifying off-site officials as required by 40 CFR 264.56(d) in the event of a situation which could threaten human health or the environment.	Plan - Environmental/N&SS - Contingency plan contents and emergency procedures will be consistent with existing RCRA program. The contingency plan and emergency procedures will be described in the RD/RA Work Plan.

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EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.13, 264.17, 264.198, 264.199, 264.312, 264.313, 264.314, 264.315, 264.316 & 264 Appendix V [OAC 3745-54-13 & 17]	**FOR HAZARDOUS WASTE DISPOSAL:** Detailed chemical and physical analysis of a representative sample must be obtained prior to disposal of any waste. A Waste Analysis Plan (WAP), specifying the sampling and analytical procedures, and rationale and frequency for analysis, must be prepared in accordance with 40 CFR 264.13. Reactive wastes can not be placed into the EDF. Ignitable waste may be placed into the EDF provided that the ignitable wastes are placed in non-leaking containers, safely handled, covered daily with soil or other non-combustible materials, and isolated from potential sources of ignition. Precautions shall be taken to ensure that incompatible waste are not mixed together which could cause any of the conditions identified in 40 CFR 264.17(b). Bulk liquids or bulk waste containing free liquids, regardless of adding an absorbent, cannot be placed into the EDF. Lab packs (40 CFR 264.316) and specially designed containers can be disposed of with free liquids. Absorbents or other methods can be used by the generator to eliminate free liquids in a container prior to disposal. Waste containers must either be 90% full or their volume minimized (shredding, crushing or other means) prior to being placed into the EDF (40 CFR 264.315). The disposal of hazardous wastes F020, F021, F022, F023, F026, and F027 requires an EPA approved management plan (40 CFR 264.317).	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP. The capabilities of the on-site laboratory, if built, will be considered during the development of the WAP. Existing hazardous waste characteristics and classifications will be used to prepare the WAP.
40 CFR 264.15, 264.33, 264.195, & 264.303(b) [OAC 3745-54-15 & 33]	**FOR HAZARDOUS WASTE DISPOSAL:** The EDF must be inspected to prevent an event which may cause the release of hazardous waste constituents to the environment or pose a threat to human health. The inspection items and frequencies are to be specified in an Inspection Plan. All inspections are to be recorded and maintained in an inspection log. Inspection items are to included: (1) testing and maintenance of emergency equipment (including facility communications, alarms, and decontamination equipment), (2) tank overfill control, (3) the aboveground tank portions of the tank system and secondary containment for corrosion, erosion and spills/leaks each operating day, (4) the functionality of tank monitoring and leak detection equipment each operating day, (5) the proper operation of the cathodic protection after six months of installation and annually thereafter, (6) impressed current sources at least bimonthly, (7) drainage systems, wind dispersal controls, and leachate collection/removal system accumulation/function each week and after storms.	Plan - Environmental - The Inspection Plan will be included as part of the RD/RA Work Plan. The inspection frequencies are not to violate ALARA radiation protection principles. The need for computerized tracking will be determined during Title I design.
40 CFR 264.16 [OAC 3745-54-16]	All EDF personnel must be trained within six months from their date of hire or reassignment, and participate in annual reviews. The training requirements are to be specified in a Training Plan. Employees hired after April 15, 1981 are not to work unsupervised unless the requirements of OAC 3745-54-16(A) are fulfilled.	Plan - Environmental - The Training Plan will be included as part of the RD/RA Work Plan.

EXHIBIT 1

ENGINEERED DISPOSAL FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.192	A written assessment report must be prepared and submitted for the hazardous waste tank(s). The assessment report is to be reviewed and certified by an independent, qualified registered professional engineer attesting that the tank system(s) has sufficient integrity and is acceptable for storing hazardous waste. The contents of the assessment report are identified in 40 CFR 264.192.	Plan - Environmental/Mechanical - The assessment report will be included with the RD/RA Work Plan. The assessment report will be certified in accordance with 40 CFR 270.11(d).
40 CFR 264.92, 264.93, 264.94, 264.96, 264.97, 264.98 & 264 Appendix IX [OAC 3745-54-92, 93, 94, 96, 97 & 98], & 10 CFR 61.53	A detection groundwater monitoring program must be developed to ensure that the specified groundwater protection standard is not exceeded. The monitoring program is to consist of a list of monitoring parameters and associated limits, monitoring frequency, sampling and analytical procedures, and statistical evaluation procedures. Baseline monitoring data (including ecological, meteorological, climatical, hydrological, geological, geochemical, and seismological) shall be established prior to disposal operations.	Plan - Environmental - The groundwater monitoring program will be integrated with the existing FMPC monitoring programs. The monitoring program will be part of the RD/RA Work Plan.
OAC 3745-20-05 [40 CFR 61.150]	**FOR ASBESTOS WASTE DISPOSAL:** All friable asbestos-containing waste material shall be sealed into durable leak-tight disposal containers or use an approved alternative disposal system as specified in OAC 3745-20-05(C).	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP.
40 CFR 264.194 & 40 CFR 264.196 [OAC 3745-55-90]	Operating procedures and spill/leak response procedures need to be specified.	Plan - Mechanical/Environmental - An operating plan for the tank systems will be prepared and included as part of the RD/RA Work Plan.

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EXHIBIT 2

MEMORANDUM

To: Jack Craig, DOE
From: T.H. Tank, IT Cincinnati
Date: October 23, 1990
Subject: Preliminary Operable Unit Waste Volumes

The following waste volumes have been supplied by the ASI/IT RI/FS Task managers for Operable Units 1, 2, 3, 4, and 5. The volumes should be considered a very preliminary quantities estimate due to insufficient site data. As the results of proposed sampling and analysis programs and treatability studies become available, the final disposal volumes can be more accurately defined (exclusive of ARAR defined remediation goals and allowable contaminant levels).

PRELIMINARY OPERABLE UNIT WASTE VOLUMES*

OPERABLE UNIT	WASTE VOLUMES (CY) LLRW	LLMW	OTHER**	TOTAL (CY)
1	1,800,000	120,000	—	1,920,000
2	300,000	—	—	300,000
3	121,750	34,190	—	155,940
4	2,430	24,970	9,860	37,260
5	37,060	—	—	37,060
			GRAND TOTAL	2,450,260
				(66,157,020 CF)

*Volumes are based on total waste removal and subsequent stabilization with cement and fly-ash.

**LL waste with half-life greater than 20 years and activity greater than 100 nCi/g (α)

TT1354.kg3

cc: M. Higgins, OU1/IT
D. Smith, OU2/ASI
S.H. Wolinsky, OU3/ASI
D. Harmer, OU4/IT
R. Smith, OU5/IT
M. Khan, Site-Wide Trt'mt/IT
D. Carr, WMCO
J. Krieger, WMCO
M. Neal, Lee Wan
S.Y. Latham, Parsons

0100

EXHIBIT 3

WASTE SUMMARY FOR THE EDF			
WASTE SOURCE	VOLUME (cu. yd.)	WASTE CHARACTERISTIC [b]	COMMENTS [c]
Waste Pit 1	135,080 [a] (33,676)	LLRW	This pit contains neutralized waste filter cake, fly ash, 55-gallon drums, scrap graphite, brick scraps, sump cake and liquor, and depleted slag. Approximately 120,000 lbs. of uranium is present with these materials.
Waste Pit 2	77,156 [a] (18,478)	LLRW	This pit contains neutralized waste filter cake, fly ash, 55-gallon drums, graphite, brick scraps, sump cake and liquor, and depleted slag. Approximately 2,700,000 lbs. of uranium is present with these materials. A large quanity of concrete and construction rubble is buried here also.
Waste Pit 3	459,309 [a] (237,053)	LLRW	This pit contains lime neutralized raffinate, raffinate concentrate , slag, slag leach residues, filter cake, fly ash, and lime sludge. Approximately 290,000 lbs. of uranium is present with these materials.
Waste Pit 4	230,663 [a] (53,706)	Mixed Waste	This pit contains process residues, filter cake, slurries, raffinates, scrap graphite, noncombustible trash, asbestos, and 23,500 lbs. of barium chloride. Approximately 6,700,000 lbs. of uranium and 147,000 lbs. of thorium metal in 55-gallon drums are present with these materials.
Waste Pit 5	331,881 [a] (98,841)	LLRW	This pit contains solids from neutralized raffinate, slag leach slurry, sump slurry, and lime sludge. Approximately 110,000 lbs. of uranium and 38,000 lbs. of thorium are present with these materials.
Waste Pit 6	91,023 [a] (11,556)	LLRW	This pit contains green salt (UF4), filter cake, slag, process residues and asbestos. Approximately 1,900,000 lbs. of uranium is present with these materials.
Burn Pit	27,356 [a] (9,074)	LLRW	This pit contains glass, organic material, metals, silt-sized particles, semisolids and carbonized residues. The amount of uranium is unknown.
Clear Well	49,711 [a] (5,008)	LLRW	This pit contains surface water runoff from the surfaces of Pits 1, 2, and 3, as well as excess impounded storm water from Pit 5. The amount of uranium is unknown.
North Lime Sludge Pond	5,000 [b]	Non-Radioactive	This pond contains both organic and inorganic compounds. Also, radionuclides were detected at concentrations greater than background. There is also uranium contaminated perched groundwater located beneath the ponds.
South Lime Sludge Pond	5,000 [b]	Non-Radioactive	This pond contains both organic and inorganic compounds. Also, radionuclides were detected at concentrations greater than background. There is also uranium contaminated perched groundwater located beneath the ponds.
Sanitary Landfill	5,400 [b]	LLRW	The landfill contains the largest variety of organic and inorganic chemicals in OU-2. There is also uranium contaminated perched groundwater located beneath the landfill.
Active Fly Ash Pile	50,000 [b]	LLRW	This fly ash pile has several organic compounds, lead, radium, and uranium present. It is assumed that this pile also contains PCBs and other inorganic metals based upon the laboratory analyses conducted for the inactive fly ash pile.
Inactive Fly Ash Pile	33,000 [b]	Non-Radioactive	This fly ash pile contains PCBs (aroclors-1242,1254, and 1260), cadmium, lead, radium, and uranium. Only uranium was detected the perched groundwater.
Southfield	125,000 [d]	LLRW	The Southfield contains buried contaminated construction rubble and surrounding soil.

WASTE SUMMARY FOR THE EDF			
WASTE SOURCE	VOLUME (cu. yd.)	WASTE CHARACTERISTIC [b]	COMMENTS [c]
Sub OU-3, Unit A	30,173 d	LLRW	This Suboperable unit consists of open fields with limited access to contaminated soils. There is uranium present.
Sub OU-3, Unit A	8,807 d	Mixed Waste	Same as above, except in addition to uranium, other RCRA wastes are present.
Sub OU-3, Unit B	23,280 d	LLRW	This Suboperable unit consists of open field areas with good access to contaminated soils. There is uranium present.
Sub OU-3, Unit B	14,896 d	Mixed Waste	Same as above, except in addition to uranium, other RCRA wastes are present.
Sub OU-3, Unit C	18,160 d	LLRW	This Suboperable unit consists of soil contamination under facilities. There is uranium present.
Sub OU-3, Unit D	31,870 d	LLRW	This Suboperable unit consists of soil contamination under facilities designated for possible demolition. There is uranium present.
Sub OU-3, Unit D	7,480 d	Mixed Waste	Same as above, except in addition to uranium, asbestos, and other RCRA wastes are present.
Sub OU-3, Unit E	15,580 d	LLRW	This Suboperable unit consists of aboveground contaminants. There is uranium present.
Sub OU-3, Unit E	1,550 d	LLRW	This Suboperable unit consists of aboveground contaminants. There is uranium present.
Sub OU-3, Unit F	3,000 d	Mixed Waste	This Suboperable unit consists of perched groundwater contamination. Uranium and other RCRA wastes are present.
Sub OU-3, Unit G	1,140 d	LLRW	This Suboperable unit consists of soils surrounding transfer lines. There is uranium present.
K-65 Silos 1 & 2	24,970 d	LLRW Mixed Waste	The K-65 Silos contain uranium, lead, radium, barium, iron, gold, platinum, palladium, silver, copper, cobalt, nickel, thorium, aluminum,arsenic, beryllium, cadmium, calcium, chromium, magnesium, manganese, mercury, potassium, selenium, sodium, zinc, thallium, vanadium and cyanide. Also includes the silo structures.
K-65 Silo 3	9,860 d	Mixed Waste	This includes the silo structure and its waste.
K-65 Silo 4	2,430 d	LLRW	This includes the silo structure and its waste.
OU-5 Waste	37,060 d	LLRW	This waste includes excavated soil and dry sludge.
Thorium Storage	4,100 b	LLRW	This waste is expected to go to Canada, not to EDF.

a: Data obtained from "Initial Screening of Alternatives, Jan 1991". The numbers represent total quanity of waste plus contaminated soils. The numbers in parenthesis represent quanity of waste only.

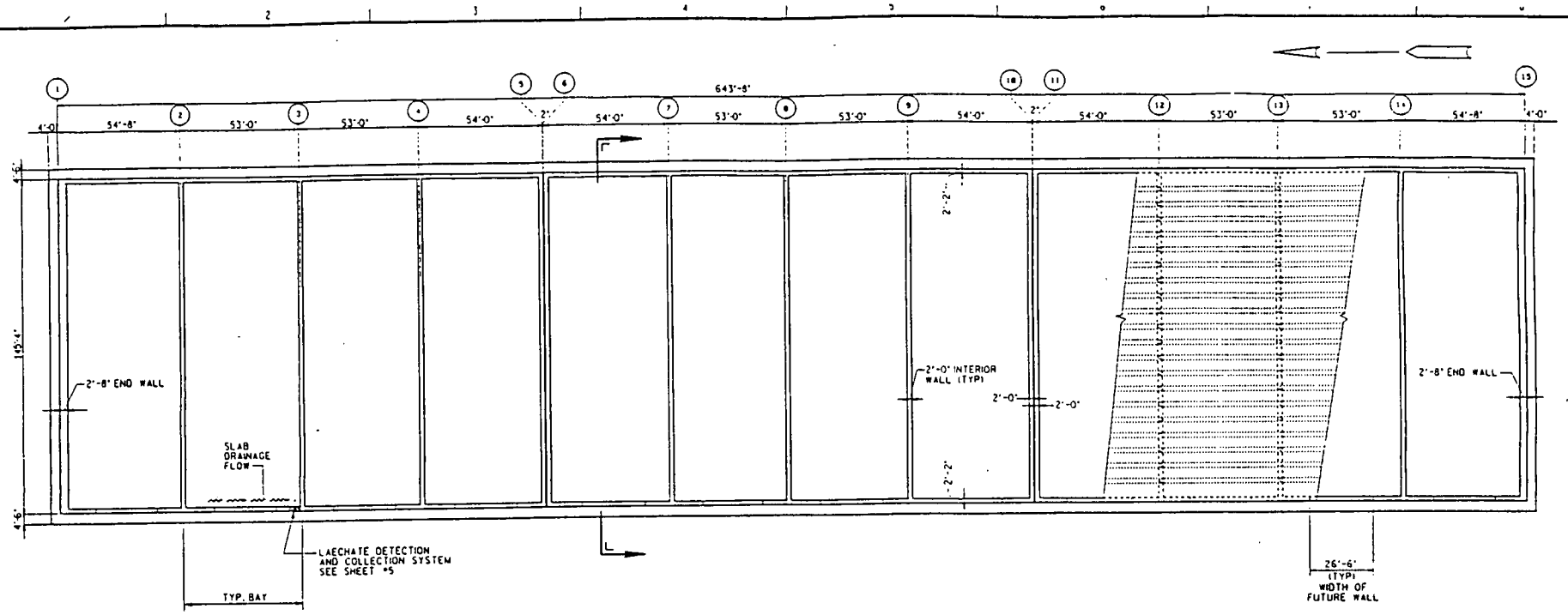
b: Data obtained from WMCO's "Conceptual Design Report, Above Ground Engineered Storage (AGES), Apr 1990".

c: Characterization comments have been based on the following references.
- Feasibility Study Report for OU-4, RI/FS Report (Draft), Oct 90.
- Initial Screening of Alternatives for OU-1, RI/FS Report, Jan 91.
- Initial Screening of Alternatives for OU-2, RI/FS Report (Draft), Jan 91.

Characterization of wastes are subject to change based on further analyses.

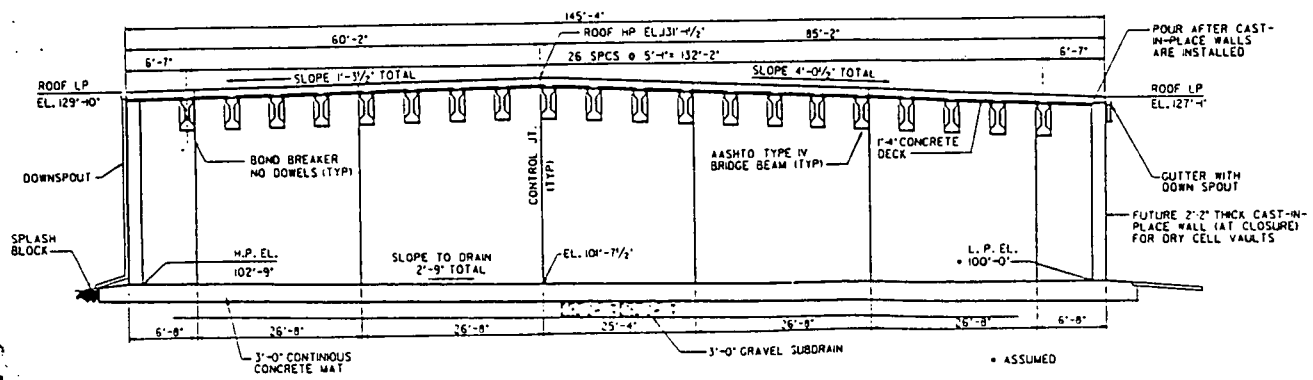
d: Data obtained from a memorandum to J. Craig (DOE) from T.H. Tank (IT) regarding preliminary Operable Unit Waste Volumes (March 12, 1991). It was noted that the calculations are very preliminary, do not appear in standard IT Corporation format, and have not been formally reviewed.

0102



TYPICAL FOUNDATION AND FLOOR SLAB PLAN

NO SCALE



SECTION (TYP INTERIOR WALL ELEVATION)

NO SCALE

EXHIBIT 4

NOTES

A	REPORT ISSUED 12-07-90	

UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER

THE RALPH M. PARSONS COMPANY
ARCHITECTS - ENGINEERS
CHARLOTTE, N. C.

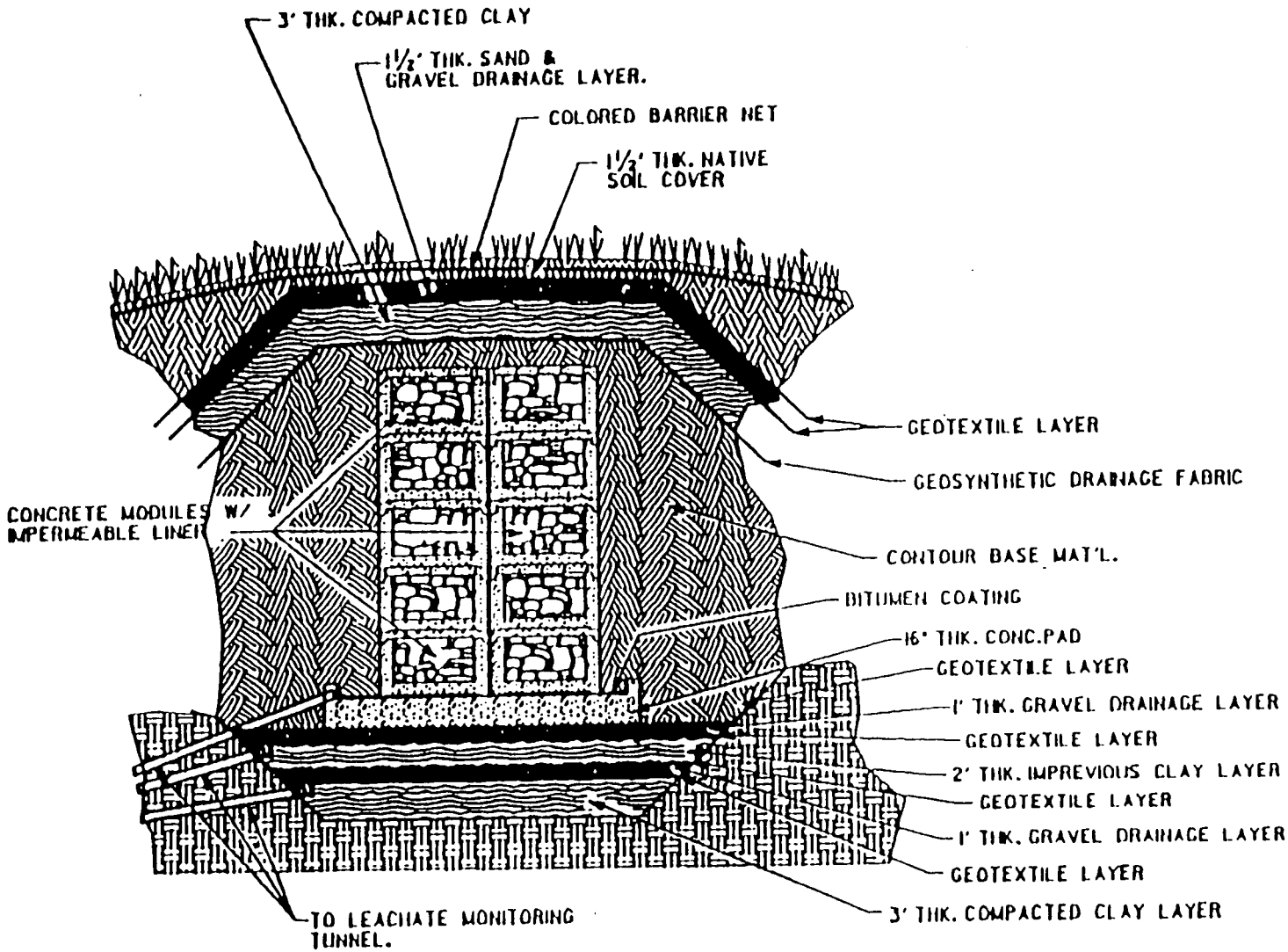
PITS INTERIM REMEDIATION
ON-SITE LOW LEVEL WASTE DISPOSAL FACILITY

DISPOSAL VAULTS

SHEET #4

6420

A-4



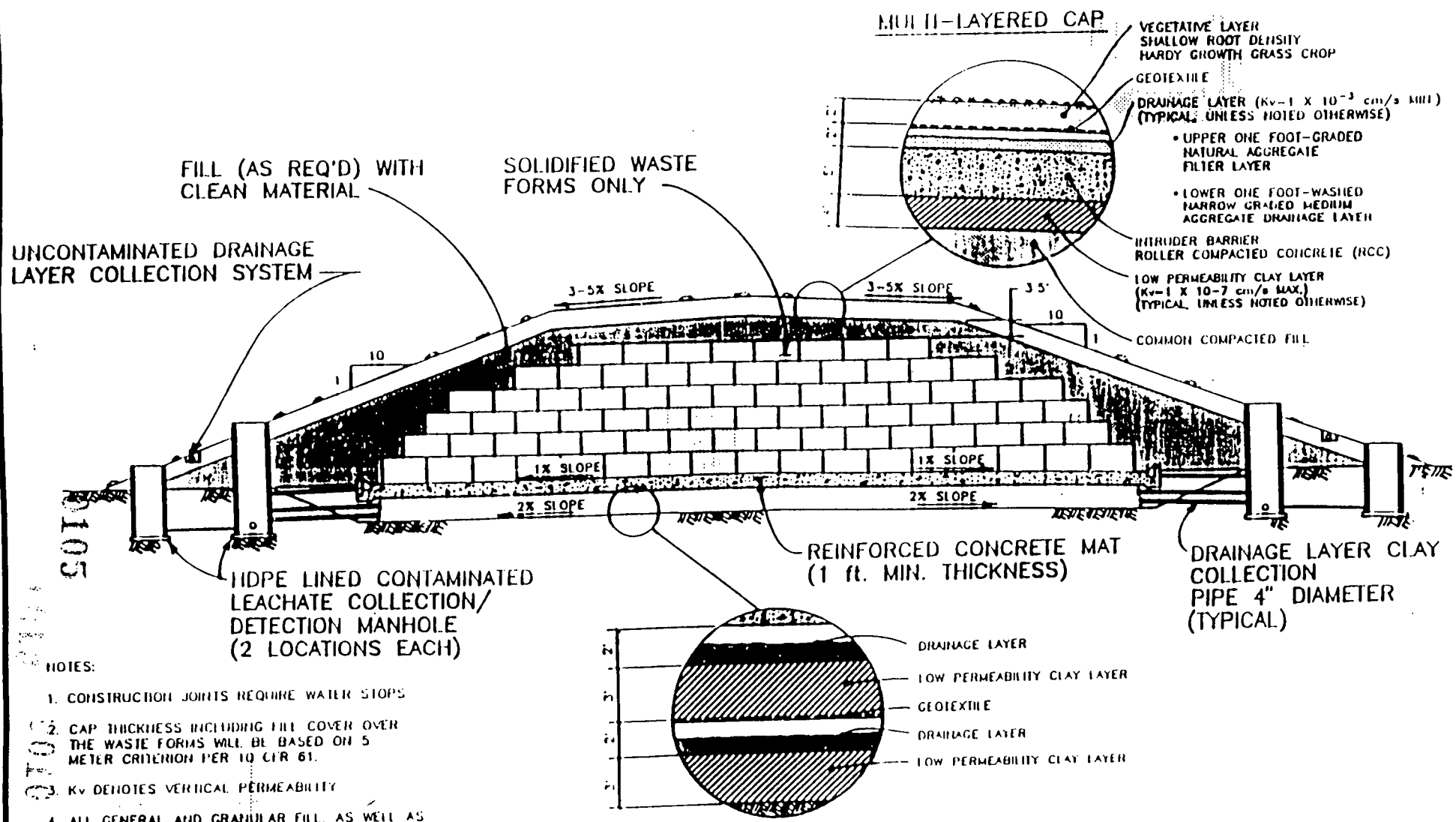
CONCEPTUAL DESIGN
ABOVE GROUND ENGINEERED
STORAGE FACILITY.

FEED MATERIALS PRODUCTION CENTER

OWNED AND OPERATED BY THE UNITED STATES
DEPARTMENT OF ENERGY

EXHIBIT 5

0104



NOTES:

1. CONSTRUCTION JOINTS REQUIRE WATER STOPS
2. CAP THICKNESS INCLUDING FILL COVER OVER THE WASTE FORMS WILL BE BASED ON 5 METER CRITERION PER 10 CFR 61.
3. Kv DENOTES VERTICAL PERMEABILITY
4. ALL GENERAL AND GRANULAR FILL, AS WELL AS CLAY, ARE ASSUMED TO BE REGIONALLY AVAILABLE.
5. GEOTEXTILE MAY BE USED TO FACILITATE CONSTRUCTION.
6. WASTE FROM DISPOSAL CONFIGURATION FOR REPRESENTATIONAL PURPOSE ONLY.

EXHIBIT 6 TUMULUS SECTION

303317-A-G103 OU4 TK 15 KNOX

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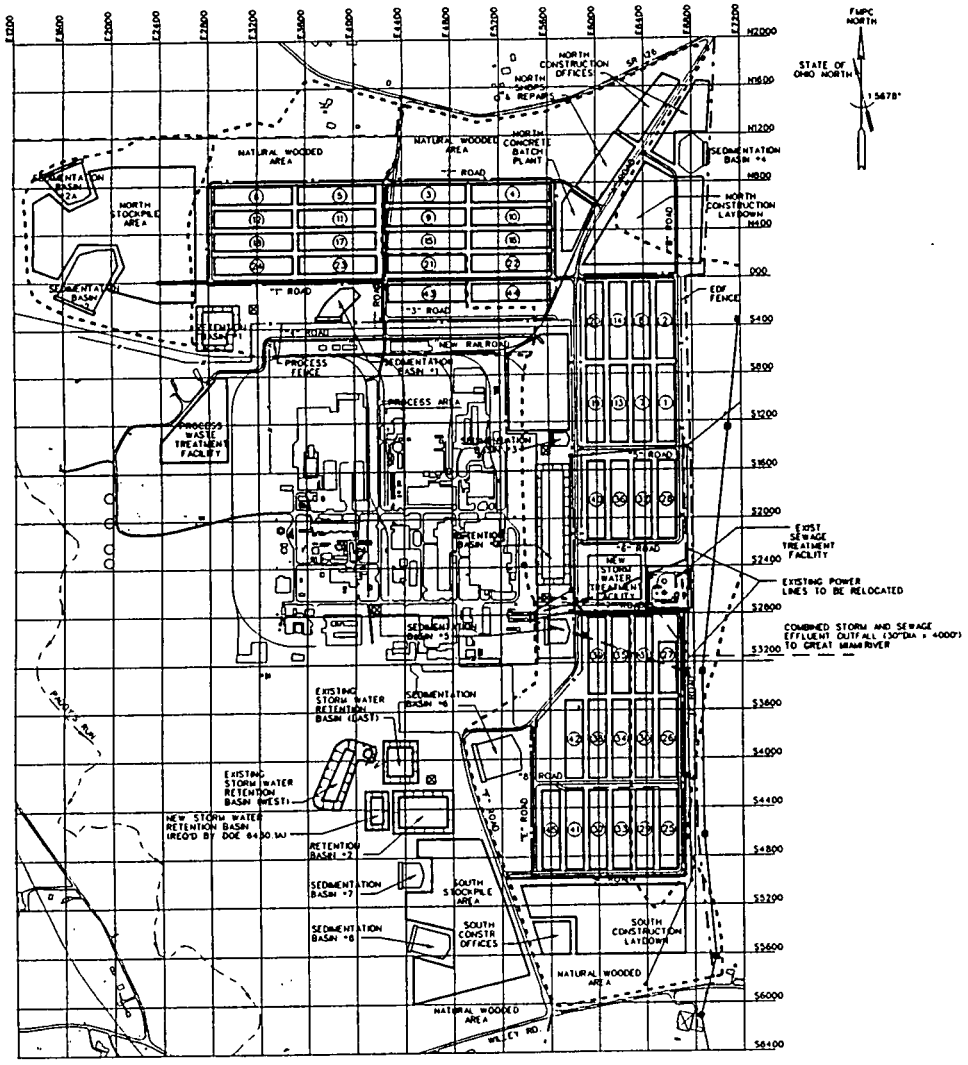

SCHEME C

EXHIBIT 7

NOTES

DRAWING SCHEDULE:

SHEET NO.	TITLE
001	MASTER PLAN
002	SITE PLAN - SHEET 1
003	SITE PLAN - SHEET 2
004	CLOSURE PLAN - SHEET 1
005	CLOSURE PLAN - SHEET 2
006	CONSTRUCTION STRATEGY YEAR 8 - SHEET 1
007	CONSTRUCTION STRATEGY YEAR 8 - SHEET 2
008	CROSS SECTIONS - SHEET 1
009	CROSS SECTIONS - SHEET 2

LEGEND:

- PROPERTY LINE
- OPEN DITCH OR TEMPORARY NATURAL DRAINAGE
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- DRAINAGE BOUNDARY

UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M PARSONS CO. · CHAS. T. MAIN, INC. · ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FMPC ERA

DRAWING TITLE
EDF VAULTS
MASTER PLAN

DRAWN BY ECC	DATE 4-18-91	REVIEWED BY	DATE
CHECKED BY	DATE	SCALE 1"=400'	
3-03-91			
BY DOE LATER	00-90701	96X5900	001

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CDR
Functional Requirements For The Engineered Disposal Facility

At The
Feed Materials Production Center
Fernald, Ohio

Prepared by:

PARSONS

Fairfield Executive Center
6120 South Gilmore Road
Fairfield, Ohio 45014

DOE Contract No. DE-AC05-900R21951

0010107

CDR - Functional Requirements for the Engineered Disposal Facility at the Feed Materials Production Center Fernald, Ohio

APPROVED FOR ISSUE

Prepared By:

William Ubbes — 5/21/91
W.F. Ubbes, EDF Project Engineer, Parsons — Date

Approved By:

James C Cooper for — 21 MAY 1991
R. Nixdorf, Engineering Manager, Parsons — Date

S. Y. Latham — 5/21/91
S. Y. Latham, EDF Manager, Parsons — Date

5-29-91
G. J. Krieger, EDF Manager, WMCO — Date

6-3-91
J. R. Craig, EDF Manager, U.S. DOE/FMPC — Date

0108

CDR Functional Requirements Document

Figure 9-1

PROJECT ORDER COST PLAN

APPROVAL
DEPUTY PROJ. DIRECTOR: DATE: 2-19-91
MGR. PROJECT FINANCE: DATE: 2-19-91
RESOURCE PLANNING: DATE: 2-19-91
OPERABLE UNIT MGR: S. Latham DATE: 2-14-91

COMPANY NAME: PARSONS

CLIENT NAME : DOE – FMPC
PROJECT ORDER NO: 6
WBS: RNA01 CWBS 8.1.1
JOB NAME : EDF,CDR,RI/FS TECH SUPPORT & ENGR STUDIES
LOCATION : PARSONS – FAIRFIELD

PROPOSAL MANAGER : S. LATHAM
DATE RFP RECEIVED: 11–16–90
DATE DUE TO CLIENT: 12–14–90
DATE: 12–12–90
REVISION 1: 01–09–91
REVISION 2: 02–12–91

LABOR

	ACTIVITY	HOURS	COST	CLASS. CODE
10	PROJECT MANAGEMENT	1,800		1
12	PROJECT ENGR.	1,800		3
15	CIVIL ENGR–SPEC I	570		4
15	CIVIL ENGR–SPEC II	160		5
15	CIVIL PRIN. ENGR.	160		6
15	CIVIL SR. DSGN.	300		8
16	GEOTECH ENGR–SPEC I	900		4
20	ARCHITECT–PRIN. ENGR.	148		6
20	ARCHITECT–SR. ENGR.	124		7
22	ENVR. ENGR–SPEC I	950		4
22	ENVR. ENGR–SPEC II	50		5
25	STRUCT ENGR–SPEC I	1,180		4
25	STRUCT ENGR–SPEC II	180		5
25	STRUCT ENGR–PRINCIPAL	20		6
25	STRUCT SR. DSGN.	340		8
30	MECH ENGR–SPEC I	510		4
30	MECH ENGR–SPEC II	580		5
30	MECH ENGR–PRINCIPAL	20		6
31	PROCESS ENGR–SPEC I	740		4
31	PROCESS ENGR–SPEC II	290		5
31	PROCESS SR. DSGN.	150		8
32	PIPING–SPEC I	200		4
32	PIPING–SPEC II	240		5
32	PIPING– SR. DSGN.	260		8
33	INSTRUMENTATION–SPEC I	130		4
33	INSTRUMENTATION–SPEC II	190		5
33	INSTR.–SR. DSGN.	70		8
35	BLDG. SVCS.–SPEC I	420		4
35	BLDG. SVCS.–SPEC II	320		5
35	BLDG. SVCS.–SR. DSGN.	140		8
36	HVAC–SPEC I	100		4
36	HVAC–SPEC II	680		5
36	HVAC–SR. DSGN.	160		8
40	ELECTRICAL ENGR–SPEC I	110		4
40	ELECTRICAL ENGR–SPEC II	180		5
40	ELECTRICAL– SR. DSGN.	50		8
56	NUCLEAR–SPEC II	1,652		5
SUBTOTAL		15,864	$515,740	
MARKUP – (DL X 1.10)			567,314	
TOTAL LABOR COMPONENT			1,083,054	
FCCM – (DL X 2.345%)			12,094	
TOTAL EXPENSE			60,000	
SUBTOTAL PROJECT COST			$1,155,148	
	SAY:		$1,155,000	

EXPENSES

DESCRIPTION	CHARGES
SUBCONTRACT	$60,000
	0
SUBTOTAL	60,000
MGMT. RESERVE 0%	0
SUBTOTAL	60,000
ESCALATION 0%	0
TOTAL	$60,000

THE FOLLOWING ADDITIONAL AMOUNT FOR MANAGEMENT RESERVE IS RECOMMENDED TO BE HELD TO COVER UNPLANNED CONTINGENCIES: $115,500 (10%)

0110

Figure 9-1 - Project Order Number 6 Cost Estimate

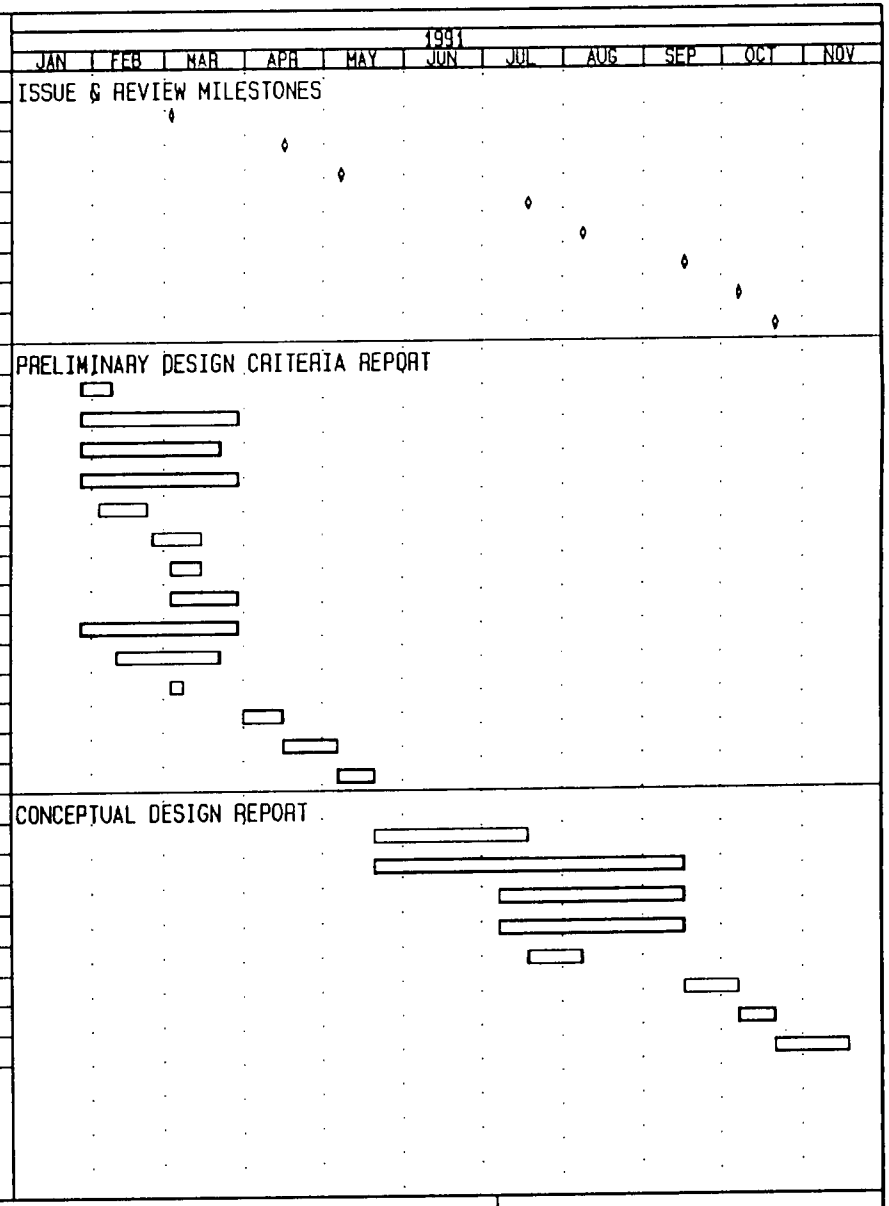
SECTION 10

SUBCONTRACT ACTIVITIES

Parsons currently plans to utilize Battelle and SAIC for portions of the Facility/Systems Function Analysis that will be conducted to support design configuration selection for the EDF. The Function Analysis will address the suitability of Vaults versus Tumulus Structures for waste disposal/storage at the FMPC site.

Parsons anticipates additional tasks will be identified during the development of the PDCR and CDR that will require subcontractor's assistance.

ACTIVITY DESCRIPTION	REM DUR	EARLY START	EARLY FINISH
ISSUE & REVIEW MILESTONES			
ISSUE 50% PDCR FOR DOE REVIEW	0	4MAR91	
ISSUE 100% PDCR FOR DOE REVIEW	0	16APR91	
ISSUE FINAL PDCR TO DOE	0		7MAY91
ISSUE 50% CDR FOR DOE REVIEW	0	19JUL91	
50% REVIEW MEETING TO RESOLVE DOE COMMENTS	0		8AUG91
ISSUE 100% CDR FOR DOE REVIEW	0	17SEP91	
100% REVIEW MEETING TO RESOLVE DOE COMMENTS	0		7OCT91
ISSUE FINAL CDR TO DOE	0	22OCT91	
PRELIMINARY DESIGN CRITERIA REPORT			
IDENTIFY APPROPRIATE DOE ORDERS	10	28JAN91	8FEB91
DEVELOP SAFETY CRITERIA	45	28JAN91	29MAR91
IDENTIFY REGULATORY REQUIREMENTS	40	28JAN91	22MAR91
IDENTIFY WASTE CHARACTERIZATION	45	28JAN91	29MAR91
IDENTIFY PRELIM PROJECT WBS	15	4FEB91	22FEB91
IDENTIFY PRELIM CLOSURE REQUIREMENTS	15	25FEB91	15MAR91
IDENTIFY FIRE PROTECTION REQUIREMENTS	10	4MAR91	15MAR91
IDENTIFY SEISMIC REQUIREMENTS	20	4MAR91	29MAR91
GENERATE PRELIM DESIGN CRITERIA REPORT	45	28JAN91	29MAR91
FUNCTION ANALYSIS / STUDIES	30	11FEB91	22MAR91
50% PDCR REVIEW	5	4MAR91	8MAR91
FINALIZE PRELIM DESIGN CRITERIA REPORT	11	1APR91	15APR91
100% REVIEW & RESOLUTION OF PRELIMINARY DCR	15	16APR91	6MAY91
APPROVE PDCR; AUTHORIZE AND COMMENCE CDR	10	7MAY91	20MAY91
CONCEPTUAL DESIGN REPORT			
PREPARE PROJECT SCOPE/DRAWINGS	40	21MAY91	18JUL91
PREPARATION OF CDR	81	21MAY91	16SEP91
PREPARE SAFETY ASSESSMENT	50	8JUL91	16SEP91
PREPARE PROJECT ESTIMATE/SCHEDULE	50	8JUL91	16SEP91
50% REVIEW & RESOLUTION OF SCOPE/EST/SCHED	15	19JUL91	8AUG91
100% CDR REVIEW & RESOLUTION	15	17SEP91	7OCT91
FINALIZE CDR & ISSUE	10	8OCT91	21OCT91
CDR APPROVAL	20	22OCT91	18NOV91



Activity Bar/Early Dates

Primavera Systems, Inc. 1984-1990

DEPARTMENT OF ENERGY
EDF - PROJECT ORDER #6
PDCR/CDR SCHEDULE

BW-P006
Project Finish: 18NOV91

Sheet 1 of 1

Plot Date: 19FEB91

Date	Revision	Checked	Approved
2-19-91	2	SYL	SYL

Figure 8-1

Figure 8-1 - EDF Project Order Number 6 PDCR/CDR Schedule

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SECTION 9

COST ESTIMATE

The project estimate is depicted in Figure 9-1. The total estimated cost for the tasks contained in this Project Order Plan is ~~$1,265,000~~ ***$1,155,000.***

The cost estimate is based on providing the required deliverables at a utilization of approximately ~~17,500~~ ***15,900*** equivalent engineering labor hours over a 11-month period. The cost estimate is documented by design discipline estimating worksheets. The engineering practices observed in formulating the estimate are consistent with current accepted guidelines at DOE and Parsons.

Section 5 presents the WBS to be used on this project. Activity 3, General Technical Support, is currently estimated as a level-of-effort activity. To that end, estimating such an activity can be difficult, especially at the beginning phase of a project. Parsons will be preparing monthly reports on the progress/status of this project, and variance analysis will be a part of these reports. If, after an appropriate period of time, the variance analysis indicates that a change order is appropriate, Parsons will prepare such a request. At this time, Parsons estimates at least three months of activity is needed to establish a meaningful data base of activities and expenses for this activity. It is also important to note that the complicated hierarchy of organizations involved with development of the EDF Project Order Plan provides additional uncertainty in estimating the required efforts for these activities. Parsons will keep DOE informed of potential project cost impacts due to activities of organizations not under control of Parsons.

When this Project Order Plan is approved, a fully integrated schedule and resource loaded project baseline will be developed. That baseline will form the basis for all project schedule and cost progress reports.

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SECTION 7

DELIVERABLES

The following deliverables are required with this Project Order Plan:

1) A Preliminary Design Criteria Report

2) A Conceptual Design Report

3) Parsons Technical Support Services as requested by DOE, within the LOE.

A subcontracted effort involving a Function Analysis of the EDF requirements is planned. The work is intended to help focus on the appropriate functions of the facility including those being driven by public opinion. An independent, structured analysis of this nature is expected to lend validity to the PDCR.

The Function Analysis activity is expected to require approximately six weeks and will involved the following work.

1) Information gathering
2) Review of alternatives versus required functions
3) Evaluation of alternatives
4) Development of Function Analysis proposals
5) Submit Study Report

The Function Analysis Study Report will be submitted to DOE for review and acceptance. The study results will be incorporated into the PDCR.

The schedules and cost estimate for the work are based on Parsons providing the required deliverables over approximately a 11-month time period at an expenditure of approximately ~~17,500~~ ***15,900*** equivalent engineering labor hours. It is anticipated that drawings/sketches, one integrated Project Order Plan schedule, one detail cost estimate review, one subcontracted study report, and applicable specialty assessments (QA, Safety, Regulatory, etc.) will be included as part of the deliverable packages or as supportive documentation. Definition of required drawings is a function of concept development.

SECTION 8

TASK SCHEDULE

Figure 8-1 depicts the task schedule which has been developed with the Project Order Plan. The delivery dates that were specified in the Project Order represent the primary driver in resource loading of the project. Where possible, resources are targeted on providing the required services in the prescribed timetable.

The duration of scheduled activities is based on the combined estimates, by discipline, of the time needed to accomplish the work. These estimates were provided in working review sessions with Project Team members having experience with similar work at other DOE facilities.

The Project Order identifies February 19, 1991, for a final draft and review of a Preliminary Design Criteria Report. This delivery date was reviewed against the available data, the effort needed to streamline requirements, and the time needed to assemble the report. A delivery of the 50% completed PDCR by ~~February 13~~ ***March 4***, 1991, with the ~~original~~ start date of ~~January 9~~ ***January 28***, 1991, provides approximately thirty (30) days to formulate the PDCR. A 100% completion and review by ~~April 23~~ ***May 20***, 1991, will furnish the formal document in time to provide basic design criteria data to the Conceptual Design.

Minor adjustments are likewise proposed to the CDR schedules. It is estimated that a 50% review is achievable by ~~July 22~~ ***July 19***, 1991, at a duration of approximately ~~50~~ ***40*** days. The 100% CDR review is estimated to begin on ~~September 23~~ ***September 17***, 1991. The final CDR will be completed on October 21, 1991, as requested in the Project Order.

Subcontracted services will be utilized where tasks require more specialized efforts, such as the Function Analysis of the Disposal Facility's configuration. Subcontract negotiations will be the responsibility of Parsons.

0115

SECTION 5

WORK BREAKDOWN STRUCTURE

Project performance of the work defined above will be tracked and reported under ERA Project Work Breakdown Structure (WBS) No. RNA01. The following three deliverables/services will be furnished as part of the work.

1) A Preliminary Design Criteria Report
   (1) Prepare Project Order Plan
   (2) Review available data
   (3) Conduct function analysis
   (4) Develop systems description
   (5) Develop technical requirements
   (6) Incorporate applicable orders, codes, and standards
   (7) Establish equipment parameters
   (8) Develop diagrams and sketches

2) Conceptual Design Report
   (1) Prepare Project Order Plan
   (2) Review available data
   (3) Develop outline of specifications
   (4) Conduct project assessments
   (5) Draft construction project data sheets
   (6) Develop detail cost estimate

3) General Technical Support to the EDF Project (provided to DOE as required, on a Level of Effort (LOE) basis)

Parsons will develop the necessary cost accounts to support progress reporting. It is anticipated that Activities (1) and (2) will be tracked by the Milestone Percent Complete method of earned value while Activity (3) will be tracked by Level-of-Effort method. The three deliverables are being treated as Work Packages for which resource loaded schedules will be defined. The proposed budgets and schedules for the work are discussed below in greater detail.

SECTION 6

INTERFACE REQUIREMENTS

The activity proposed in this Project Order Plan will require the following coordination and interfaces:

1) EDF Project Interfaces:
   (1) DOE
   (2) WMCO
   (3) ASI
   (4) Subcontractor
   (5) Parsons/DOE Public Relations.

2) External Interfaces:
   (1) U.S. NRC (for obtaining guidance documents only)
   (2) U.S. EPA
   (3) Ohio EPA
   (4) Local government agencies/departments
   (5) Local civic organizations or public interest groups.

Contact with external organizations will be conducted in accordance with DOE/FMPC established protocols.

0117

4.2 Conceptual Design Report

The following sequence of work will provide the Conceptual Design Report (CDR) to DOE:

1) This Project Order Plan will be developed to meet the technical scope, schedule and cost requirements of the Project Order. This Plan will be agreed to by the Parsons Project Team members and reviewed by DOE.

2) The Design Criteria and other available data will be reviewed for the inclusion of appropriate provisions into the facility requirements. The basic background data for the project will be established. A preliminary project description and statement of project justification will be submitted for review to DOE. The project description and justification will be included in the CDR.

3) Outline specifications and combined discipline scopes of work will be prepared and submitted to Parsons Estimating Engineering for cost estimating purposes. A summary outline of the specifications will be included in the body of the CDR.

4) Project assessments (QA, safety, regulatory and energy) will be conducted. The assessments will be submitted to DOE for review and approvals. A reference statement about the status/results of the assessments will be included in the CDR.

5) A draft of the Construction Project Data Sheets will be developed for review and comment. This draft will be submitted at the 50% CDR review and will include a preliminary project strategy of cost, funding, and schedule (BA/BO Analysis).

6) A draft summary and detail cost estimate sheets will be developed and included in the body of the CDR. Design engineering, estimating, and other supporting documents will be collected and included in the body or as appendices to the CDR.

4.3 General Technical Support

General Technical support will be provided as requested by DOE. All DOE requests will be based upon a Level of Effort (LOE). All EDF meetings will be attended by a Parsons EDF Project team representative. Any RI/FS deliverable pertaining to the EDF will be reviewed for applicable requirements or data.

4.4 Monthly Status Reports

Routine (monthly) progress reporting of PDCR, CDR, and Technical Support activity will be provided to DOE.

4.5 Assumptions

1) While a Function Analysis of vault versus tumulus structural configuration is planned to support the design criteria and concept design, Parsons will proceed on the assumption that the vault configuration is preferred, based on Parsons' experience at other DOE facilities providing vault designs.

2) The waste volumes and characteristics assumed for storage/disposal are based on the October 23, 1990, memorandum from T. H. Tank (IT Cincinnati) to Jack Craig (DOE), "Preliminary Operable Unit Waste Volumes." Approximately 2 million cubic yards of wastes, exclusive of defined ARAR remediation goals and allowable contaminant levels, are estimated for removal and stabilization. This total volume includes thirty (30) percent increase for stabilization with cement and fly ash.

3) Current schedules for RI/FS and site-wide EIS will be met. The data from these studies and evaluations will be available and comprehensive. Records of Decision will be made as scheduled with DOE-EPA consent Agreement.

4) The facility containment features, along with a leach resistant waste container, will prevent migration of hazardous constituents to the accessible environs as required by pertinent ARARs. As a basic assumption, Parsons will assume a design life of 300 years.

5) Accommodation of comments submitted by the EPA or other agencies and organizations, other than DOE, is outside the scope of work and schedule of this Project Order Plan.

6) DOE review cycles are conducted within the time depicted on the task schedule.

0119

4) The following preliminary general systems descriptions will be developed by Parsons Engineering concurrent with the Function Analysis for an EDF configuration employing an array of Engineered Vaults at the FMPC:

(a) Function of the system
(b) General description
(c) Design basis and description of equipment needed
(d) Justification for the Vault configuration
(e) Operating and performance requirements
(f) Major assumptions.

5) The technical requirements will be analyzed for appropriateness of application to the EDF project. The requirements to be considered will include Facility Configuration, selection of materials, important environmental concerns, key structural design issues. Civil, Mechanical, Electrical and Instrumentation, Safety, Fire Protection, Security and Safeguards, and Permitting/Compliance requirements will be considered. A review of applicability, availability, reliability, as well as limitations of the requirements is a function of this activity.

6) Pertinent ARARs and other industrial codes and standards which are applicable to the project will be reviewed. The applicable regulatory requirements and industrial standards will form the basis for the functional design. This review procedure will insure that provisions are in place for the design to satisfy these industrial and regulatory requirements.

7) Design parameters will be established for any known equipment and controls. Physical and chemical properties of significant materials to be employed will be defined. Any by-product or wastes expected to be generated will be identified. The facility's system or components will be depicted in functional logic diagrams, preliminary drawings, and sketches.

0120

8) Reference diagrams and sketches may be included as figures or appendices to provide preliminary definition of floor layout plans, work stations, dock stations, collection or staging areas, etc.

A 100% PDCR Package will be furnished to DOE by ~~March 26~~ ***April 16***, 1991. A one-month review and comment resolution period is scheduled. This plan is designed to provide a DOE approved Preliminary Design Criteria Document for the EDF Project on ~~April 23~~ ***May 20***, 1991.

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SECTION 3

APPLICABLE DOCUMENTS

The primary reference sources for this Project Order Plan are listed below.

1) Project Order Number 6, "Preliminary Design Criteria and Conceptual Design Report for the Engineered Disposal Facility," November 15, 1990.

2) "Project Management Procedures," Feed Materials Production Center, WMCO, prepared for DOE-ORO, #DE-AC05-860R21600.

3) Project Management System, DOE Order 4700.1, dated 6 March 1987.

4) Initial Screening of Alternatives for OUs 1-5, Task 12 Report.

5) General Design Criteria, DOE Order 6430.1A, dated 6 April 1989.

6) Feasibility Study Report for OU-4, Task 15 Report, dated October 1990.

7) Regulations and guidance documents identified per "Draft" EDF ARAR List, Rev.1, dated December 18, 1990.

It is expected that a significant number of other important documents will be used, and/or directly referenced in support of this project's efforts. However, direct reference to them is not practical at this time.

SECTION 4

METHOD OF ACCOMPLISHMENT

4.1 Preliminary Design Criteria Report

The following sequence of work will provide the Preliminary Design Criteria Report to DOE:

1) This Project Order Plan will be developed to meet the technical, schedule and cost requirements of the Project Order. This Project Order Plan will be provided by Parsons for review and acceptance by DOE.

2) The available site data associated with the anticipated design and regulatory requirements of the EDF will be collected and reviewed. This data will include RI/FS and other site specific documents, DOE Orders, U.S. NRC regulatory and guidance documents listed as TBCs and other ARARs, and relevant documents and design data from similar projects at other facilities.

   The data will be reviewed and evaluated by Parsons for application to the EDF Project.

3) A Facility/Systems Function Analysis will be conducted to support design configuration selection. The EDF design and regulatory requirements will be defined based on current available data regarding expected wastes volumes, characterization of wastes, schedules for disposal (extrapolated when necessary from available ERA RI/FS and performance schedules), and pertinent ARARs.

   The Function Analysis will be provided via Subcontract, and will address the suitability of Vaults versus Tumulus Structures for waste disposal/storage at the FMPC site. Public sentiment will be considered in the evaluation as an element of design effect and the extent described from public interaction.

   The results of the analysis will be subject to DOE review before being adopted for application to the EDF project.

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SECTION 1

INTRODUCTION

The Engineered Disposal Facility (EDF) Project will provide FMPC on-site storage and disposal capacity for radioactive mixed and hazardous wastes generated by the ERA Project. On-site disposal is being considered as a remedial alternative for all of the FMPC-ERA Operable Units. Potential applicable or relevant and appropriate regulatory requirements (ARARS) are being reviewed, and compliance strategies are being formulated to develop the performance requirements for an EDF. Siting characterization for a potential EDF is being completed as part of the RI/FS and the site-wide Environmental Impact Studies (EIS).

Alternative configurations currently being considered for the EDF layout plan include arrays of engineered structures such as vaults, tumulus, etc. Plans for an associated Treatment, Packaging, and Staging Facility are in review cycles at DOE and the EPA.

The EDF or other provisions for sufficient interim storage/disposal capacity will be available for wastes as they are generated by the FMPC remediation.

The original Project Order Plan has been prepared in response to Project Order Number 6, Preliminary Design Criteria and Conceptual Design Report for the Engineered Disposal Facility, dated November 15, 1990. The original Project Order Plan provides for preparation of a Preliminary Design Criteria Report, a Conceptual Design Report for an Engineered Disposal Facility to be located on the FMPC site, and general technical support to the DOE site activity associated with the integration of the EDF with RI/FS and other aspects of the ERA Project. ***This revision, Revision 2, of this Project Order Plan, is the result of comments received by Parsons. The Management Reserve was deleted from the Total Project Cost, with Parsons' recommendation that the original 10 percent for Management Reserve be set aside by DOE for contingencies. The schedule was updated to reflect the original start date of January 28, 1991, for the preparation of the Preliminary Design Criteria Report. The revised schedule maintained the original submittal date of October 21, 1991, for the 100% Conceptual Design Report as requested in the original Project Order. DOE approval of Revision 2 of this Project Order Plan, along with approval conditions, if any, will be interpreted by Parsons as DOE's acceptance of these changes.***

SECTION 2

OBJECTIVE

This Project Order Plan covers the work required to develop a Preliminary Design Criteria Report (PDCR), a Conceptual Design Report (CDR), and to provide General Technical Support for the EDF Project. The scope of work is defined in Project Order Number 6. The work will be consistent with applicable DOE Orders and pertinent ARARs will include progressive technical findings of on-going RI/FS activity.

2.1 Preliminary Design Criteria Report

A Preliminary Design Criteria Report (PDCR) will be developed as the basis for the EDF. This document will define the functional requirements of the facility and, as such, is a requisite data base for conceptual engineering. The functional requirements developed by the PDCR will establish the criteria for design and the performance of the facility. The PDCR is the essential document of understanding between Parsons and the DOE regarding the performance requirements for the EDF project.

2.2 Conceptual Design Report

A Conceptual Engineering Design will be developed based on the PDCR. A Conceptual Design Report (CDR) will summarize the results of this engineering activity. Further, the CDR will verify that the project is necessary, has been properly developed, can comply with pertinent ARARs, and be executed on schedule and within the estimated cost. The CDR will support the Construction Project Data Sheets and can be used to support project reviews.

2.3 Design Engineering

Parsons' Design Engineering will provide general technical support to the DOE to assist in integrating the design engineering requirements of the EDF with the RI/FS work, identifying necessary design related investigations of studies, and otherwise support technical development of the EDF. This support will be furnished as requested by the DOE concurrent with the aforementioned work involving the development of the Preliminary Design Criteria and the Conceptual Engineering Design Report.

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PROJECT ORDER NUMBER 6
ENGINEERED DISPOSAL FACILITY
Revision 2

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Project Plan for Project Order Number 6 Preliminary Design Criteria and Conceptual Design Report for the Engineered Disposal Facility Revision 2

United States Department of Energy
Contract No. DE-ACO5-900R21951

Prepared By

PARSONS

Fairfield Executive Center
6120 South Gilmore Road
Fairfield, Ohio 45014

Approved: R.F. Duda 2/19/91
R.F. Duda
Parsons - Project Director
Date

Project Order Plan

SCOPE OF WORK
PRELIMINARY DESIGN CRITERIA REPORT
AND
CONCEPTUAL DESIGN REPORT
FOR THE
ENGINEERED DISPOSAL FACILITY

Provide all necessary manpower to prepare a Preliminary Design Criteria Report (PDCR) and a Conceptual Design Report (CDR) for an Engineered Disposal Facility (EDF) to be located on the FMPC site. The two reports shall be completed in a manner consistent with DOE Order 4700.1, and shall employ the progressive technical findings of the ongoing RI/FS.

- Ten copies of a 100% PDCR package shall be provided to DOE on or before February 19, 1991. Following a one month DOE review and comment resolution period, the vendor shall issue a final PDCR to DOE.

- Ten copies of a 50% CDR package shall be provided to DOE on or before July 12, 1991. Following a two week DOE review of the package, the vendor shall participate in a 50% review meeting to discuss resolution of all DOE comments.

- Ten copies of a 100% CDR package fully addressing the 50% review comments shall be provided to DOE on or before September 23, 1991. Following a two week DOE review of the package, the vendor shall participate in a 100% review meeting to discuss resolution of all DOE comments.

- Vendor shall issue a final CDR to DOE on or before October 21, 1991. Vendor shall provide 30 copies of the final CDR.

- Vendor shall also provide general technical support to DOE site activities regarding integration of the EDF facility with the RI/FS work and other aspects of the ERA project. Vendor shall attend all EDF meetings and review all RI/FS deliverables pertaining to the EDF.

PERFORMANCE PERIOD (WEEKS)	SUBPROJECT (WBS # AND TITLE)	BID PROCEDURE (CIRCLE ONE)		TYPE OF REVIEW			TYPE OF ESTIMATE					DESIGN SCHEDULE BAR CHART
		IFB	RFP	1	2	3	[illegible]	30%	50%	60%	100%	✓
17	Preliminary Design Criteria Report	IFB	(RFP)	X							X	✓
28	Conceptual Design Report	IFB	(RFP)			X					X	✓
		IFB	RFP									
		IFB	RFP									
		IFB	RFP									
		IFB	RFP									
		IFB	RFP									
		IFB	RFP									
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		IFB	RFP									
		IFB	RFP									
		IFB	RFP									
		IFB	RFP									

SPECIAL CONSIDERATIONS (I.E., DESIGN PRIORITIES, SPECIAL REVIEWS, ETC.):
Design schedule to show review periods.

1 = PA 100%

2 = PA 30% 60% 100%

3 = PA 50% 100%

T TRENDING UPDATE OF DESIGN CRITERIA ESTIMATE

0130

6420

U.S. Department of Energy
Oak Ridge Operations
FMPC Site Office
Date _____

SEP 5 1991
RECEIVED

FINAL

PROJECT ORDER NO. 6 REVISION 3

Contract No. DE-AC05-900R21951

TO: Ralph M. Parsons, Inc.
Attn: Mr. Richard F. Duda
6120 South Gilmore Road
Fairfield Executive Center
Fairfield, Ohio 45014

Project Title: Preliminary Design Criteria & Conceptual Design Report for Engineered Disposal Facility

Provide the following engineering services:

Provide labor, equipment and materials for 1) Preliminary Design Criteria Report and 2) Conceptual Design Report for the Engineered Disposal Facility

Revision 3 Reduces the total negotiated cost to $1,065,400 per the approved attached ECP 2000-02, and reduces the limitation of funding by $89,600. For FY-91 the limitation of funding is reduced by $455,000.

Start Engineering Services:
Complete Engineering Services: September 30, 1991 (for FY-91)
Project Order Limitation of Funds: ~~$700,000 (for FY-91)~~ $1,065,400 REV.
Funding Source: EW-20 Charge Nº RNA01
Project Order Limitation of Hours: ~~10,425 DPLH (for FY-91)~~ 15,864 REV.

Robert E. French 9-4-91
Robert E. French
Contracting Officer
Oak Ridge Operations

0131

DOE Operable Unit Manager: [signature] Date: 8/26/91
DOE Project Manager: [signature] for W.P. Date: 8/27/91
DOE Contract Administrator: [signature] Date: 8/29/91
COR: [signature] Date: 8/28/91

cc: WMCO Technical Monitor: G. J. Kreiger

U.S. Department of Energy
Oak Ridge Operations
FMPC Site Office
Date: _____

PRELIMINARY

REQUEST FOR PROJECT PROPOSAL AND PROJECT ORDER NO. 6 **REVISION** 0

Contract No. DE-AC05-900R21951

TO: Ralph M. Parsons, Inc.
Attn: Mr. Richard F. Duda
6120 South Gilmore Road
Fairfield Executive Center
Fairfield, Ohio 45014

Project Title: Preliminary Design Criteria & Conceptual Design Criteria for Engineered Disposal Facility

Provide the following engineering services:

Provide Cost Proposal for a 1) Preliminary Design Criteria Report and 2) Conceptual Design Report for the Engineered Disposal Facility

Start Engineering Services: _____

Complete Engineering Services: Oct, 1991

Project Order Limitation of Funds: $15,000

Funding Source: EW-20

The negotiated labor hours will be established in the negotiated final project order.

Robert E. French 11-15-90
Robert E. French
Contracting Officer
Oak Ridge Operations

DOE Operable Unit Manager [signature] Date: 11/8/90
DOE Technical Manager [signature] Date: 11/8/90
DOE Contract Administrator [signature] Date: _____
COR [signature] Date: 11/13/90

cc: WMCO Technical Monitor G.J. Kreiger

Passed to Parsons 11-16-90

Project Order

SECTION 1

PREREQUISITE DATA

1.1 Project Order

The request for proposal for Project Order Number 6 to provide a Conceptual Design Report (CDR) for the Engineered Waste Management Facility (EWMF) is attached.

1.2 Project Order Plan

The Project Order Plan for the Engineered Waste Management Facility, which was previously called the Engineered Disposal Facility, is attached.

1.3 CDR Functional Requirements Document

The CDR Functional Requirements Document for the Engineered Waste Management Facility, which was previously called the Engineered Disposal Facility, is attached.

SECTION 2

SCOPES OF WORK

The following subsections provide a brief description of the effort needed to construct the vaults; containment system; interim cover; final cover; facility support building; ditches, drains, and water retention; hydrogeologic monitoring system; roads and walkways; fences and gates; and landscaping.

2.1 Vaults

2.1.1 Civil/Structural/Architectural

The EWMF will include a total of 44 3-module vaults and one 2-module vault. Typically, each vault consists of an above-grade reinforced concrete structure capable of storing approximately 53,000 cubic yards of waste material.

Each vault is approximately 644 feet by 145 feet by 26 feet high, and has three modules; each module has four cells. (See Drawing S00017 for plans and sections. All drawings are shown in Volume 1, Section 4.3).

The interior slab-on-sand cushion is designed to resist heavy forklift and hydraulic boom truck wheel traffic. The interior walls are supported on reinforced concrete spread footings.

The roof of each vault consists of precast concrete deck panels and a cast-in-place concrete deck over precast/prestressed concrete roof beams.

The vault design and construction will have special features to enhance durability and to eliminate or minimize cracking for maximum life expectancy.

2.1.2 Mechanical

1) Leachate Sump Pump Trailers

Mobile and self-contained sump pumping units will be mounted on light-weight trailers, which can be pulled by a light pickup truck. This equipment will be used during the operation and post-closure phases of the vault cell, as required.

2) Boom Truck

A boom forklift truck will be used in the operating cell for stacking waste containers inside the cell.

The boom truck will be diesel powered and will be capable of handling a 4-foot-wide by 6-foot-long by 4-foot-high container weighing a maximum of 10,000 pounds. The boom truck will be equipped with a telescoping boom, a four-wheel drive transmission, and an air-conditioned, radiation-shielded operator's cab. The boom will have a capacity of 10,000 pounds at 13-foot reach (from the front of the tires) at 13-foot height. The boom truck will comply with all applicable Occupational Safety and Health Administration (OSHA), Society of American Engineers (SAE), and National Fire Protection Agency (NFPA) regulations and safety standards.

3) Forklift Truck

A forklift truck will be used in each operating cell for off-loading waste containers from flatbed trucks and stacking them in the staging area close to the cell being filled.

The forklift truck shall be capable of lifting and transporting a 4-foot-wide by 6-foot-long by 4-foot-high container weighing a maximum of 10,000 pounds. Maximum lift height will be 13 feet. The forklift truck will comply with all applicable OSHA, SAE, and NFPA regulations and safety standards.

4) Ventilation Fans

Exhaust fans will be required in each operating dry vault cell to remove diesel fork truck exhaust fumes from the vault cell. The fans will be temporarily mounted in temporary openings in the rear wall of the cell. The openings will be above the level of the stacked boxes. When the cell is closed, the fans

will be removed and reinstalled in the next operational cell. The temporary openings will then be sealed.

Cells to be filled with slurry will not require forced ventilation.

5) Fire Protection Equipment

Fire protection will consist of portable fire extinguishers at each operating cell. All fire protection equipment will be reviewed and approved by the Fernald Environmental Management Project (FEMP) Fire Protection Engineering Group.

6) Personnel Safety Equipment

A portable eyewash/safety shower station with a first aid kit will be placed in each operating cell. It shall comply with American National Standards Institute (ANSI) Z358 and shall be freeze protected.

2.1.3 Electrical

1) Wet Cells

Wet vault cells will require floodlighting for the roof and drop lights for viewing inside the cells. All lighting will be portable and will be powered by a portable diesel generator. The generator shall include receptacles for connecting the drop lighting and a grounding cable. A single-line electrical diagram for the wet cell is shown on Drawing E00026.

2) Dry Cells

Dry vault cells will require power for two portable ventilation fans, electric lighting, and emergency lighting. Lighting shall be easily disconnected for use in future operational cells. The portable ventilation fans will require integral motor controls as part of each portable unit. Emergency lighting units and exit signs will be supplied by internal batteries upon loss of power to the main electrical lighting system. Permanent wiring and conduit will be installed for distribution to the electric equipment. Upon cell closure, the wiring and conduit will be abandoned in place. A typical layout for the dry cell is shown on Drawing E00026.

Power supplied to the ventilation fans and electric lighting will be supplied by a portable diesel generator. Junction boxes will be provided with the portable generator unit and in each cell for connecting jumper cables. The jumper cable provided with the portable generator shall be suspended at the vault entrance to avoid damage by vehicular traffic. A distribution panel with circuit breakers and a grounding cable will be provided with the portable generator. The generator shall also contain receptacles for providing power to radiation monitors and air samplers. Upon completion of filling a cell, the portable generator and electrical distribution equipment will be moved easily by trailer or fork truck to the next operational cell. A single-line diagram is shown on Drawing E00026.

3) Grounding

Grounding cables and rods shall be installed along the open sides of vaults with connected ground plates located at each generator location. Grounding lugs and cables shall be provided with the generator. Grounding shall be in strict compliance with NFPA/National Electric Code (NEC) 70-90.

4) Obstructions

All electrical equipment obstructing vault construction shall be dismantled and relocated by the construction manager.

2.1.4 Instrumentation and Control

1) Radiation monitoring equipment will be provided with a minimum of 8 hours backup power and will consist of the following:
   (1) Personnel monitoring system for checking personnel for contamination upon leaving regulated areas
   (2) Area radiation monitoring system for continuous monitoring of radiation flux intensities at the perimeter of the EWMF and locally at the work area
   (3) Air samplers/monitors for monitoring the working areas in the EWMF for airborne radionuclides.

2) Ventilation Monitoring System

The portable ventilation system will be equipped with an air flow detection device to assure proper airflow in vaults when they are occupied.

The personnel monitor, area radiation monitor, and low air flow signals will be monitored by the monitoring data logging system which will be installed in the Facility Support Building.

2.2 Containment System

The containment system is designed to meet the requirements of 40 Code of Federal Regulations (CFR) 264.301. It consists of a liner and a Leachate Collection and Leak Detection System (LCLDS) that will collect leachate and any run-on that may enter the EWMF vaults during disposal operations. The LCLDS will use two independent containment and collection systems: the primary leachate collection system and the secondary leak detection system. The leak detection system will be used to monitor the performance of the primary liner and to allow a backup system for the removal of accumulated liquids. A process flow diagram is shown on Drawing F00019.

Each cell within a vault structure will have an independent primary liner constructed of HDPE. The liner will cover the floor and will entirely cover each wall for the wet cells. In dry cells, the liner will cover the floor and will extend 2 feet up all walls. A concrete slab and sand layer will be placed over the liner to protect it from traffic during filling operations. The concrete will be designed to allow for water to flow freely to the lower sand layer. The concrete and sand will also be used to level the floor of the cell with the doorway. The floor of the vault and the liner will be sloped towards one corner of the cell where a drain shall collect and transport leachate to the collection tank. The design of the leachate tank shall comply with United States Environmental Protection Agency (US EPA) regulation 40 CFR 264 Subpart J.

The leak detection system will consist of a geotextile drainage net, a polymer spray coating on the concrete walls and floors of the cells, and an individual collection sump. The geotextile drainage net will be placed along the floor and along each wall. The net shall extend 2 feet up the wall in the dry cells and up to the ceiling in wet cells. The drain for the leak detection system is coaxial with the drain system used by the leachate collection system. The outer pathway of the double wall pipe will collect any leaks in the primary system's pipe drain or liner system and transport the liquid to the leak detection sumps. Each cell will have its own leak detection sump.

The inspection of the liner upon completion of construction will be in accordance with 40 CFR 264.303 (a). This regulation calls for inspection of all synthetic liners (including those used for cover systems) to ensure that the liner is free from tears, punctures, or blisters and that seams and joints are tight.

Both the leachate collection and leak detection systems will have piping that extends to the surface. This piping will provide access for instrumentation, pump-out, and cleaning of the tanks, sumps, and piping. The instrumentation and accessways will be used to comply with operational requirements dictated in 40 CFR 264.303 (b). When a final cover is placed over the vault, manways will be installed from the final cover surface down to the top of the vault base slab surface. The piping systems will be extended to the surface and will use the manway for support of the piping.

2.2.1 Electrical

Equipment pads containing individual dry transformers and power distribution panelboards will be centrally located around vaults for providing power to multiplexer modules. All power to the leachate detection instruments will be supplied from the multiplexer modules. Additional circuits will be provided on the power distribution panelboards for feeding site perimeter radiation monitors and pad lighting. Leachate instruments and power distribution equipment shall be permanently installed in metal conduits suited for outdoor use. For arrangement and power plans, reference Drawing E00026.

2.2.2 Instrumentation/Control

1) Leachate Collection System

Each leachate collection sump will be equipped with two single-point liquid level conductivity probes. The probes will activate a warning light and/or alarm which will be located within the Facility Support Building (FSB) to allow centralized monitoring of all leachate collection systems. One probe will be located near the bottom of the sump to allow detection of accumulated liquids. The other probe will be located at a predetermined level to notify the operators that liquid removal is required. The predetermined level will be established to allow removal activities to occur prior to exceeding the regulatory limit of 1 foot above the lowest point of the liner system (40 CFR 264.301). If possible, this level probe will be located and the leachate system will be designed so that the leachate removal notification occurs prior to the accumulation of any leachate above the liner system. This precautionary measurement will keep the primary liner dry to eliminate the potential of leachate migration into the leak detection system through any liner failures.

2) Leak Detection System

The leachate collection level monitors and leak detection instrument will provide inputs to the monitoring data logging system computer via remote multiplexers located in the vault area. The data logging system computer terminal and related operator interfaces will be installed in the Facility Support Building.

An instrument device is provided to detect the presence of water in the sump to determine if the primary liner has failed. When water is detected, a visual and audible alarm will start in the Facility Support Building, and a permanent record will be kept on the data logging system.

2.3 Final Cover

An engineered cover will be placed over the vaults during closure of the EWMF. The cover consists of compacted soils and a synthetic liner material to minimize infiltration of surface water and erosion. Sloping of the surface is provided to promote drainage and to reduce the potential for ponding. The cover is also designed to withstand estimated settlements and to provide long-term isolation.

The final cover will be designed to have a permeability no greater than that of the bottom liner and to be less than 10^{-7} cm/sec. The final cover system will either be at least 5 meters thick or have an intruder barrier with a 500-year operating life.

2.3.1 Civil/Geotechnical

Installation of the final cover materials will occur during interim and final closure. The final closure is to be conducted in three stages during the operational and closure periods of the EWMF. This approach limits the time and number of vaults that are exposed at any one time. This approach also reduces the time and construction efforts required during the final closure period.

Specific operational activities can be found in the closure concept for the EWMF (see Volume 1, Section 2.2.3.7). The following construction materials for the multi-layered cover are presented from bottom to top:

1) Compacted fill
2) Compacted clay cap

3) HDPE liner
4) Sand
5) Cobblestone
6) Pea gravel
7) Topsoil

Geotextile fabric will be used in certain layers of soil to prevent clogging of coarse materials with fine soils.

The provisions for the vegetative cover are described in Section 2.9.

2.4 Facility Support Building

2.4.1 Civil/Structural/Architectural

A Facility Support Building will be provided for the operation services for the EWMF. This building will consist of offices, record/file space, toilets, and an equipment room. The facility will be constructed as a pre-engineered structure.

2.4.2 Mechanical

2.4.2.1 Fire Protection

Fire protection will be provided in the Facility Support Building using a wet-pipe sprinkler system throughout. In addition, portable fire extinguishers will be provided. All fire protection equipment and devices will be reviewed and approved by the FEMP Fire Protection Engineering Group prior to installation.

2.4.2.2 Plumbing

General service plumbing system will be provided for the facility support building consisting of:

1) Sanitary sewer piping
2) Domestic water piping with insulation
3) Plumbing fixtures for men's and women's restrooms, including service sink and floor drains

4) Non-freezing outside hose bibbs
5) One electric water cooler
6) One electric water heater

2.4.2.3 Heating, Ventilation, and Air Conditioning (HVAC)

The Facility Support Building will be heated and air conditioned throughout. Air will be distributed through diffusers by way of ductwork in the ceiling space. The unit will be controlled by a local thermostat located on the interior wall within the open area. Upon actuation of the system unit, the supply air fan will run continuously.

The toilet rooms will be exhausted by a roof ventilator.

2.4.3 Electrical

Permanent power required for the EWMF shall be fed through an outdoor pad-mounted transformer to a main distribution panel located in the Facility Support Building. The main distribution panel will provide circuit protection and distribution to all outdoor lighting, the leachate collection electrical systems, and the office/storage building power panelboard. During construction, sufficient capacity of power will be available from the existing process area manhole Number 227. Additional manholes shall be installed for running 3/C underground cables to the EWMF pad-mounted transformer. A single-line diagram of the main distribution panel has been provided on Drawing E00026.

Permanent outdoor lighting and poles will be placed approximately 100 feet apart along all permanent EWMF roadways. Power required for temporary lighting between the vaults and in other construction areas will be provided by the construction contractor.

The Facility Support Building power panelboard will be supplied from the main distribution panel through a dry transformer. The office/storage building power panelboard will supply power for indoor fluorescent lighting, HVAC, receptacles, building outdoor lighting, the evacuation system, the fire alarm system, and the data logging system. Indoor emergency lighting and an uninterruptable power supply for the data logging and multiplexers will also be required.

The fire alarm and evacuation systems shall have stand-alone command stations located in the office/storage building. Provisions to connect both systems to the central command station located in Building 53 will be provided.

The fire alarm system shall consist of manual pull stations, smoke detectors, flow and tamper switches, and horns. Telephone lines shall be provided by the construction manager for connecting the fire alarm system to the central command station. A riser diagram for the fire alarm system has been provided on Drawing E00027.

The evacuation system shall consist of a radio, cabinet, an audio cabinet, a battery backup, and lightning protection equipment. Evacuation speakers located around the EWMF roadways shall produce a minimum sound level of 80 db. A riser diagram of the evacuation system has been provided on Drawing E00027.

2.4.4 Instrumentation/Control

The monitoring data logging system computer terminal and peripherals will be located in the Facility Support Building and will perform the following functions:

1) Monitor area radiation
2) Personnel monitors
3) Monitor leachate level alarm
4) Monitor leak detection alarm
5) Monitor ventilation alarm
6) Visual and audible indicator of alarm condition
7) Permanent record of monitored conditions
8) Shift log printout
9) Operate for 24 hours after power loss, using an uninterruptable power supply.

2.5 Ditches, Drains, and Water Retention

Ditches and drains for the removal of surface water will be provided and will connect to existing or proposed water retention and sediment basins. The surface waters will be pumped to the existing stormwater basins for subsequent treatment prior to discharge. The current design criteria of the Advanced Waste Water Treatment system (AWWT) need to be evaluated to determine if the treatment

capabilities and capacity are adequate. The design of the AWWT system may need to be modified, or an additional facility may need to be provided. Drains and gutters for the roofs/covers will be discharged into storm sewers, stabilized ditches, splash blocks, or paving.

2.6 Hydrogeologic Monitoring (Pre-Operation through Post-Closure)

A groundwater monitoring program is necessary to evaluate the performance of the EWMF. The groundwater monitoring program will asses existing hydrogeologic data to determine if sufficient site characterization data is available to design a monitoring program and will supplement this data to the extent necessary. Based on these data, a groundwater monitoring program will be developed consisting of upgradient and downgradient monitoring wells capable of immediately detecting releases from the EWMF. The groundwater monitoring program will also establish groundwater protection standards based on ARARs. Groundwater models specifically designed to represent flow conditions and solute transport of hazardous and radioactive substances will be employed to predict probable pathways for release and potential travel time to support the design of the monitoring program.

Groundwater monitoring will be initiated prior to operation of the EWMF to establish baseline water quality data. Additional wells will be installed to monitor newly constructed and operating units throughout the construction sequencing of the vaults.

Periodically, samples collected from active monitoring wells will be analyzed for chemical and radiological constituents representative of the waste. Upgradient and downgradient monitoring data will be compared to groundwater protection standards after each monitoring event. If a release is detected, a more detailed assessment program will be developed and implemented to understand the nature and extent of the release. A corrective action program will be developed, if necessary, and implemented to remove the source of the release and to contain further spread of the release.

2.7 Roads and Walkways

All-weather roads with a minimum of a 20-foot width will be constructed so as to provide the existing services road with access for the EWMF construction and waste disposal operations.

2.8 Fences and Gates

The security fencing for the EWMF will be integrated with existing FEMP security fencing. Access gates for traffic and personnel will be provided as required.

2.9 Landscaping

All excavations will have provisions for erosion control and soil stabilization of ditches, fill areas, slopes, and embankments. Upon completion of the final cover, a shallow-rooted vegetative cover will be established. Revegetation activities will include preparing the seed bed, seeding, fertilizing, firming the seed area, mulching, and protecting the mulch from wind and erosion.

SECTION 3

OUTLINE SPECIFICATIONS

The following subsections describe the civil/structural/architectural, process, mechanical, electrical, and instrumentation work specified for construction of the EWMF.

3.1 Civil/Structural/Architectural

(Section Numbers given refer to Construction Specification Institute (CSI) 16 Division Spectext Format.)

3.1.1 Site Work (Section 02200)

3.1.1.1 Clearing (Section 02110)

Clearing will consist of removing all natural and artificial objectionable materials from the sites of the EWMF vaults, retention basins, sedimentation basins, construction areas, road approaches, and any such areas as may be specified. Clearing will be performed in advance of grading operations and in accordance with the specified requirements.

3.1.1.2 Demolition and Removal (Section 02060)

Structures to be removed designated on the plans will be removed to the full depth of the structure. Voids resulting from abandoned or removed structures will be filled with suitable material compacted to 90 percent maximum density. Demolition will be carried out in such a manner as to ensure that remaining buildings, trees, and environmental resources are protected.

3.1.1.3 Earthwork (Section 02200)

The excavation will conform to the dimensions and elevations indicated on the drawings. The excavated material will be segregated, stockpiled, and, if approved, used as backfill. Backfill will be placed symmetrically to prevent eccentric loading against structures and will be compacted to 95 percent of maximum density in accordance with American Society for Testing and Materials (ASTM) Specification D-1557, Method C.

All subgrades for roads, walkways, ditches, and vaults will be finished to a true compacted surface and will conform to details and cross sections shown on the drawings.

Approved, on-site soil materials will be used below the stripped layer as backfill. The material will not contain particles greater than 2 inches in largest dimension unless approved by the contractor during construction.

Excavated surplus material from the various construction sites will be stockpiled in designated areas only.

The final cover will consist of layers of top soil, geotextile pea gravel, cobblestone, geotextile, sand, Flexible Membrand Liner (FML) liner, clay cap, and backfill soil. The following items will be provided and installed for construction of the final cover.

1) Approximately 350,000 cubic yards of top soil (2-feet thick).

2) Approximately 290,000 cubic yards of pea gravel (1-foot thick).

3) Approximately 700,000 cubic yards of cobblestone (2-feet, 4-inches thick).

4) Approximately 15,500,000 square feet of geotextile.

5) Approximately 200,000 cubic yards of sand (8-inches thick).

6) Approximately 42,000,000 square feet of FML.

7) Approximately 580,000 cubic yards of backfill (6-inches minimum to 2-feet maximum thickness).

8) Approximately 900,000 cubic yards of clay cap.

3.1.1.4 Paving and Surfacing (Section 02510)

Asphalt pavement will consist of material specified and will be placed in accordance with the Ohio Department of Transportation "Construction and Material Specifications" and American Association of State and Highway Transportation Officials (AASHTO)-GHHS-84.

Gravel or crusher run stone will be the preferred materials for construction of the roads and unloading areas.

Roads will consist of:

1) 35,000 linear feet of 20-foot-wide road for EWMF access and unloading. The road consists of an 8-inch base course with a 4-inch course asphalt base surfacing. The road cross slope is to be 1/4-inch per foot (minimum).

2) 20,370 linear feet of 24-foot-wide paved site access road. The road consists of an 11-inch aggregate base course with a 4-inch leveling course and a 1-1/2-inch surface course. The road cross slope is to be 1/4-inch per foot (minimum).

3) 14,200 linear feet of 20-foot-wide gravel patrol road. The road consists of an 8-inch gravel base course and a 2-inch course crushed gravel surfacing. The road cross slope is to be 1/4-inch per foot (minimum).

   Paving for sidewalks and areas subject to foot traffic will be 4-inch-thick air entrained Portland cement concrete surfacing, unreinforced with a compressive strength of 3,000 psi in 28 days.

3.1.1.5 Site Drainage (Section 02725)

Drainage systems will be constructed to drain all surface water which can cause damage to facilities, property, and adjoining land from the EWMF construction area. Culverts will be provided under roadways wherever the natural drainage pattern is interrupted and will be aligned with and generally match the slope of channel. A headwall at the upstream end and an endwall with suitable downstream protection below the outlet will be provided. Drainage pipes will be corrugated metal pipe, reinforced concrete pipe, or polyvinyl chloride pipe.

The EWMF project will include the following items:

1) Approximately 166,000 linear-feet of reinforced paved gutter that is 4 feet wide and 6 inches thick, with a concrete strength of 3,000 psi at 28 days.

2) 37,520 linear-feet of 8-inch-diameter High Density Polyethylene (HDPE) pipe (AASHTO M294, Type S) for roof drain leader pipe.

3) 58,500 linear-feet of 12-inch-diameter HDPE pipe (AASHTO M294, Type S) perforated, for subdrain pipe.

4) 15,400 linear-feet of 18-inch-diameter HDPE pipe (AASHTO M294, Type S) for roof drain header pipe.

5) 23,400 linear-feet of 24-inch-diameter HDPE pipe (AASHTO M294, Type S) for roof drain header pipe.

6) 11,300 linear-feet of 48-inch-diameter HDPE pipe (ASTM F-894 Class 63) for outfall pipe.

7) 90 four-foot-diameter precast manholes (ASTM C478) with manhole frame and solid lid, 30-inch diameter.

8) 268 five-foot-diameter precast manholes (ASTM C478) with manhole frame and solid lid, 30-inch diameter.

9) 220 four-foot-diameter manholes (ASTM C478) with frame and grate.

10) 30 six-foot-diameter manholes (ASTM C478) with frame and grate.

11) Trench excavation and backfill is included with drainage piping and structures. For perforated subdrain pipe, bedding and backfill material up to 12 inches above top of pipe will be granular material compacted to 95 percent of maximum density (ASTM D1557). For roof drain headers and leader pipes, bedding and backfill material up to 12 inches above top of the pipe will be washed stone in accordance with ASTM D 448, placed in layers of 6-inch maximum loose thickness and tamped.

3.1.1.6 Retention Pond (Section 02725)

The existing retention basins south of the parking lots provide 10.5 million gallons of storage. The total retention capacity required during the construction of the EWMF is estimated at 40.5 million gallons,

0150

so approximately 30 million gallons of additional capacity is needed for EWMF construction. Runoff from the EWMF will be treated prior to discharge. Additional water treatment capacity, if needed, will be provided by modification of existing facilities or construction of new facilities.

Retention Basins

1) Four retention basins for a total capacity of 30-million gallons will be located as shown on Drawing G00001. Each basin to be constructed will have a maximum side slope of 3 to 1 and a primary synthetic liner with an underdrain system.

2) Primary liner of retention basins will be 36-mil reinforced hypalon® or equal. The surface to receive the liner will be smooth and free of sharp objects that could puncture the lining. The lining will be closely fitted and sealed around inlets, outlets, and other projections through the lining. The material will have minimum hydrostatic resistance of 200-pounds per square inch tested in accordance with ASTM D-751.

3) The underdrain system for retention basins will consist of 6-inch-diameter Polyvinyl Chloride (PVC) perforated and nonperforated pipe. Polyvinyl chloride pipe will conform to the requirements of ASTM D-1785, D-2241, D-2774, and manufacturer's recommendation.

Lift Stations

1) Lift stations will be provided as shown on Drawings G00002 and G00003. These lift stations are required to transport stormwater to the treatment facility.

Sediment Basins

1) Basins with a storage capacity of 15,000,000 gallons for sedimentation will be constructed at nine individual locations as shown on Drawing G00001. Each basin will maintain the natural side slope to a maximum of 3:1. Constructed at the downstream end of the basin will be an earthen dike consisting of a 10-foot-wide crest with a maximum of 3:1 side slopes. Each basin is to maintain a minimum of 11 feet of depth measured from the crest to the upstream toe of the dike.

2) Nine outlet structures will be required for the sedimentation basins. Each structure will consist of 52 linear feet of 42-inch-diameter corrugated metal pipe (CMP), one anti-seep collar galvanized

steel plate, one 8-foot, 6-inch length of 60-inch-diameter CMP riser pipe with anti-vortex plate (5-feet, 6-inches by 6-inches by 1/2-inch galvanized steel) and one 8-feet square, 2-feet thick reinforced concrete pad.

3.1.1.7 Fences and Gates (Section 02831)

Security fencing for the EWMF will be provided as follows:

1) Approximately 23,420 linear feet of 8-foot-high security fencing (with 3 rows barbed wire).

2) Thirteen 24-foot-wide gates.

3.1.1.8 Landscaping (Section 02905)

All excavated areas and areas disturbed during construction will have provisions for landscaping. The following items will be provided: seed, fertilizer, and mulch for 817,960 square yards per United States Department of Energy (DOE) Order 6430.1A, Section 290.

3.1.2 EWMF Vaults

Quantities furnished in this subsection are for one typical 3-module, 12-cell vault (dry or wet cell).

3.1.2.1 Concrete Formwork (Section 03100)

Formwork will be designed, fabricated, erected, used, and removed in accordance with American Concrete Institute (ACI) 347 and ACI 350R.

Concrete in excess of 60 degrees F will not be placed, and insulated wall forms will be used and left in place for a period sufficient to minimize cracking.

Forms will conform to the shape, lines, and dimensions of the members as called for on the drawings, and will be substantial and sufficiently tight to prevent leakage of mortar.

3.1.2.2 Concrete Reinforcement (Section 03200)

All reinforcing bars will be new deformed billet-steel conforming to ASTM A 615, Grade 60.

All welded wire fabric will conform to ASTM A185.

Concrete design and construction will provide measures to eliminate concrete cracking to the maximum extent possible. Concrete design, materials, details, and workmanship will conform to American Concrete Institute Standards and Manuals, including ACI 318, ACI 349, ACI 311, and ACI 315. (Note: ACI 349 is specified pending the identification of the vault structure as a Safety Class Item in the Safety Analysis Report (SAR). If the SAR does not identify the vault structure as a Safety Class Item, ACI 349 will be evaluated and revised to ACI 318, if appropriate.)

3.1.2.3 Cast-in-Place Concrete (Section 03300)

Cast-in-place concrete will have 4,000 psi 90-day strength per ACI 301-89, and may include a mixture of Portland cement, fly ash, and Grade 120 slag. The 90-day strength requirement is specified to reduce shrinkage and cracking potential. Concrete design will conform to ACI 349-85, latest revisions, and to special requirements to be specified to minimize cracking. (Note: ACI 349 is specified pending the identification of the vault structure as a Safety Class Item in the SAR. If the SAR does not identify the vault structure as a Safety Class Item, ACI 349 will be evaluated and revised to ACI 318, if appropriate.)

Cast-in-place concrete for each disposal vault will consist of

1) 7,500 cubic yards of cast-in-place, reinforced concrete for exterior and interior walls; 26,300 cubic yards of reinforced concrete for slab-on-grade; and 7,630 cubic yards of reinforced concrete for wall footings.

2) 4,400 cubic yards of cast-in-place reinforced concrete for 12-1/2-inch-thick concrete deck over the precast concrete deck panels.

3.1.2.4 Precast/Prestressed Concrete (Section 03410)

Precast/prestressed concrete product design, fabrication, testing, and quality control will meet requirements of Prestressed Concrete Institute Manuals MNL-116 and MNL-117.

Precast/prestressed concrete products may include AASHTO girders, double tees, and deck panels and will be designed to meet requirements shown on design drawings.

Precast/prestressed concrete will have a minimum compressive strength of 6,000 psi at 28 days per ACI 301.

89,000 square feet of 3-1/2-inch-thick precast, prestressed deck panels over roof beams.

350 precast/prestressed concrete 53-feet long, AASHTO Type IV roof beams.

700 preformed reinforced elastomer bearing pads under AASHTO beams. The bearing pads will be expansion bearing systems and will be approved before installation.

3.1.2.5 Water Stops (Section 03300)

Water stops will be fabricated from a plastic compound the basic resin of which will be PVC.

Waterstops in wall joints as follows:

1) 1,500 linear feet of control joints to receive waterstops in the joint

2) 1,500 linear feet of joints to receive crack inducer on both faces of wall

3) 2,150 linear feet of joints (base of wall to foundations) to receive waterstop.

Waterstops in floor slab and foundation joints as follows:

1) 4,250 linear feet of floor slab perimeter joints to receive waterstops

2) 3,700 linear feet of floor slab joints to receive waterstops

3) 1,500 linear feet of footing joints to receive waterstops in the joint

4) 5,200 linear feet of 2-inch crack inducer on both top and bottom surfaces.

Waterstops in roof slab as follows:

1) 7,340 linear feet of roof slab joints to receive waterstop and crack inducer on both top and bottom faces

2) 1,570 linear feet of joints (top of wall to roof slab) to receive waterstops.

The modules of each vault are separated by a 2-inch gap. Four hundred linear-feet of 2-inch-wide expansion joint flashing between the adjacent module walls and along the expansion joints across the roof will be required.

A sand and concrete cushion will be provided over the vault liner. The cushion will be 6,000 cubic yards of 6-inch sand layer over the liner with 6,000 cubic yards of 6-inch reinforced concrete slab on top.

3.1.2.6 Grout (Section 03505)

In general, grout for setting structural members and/or embedded items in or on hardened concrete will consist of approved Portland cement and fine aggregate. Sufficient water will be added to produce a dense, workable mix.

3.1.2.7 Structural Steel (Section 05120)

Structural steel will conform to ASTM A-36 and will be designed, detailed, fabricated, and erected in accordance with the American Iron and Steel Institute (AISC) Specifications and Code of Standard Practice.

Bolts used to connect structural members will be high-strength steel bolts and will conform to ASTM A-325. Anchor bolts will conform to ASTM A-307.

All welding will conform to the American Welding Society Specification D.1.1.

All fabricated carbon steel will be painted with one shop coat of primer.

3.1.2.8 Elastomeric Sheet Roofing (Section 07533)

The vaults will be covered by approximately 94,000 square feet of single ply Elastomeric Sheet Membrane roof assembly that is mechanically attached. The roofing assembly shall conform to Underwriter's Laboratories (UL) requirements for a Class A Fire Hazard Classification rated assembly and Factory Mutual (FM) roof classification wind uplift requirement of I 60 resistance. The membrane shall consist of ehtylene-propylene diene monomer (EPDM), PVC, Neoprene, or other approved membranes and installed over 1-1/2-inch-thick insulation board recommended by the roofing manufacturer.

3.1.2.9 Flashing and Sheet Metal (Section 07620)

All necessary sheet metal work including gravel stop/fascias, gutters, downspouts, cap flashings, reglets, etc., will be a minimum of 0.032-thick aluminum alloy 3003-H14.

3.1.2.10 Sealants and Caulking (Section 07900)

All joints to receive sealants shall be prepared in accordance with sealant manufacturer's requirements. Sealants shall conform to ASTM C920 and be non-staining, non-bleeding, and non-sagging in content. Sealants will be one of the following types: Acrylic, Butyl, Polysulfide, Polyurethane, or silicone. Joints shall be primed and joint backing installed per manufacturer's recommendation.

3.1.2.11 Hollow Metal Doors and Frames (Section 08110)

All hinged personnel doors and frames will be formed of bonderized, cold-rolled stretcher-leveled sheet steel. Doors will be fabricated from 18-gage sheets flush panel and with insulation core. All interior doors will have 6-inch by 16-inch vision panels. Frames will be fabricated from 16-gage sheets.

Fire doors will be UL listed and labeled or FM approved and labeled.

0156

3.1.2.12 Overhead Door (Section 08360)

Upward-acting overhead doors will consist of steel sections constructed by box type construction, using all welded, prepainted, 20 gage, rigid, hot dipped galvanized steel.

3.1.2.13 Finish Hardware (Section 08710)

Finish hardware including lock sets, panic hardware devices, hinges, closers, thresholds, weather stripping (exterior doors only), door holders, flush bolts, and all other necessary items will be provided. Installation of finish hardware will include lock cylinders.

3.1.2.14 Painting (Section 09900)

The following items are required to be field painted:

1) Metal doors and frames
2) Exposed wood
3) Miscellaneous metal work

The following items are not required to be painted:

1) Surfaces receiving a special protective coating
2) Concrete (precast or poured in place)
3) Nonferrous aluminum, chromed, galvanized or stainless metals
4) Factory finished items and equipment

3.1.3 Facility Support Building

General Description: This facility will consist of a one story pre-engineered insulated metal building (40 feet by 60 feet) to house offices, records/filing space, toilets and equipment room. The facility will have finishes consisting of floor covering, painted walls, and acoustical ceilings. Refer to Drawing A00022 for a layout of the facility.

3.1.3.1 Cast-in-Place Concrete (Section 03300)

Cast-in-place concrete will have 3,000 psi compressive strength at 28 days per ACT 301-89. The concrete slab on grade for the building structure will consist of the following:

1) 65 cubic yards of 4-inch-thick reinforced concrete floor slab with a 3-feet-deep perimeter edge grade beam.

2) 10 cubic yards of reinforced concrete for four column footings (approximately 4 feet by 4 feet and 3 feet deep).

3) A 4-inch-thick gravel bed under the floor slab.

4) One layer of 6-mil polyethylene vapor barrier.

5) 600 square feet of 1-1/2-inch-thick rigid insulation under the perimeter edge of floor slab.

3.1.3.2 Building Insulation (Section 07213)

Provide batt type fiberglass insulation with associated vapor barrier in the walls and roof of the structure to give a U-value of .08 (or less) for the walls, .07 (or less) for the roof. The insulation shall have a Flame Spread Rating not in excess of 25 and a Smoke Developed Rating not in excess of 50 per ASTM E 84 (NFPA 255).

3.1.3.3 Joint Sealants (Section 07900)

All joints to receive sealants shall be prepared in accordance with sealant manufacturer's requirements. Sealants shall conform to ASTM C 920 and be non-staining, non-bleeding, and non-sagging in content. Sealants will be one of the following types: Acrylic, Butyl, Polysulfide, Polyurethane, or silicone. Joints shall be primed and joint backing installed per manufacturer's recommendation.

3.1.3.4 Hollow Metal Doors and Frames (Section 08110)

All hinged steel doors and frames shall conform to Steel Door Institute (SDI) SDI-100-85. Doors and frames shall be formed from bonderized, cold-rolled stretcher level sheet steel, galvanized to ASTM A525, G60 and factory primer finish. Doors and frames shall be factory prepared and reinforced to receive hardware.

3.1.3.5 Finish Hardware (Section 08710)

Finish hardware including lock sets, panic hardware devices, hinges, closers, etc., shall conform to the Door Hardware Institute (DHI) for installation of builders hardware.

3.1.3.6 Windows (Section 08410)

Provide fixed type insulated glass window units (assume ten - 3 feet wide by 7 feet high) in the building exterior walls. The window will consist of aluminum storefront type framing with an inner and outer pane of 1/4-inch-thick glass with an air space between the panes. The glass unit will be glazed into the frame per the manufacturer's recommendations.

3.1.3.7 Gypsum Board System (Section 09260)

Interior partitions shall consist of one layer (each side) of 1/2-inch-thick gypsum wallboard attached to 3-1/2-inch (nominal) steel studs located at 24 inches on centers. The gypsum wallboard system shall include all fasteners, metal corner beads, metal edge trim, and finishing (including joint compound and reinforcing tape) as required to receive paint.

The interior side of the exterior walls shall have one layer of 1/2-inch-thick gypsum wallboard attached to 2-inch (nominal) steel studs located at 24 inches on centers. The metal studs will be attached to the pre-engineered building secondary framing system. The gypsum wallboard shall be finished the same as outlines for interior partitions.

3.1.3.8 Suspended Acoustical Ceilings (Section 09511)

Suspended acoustical ceilings shall consist of a metal grid system (per ASTM C636) capable of supporting loads to a deflection of 1/360 maximum. Support channels and hangers shall be galvanized steel of size and type to suit the application. Acoustical tiles shall have a minimum thickness of 5/8 inches and a nondirectional pattern.

3.1.3.9 Resilient Flooring (Section 09650)

Resilient floor tile shall be provided in the toilet and equipment room areas. The resilient flooring shall be vinyl or rubber composition with a flame/smoke rating not to exceed 25/50 when tested in accordance to ASTM E 84. The concrete floor shall be prepared with filler and/or primer as required by the tile manufacturer. The tile shall be installed with adhesive per manufacturer's instruction. A rubber or vinyl covered base (4-inches high) shall be installed at the perimeter of the tile abutting walls.

3.1.3.10 Carpet (Section 09686)

Carpet shall be commercial grade nylon installed over cushion in accordance with manufacturer's instructions.

3.1.3.11 Painting (Section 09900)

All surfaces that will require painting shall be properly prepared, primed, and finished to receive paint.

The following items are required to be field painted:

1) Metal doors and frames
2) Gypsum wallboard
3) Miscellaneous metal items
4) Exposed piping, conduits, hangers, etc.

The following items are not required to be painted:

1) Nonferrous aluminum, chromed, galvanized, or stainless steel metals
2) Factory finished items and equipment
3) Surfaces to receive special coatings

3.1.3.12 Metal Toilet Compartments (Section 10160)

Toilet compartments shall be installed where shown on plans. The metal panels forming the compartments shall be fabricated form sheet steel with G90 zinc coating. The toilet compartments shall be furnished with all attachments, bolts, hardware, and rails required for floor mounting. Panels shall have baked-on enamel finish.

3.1.3.13 Pre-Engineered Buildings (Section 13121)

Provide a one-story pre-engineered metal building (40 feet by 60 feet) with 20-feet wide bays, rigid frame, straight column (no interior columns permitted) and 12 feet for eave height. The walls and roof are to be insulated per values established in Section 3.1.3.2. The roof will slope a minimum of 1/2 inch to 12 inches from the ridge to a gutter on each side of the building.

The building will be the design of a manufacturer who is regularly engaged in fabrication of pre-engineered structures and a current member of the Metal Building Manufacturers Association (MBMA). The building design shall conform to Ohio Basic Building Code (OBBC) requirements for dead, live, snow, seismic, wind, auxiliary, and any collateral loads imposed in the design of the structure.

The pre-engineered building materials will include structural framing, roofing, siding, anchor bolts, fasteners, and other component parts of a metal building to provide a weather-tight structure. The building components will consist, as a minimum, of the following:

1) All structural steel sections and welded plate members shall be designed in accordance with applicable sections, relating to design requirements and allowable stresses, of the latest edition of AISC "Specifications for the Design, Fabrication, and Erection of the Structural Steel for Buildings."

2) All light-gage, cold-formed, structural members and covering shall be designed in accordance with the applicable sections, relating to design requirements and allowable stresses, of the latest edition of the American Iron and Steel Institute (AISI) "Specifications for the Design of Cold Formed Steel Structural Members."

3) Wall and roof panels shall be fabricated from "Galvaume" steel conforming to ASTM A 792. Wall panels shall have a factory baked-on paint finish with a 20 year warranty.

4) Flashing, trim, and closures shall be formed of the same material as wall panels and provide weather-tight closure. Neoprene closure strips shall be provided at floor and roof termination of wall and roof panels.

5) All wall and roof penetrations shall be sealed for weather tightness with flashing materials and sealants as required by the building manufacturer.

3.2 Process

The containment system (liner) will be installed per Drawing G00018. All materials are as per the drawing and as noted below:

1) 205,000 square feet of high-solids content, concrete-coating polymer (Epoxy or polyurethane) per vault (Total = 9,150,000 square feet) to walls and floors of vault cells.

2) 178,000 square feet of geotextile material (drainage net) per vault. (Twenty percent of the vault cells will be dry and have only the lower two feet of walls to be covered; 80 percent will be wet and require entire wall coverage, which is 7,930,000 square feet total.)

3) 178,000 square feet per vault of 80-mil, high density polyethylene liner with 5,700 linear feet of prefabricated HDPE corner joints. Total = 7,930,000 square feet.

4) Approximately 5,700 linear-feet of prefabricated HDPE cover joints per vault: Total = 256,000 linear-feet).

5) 10,800 cast-in-place 304 stainless steel, anchor bolts (6-inch minimum length) per vault for the HDPE liner, 120 anchors for dry cells, 1,150 anchors for wet cells. A total of 480,000 anchor bolts with 304 stainless steel nuts and washers will be provided.

6) 32,300 feet of 304 stainless steel stripping (1-inch wide x 1/16-inch thick) for HDPE liner anchoring; 3,460 feet for wet cells, 384 feet for dry cells. (Total 1,440,000 linear feet)

7) 72 feet of cast-in-place, HDPE double-walled pipe (4-inch-diameter outer pipe, 2-inch-diameter inner pipe) per vault (3,220 feet total).

8) 840 feet of 2-inch HDPE pipe per vault (37,500 feet total).

9) 210 feet of 4-inch HDPE pipe per vault (9,380 feet total).

10) Twelve, 200-gallon cast-in-place, HDPE prefabricated tanks per vault (540 total).

11) 24 cast-in-place HDPE capped pipes (12-inch diameter by 3-feet long) per vault (1,080 total).

12) Sand layer in dry cell vaults; 14,400 cubic feet per dry cell (1,930,000 total cubic feet).

13) Six concrete manways per vault (268 total manways). Each manway will be 4 feet in diameter and 40 feet deep. Carbon steel light duty covers will also be provided.

14) Twelve cast-in-place HDPE drains as shown in Drawing G00018 (540 total).

3.3 Mechanical

3.3.1 Lift Trucks (Section 14685)

1) Forklift Truck
Two forklift trucks, one for the operating cell and one spare.

Power unit type: Diesel
Rated lift capacity: 10,000 pounds
Minimum lift height: 13 feet
Shiftable forks, 4 feet long
Radiation shielding will be provided for the operator.

2) Boom Truck
Two boom type forklift trucks, one for the operating cell and one spare.

Power unit type: Diesel
Rated lift capacity: 10,000 pounds
Minimum lift height: 13 feet
Minimum boom extension: 13 feet

Shiftable forks
Radiation shielding will be provided for the operator.
TV camera required for monitoring of load placement.

3.3.2 Basic Material and Methods (Section 15050)

Personnel Safety Equipment/Portable Eyewash/Safety Shower Stations (One for each operating cell).

Each station will provide a minimum 15-minute supply of emergency wash water. Eyewash/shower consists of a pressurized water tank connected to a fixed eyewash faucet and a hand-held shower head. Water tank will be heated. A first aid kit will be affixed to the station. The station will be cart- or trailer-mounted or capable of being transported by a standard forklift for portability.

3.3.3 Pipes and Pipe Fitting (Section 15060)

The following piping systems will be included for the FSB:

1) Hot and cold water distribution: steel and copper tubing, hot water pipes will be insulated.
2) Building drains: cast iron (installed below grade).
3) Fire protection: cast iron supply, steel distribution.

3.3.4 Pumps (Section 15160)

The leachate sump pump trailers system will consist of two mobile and self contained sump pumping units. The equipment will be mounted on light weight trailers, which can be pulled by a light pickup truck. This equipment would be used during the interim and final closure phases of the vault cell, as required.

Type of pump: Jet Pump, 2-pipe unit
Type of power unit: Gas internal combustion, 3 hp
Minimum pump capacity: 10 gpm

Ejector: 2-pipe, deepwell, maximum pumping depth 40-feet below grade
Priming water tank, approximately 150 gallons
Fuel Tank
Hose and hose reels for pressure/suction/waste lines as required

Tool locker for small tools.

3.3.5 Fire Protection (Section 15300)

All areas of the Facility Support Building will be protected with a wet-pipe sprinkler system. In addition, two portable 20-pound Class ABC fire extinguishers will be installed. Each operating cell will be provided with two portable 20-pound, Class ABC fire extinguishers.

3.3.6 Plumbing (Section 15400)

Water supply and waste drainage systems will be provided for the facility support building. Fixtures will be included as follows:

1) Men's rest room:
   1 - water closet
   1 - urinal
   1 - lavatory

2) Women's rest room:
   2 - water closets
   1 - lavatory
3) Water heater: 20 gallon, electric
4) Janitor's sink
5) Drinking fountain
6) Non-freeze outside hose bibb.

3.3.7 HVAC System (Section 15500)

1) Ventilation Fans (Vaults)

   Two exhaust fans will be provided for each dry cell to remove diesel exhaust fumes created by the boom trucks. The fans will be mounted in temporary openings in the rear wall of the cell. The openings will be above the level of the stacked boxes. When the cell is closed, the fans will be removed and reinstalled in the next operational cell. The temporary openings will then be sealed.

Fan Capacity: 10,000 cfm each, at 1/8-inch water static pressure
Wheel size: 30-inches
Motor: 2-hp, 460-Vac, 3-phase

2) HVAC Unit

The Facility Support Building will be heated and air conditioned. A packaged heating and air conditioning unit with electric heating, and thermostat control will be provided. Air distribution and return ducts will be provided for all areas. Air dampers, diffusers, registers, and filters will be installed. Estimated loads are 7-1/2 tons cooling and 100,000 Btu/hour heating.

3) Roof Exhaust Fan

The toilet rooms in the FSB will be exhausted by a roof exhaust fan with backdraft damper, disconnect switch, roof curb, and screen.

Capacity: 600 cfm at 1/2-inch static pressure.

3.4 Electrical

3.4.1 Conduit and Fittings (Section 16110)

Rigid conduit systems will be UL approved, rigid galvanized steel and threaded with a 3/4-inch minimum size. Liquid-tight flexible conduit systems will have galvanized steel construction with PVC jacket, conduit conforming to UL 360 and the fittings and conduit bodies conforming to National Electrical Manufacturers Association (NEMA) FB 1.

3.4.2 Boxes (Section 16130)

Outlet boxes will be of galvanized steel construction conforming to NEMA OS 1 indoors and cast aluminum conforming to NEMA FB 1, Type FD outdoors. Boxes will have gasketed covers provided by box manufacturer and will be provided with threaded hubs. Pull and junction boxes will be of sheet metal galvanized steel construction conforming to NEMA OS 1 indoor and stainless steel outdoors.

3.4.3 Electrical Enclosures (Section 16160)

Hinged covered electrical enclosures will be NEMA 250, Type 12, with manufacturer's standard enamel or epoxy finish. Covers will have continuous or multiple hinges held closed by screwdriver- operated door clamps. The subpanel for mounting terminal blocks and other electrical components will be 14-gage steel with a white enamel finish.

3.4.4 Terminal Blocks (Section 16160)

Terminal blocks will conform to NEMA ICS 4 and be UL listed. Power terminals will be unit construction, closed-back type with tubular pressure screw connectors rated 600 volts. Signal and control terminals will be modular construction type, channel mounted, tubular pressure screw connectors, rated 600 volts.

3.4.5 600-Volt Cable (Section 16120)

Conductors for power, lighting, and miscellaneous control will be rated 600-volt, 90 degrees C, type THHN and THWN. The minimum control wire size will be Number 14 AWG, and Number 12 AWG for all other wiring. All conductors will be stranded copper except that lighting and branch circuit wiring size Number 10 AWG or smaller may be solid.

3.4.6 15 kV Cables

Cables for 15 kV service shall be rated 90 degrees C with XLP insulation at 133 percent. Cables shall be three conductor and suitable for direct burial.

3.4.7 Primary Fuse Cutouts (Section 16440)

Primary fuse cutouts will conform to NEMA Standard SG2. The cutouts will be heavy duty, porcelain enclosed, indicating dropout type, rated 14.4-kV. Open link rural type cutouts are not acceptable. The power fuses will be rated for 100 MVA and will conform to NEMA Standard SG2. Fuse ratings will be as indicated on the drawings or coordinated to suit the pole mounted transformers provided.

3.4.8 Pad Mounted Transformers (16320)

Pad mounted transformers shall be mineral oil filled, air cooled, and shall contain NEMA standard high voltage taps. Transformers shall have a 65 degree C rise temperature and shall contain provision for future cooling fans. Transformers shall be rated as indicated on the single-line diagram and be suitable for outdoor pad mounting. The EWMF pad mounted transformer shall be rated 300 kVA, 13.2 kV to 480 Vac, three-phase, 60 Hz.

3.4.9 Distribution Transformers (Section 16462)

Distribution transformers will be general purpose, dry type, and have a 220 degree C insulation temperature classification and 150 degree C winding temperature rise. Full capacity NEMA Standard taps will be provided in the high voltage winding.

Leachate detection distribution transformers shall be 9 kVA, 480 - 208/120Vac, three-phase, 60 Hz. The office/storage building dry transformer shall be 10 kVA, 480 - 120Vac, single-phase, 60 Hz.

3.4.10 Portable Diesel Generators (Section 16210)

Wet Cell Vault - The portable diesel generator for the wet cell vault shall be rated 3 kW, 240Vac, single-phase, 60 Hz and be housed in a NEMA 4X enclosure. Integral to the generator shall be two 1,000W high-pressure sodium lamps and two 120Vac receptacles.

Dry Cell Vault - The portable diesel generator for the dry cell vault shall be rated 25 kW, 480/277Vac, three-phase, 60 Hz and be housed in a NEMA 4X enclosure. Integral to the generator shall be two 15 amp, three-pole and one 15 amp, two-pole circuit breakers. A minimum of six 120Vac, single-phase receptacles and two 3/C #12 and three 2/C #12 jumper cables shall be provided with the generator.

3.4.11 Motors (Section 15170)

All motors are totally enclosed, fan-cooled (TEFC) construction, and continuous duty classification based on 40 degrees C, ambient temperature. Polyphase motors will be Type II, Design B, squirrel cage type, having normal starting torque and low starting current; single-phase motors will be capacitor start type, except that motors rated 1/6 horsepower and less may be split phase type. All motor insulation will be Class F minimum. Two speed motors will be the 2-winding type.

3.4.12 Starters (Section 16480)

Magnetic starters will be rated for 460-volt, three-phase motors 1/2 horsepower and larger, and manual starters will be rated for all 120-volt, single phase motors smaller than 1/2 horsepower. Magnetic starters with a nonfused disconnect switch and contactors will conform to NEMA Standard IC 1, except that the minimum size will not be less than Size One. Starters will be for across-the-line starting and will be provided with NEMA Type 1 enclosure. The 460-volt starters will be equipped with thermal overloads in each ungrounded conductor. A 480-120-volt, single-phase control power transformer with a secondary fuse will be provided. An overload reset button will be installed in or through the cover.

Individual combination starters will be magnetic type with a nonfused disconnect switch and will be provided with a common NEMA Type 1 enclosure. The switch will be operable by an exterior handle clearly indicating the position. The handle will be provided with means to lock the handle in the OFF position.

Manual starters will be full voltage, toggle type conforming to the requirements of NEMA Standard IC 1, and will be provided with NEMA Type 1 enclosure, with provision for padlocking in OFF position.

3.4.13 Circuit Breakers (Section 16170)

Circuit breakers will be of the molded case type and will be in accordance with the National Electrical Code, and frame size will not be less than 100 ampere. Interrupting capacity of the 480-volt circuit breakers will be as noted but not less than 14,000-ampere rms symmetrical minimum.

3.4.14 Fused Disconnect Switches (Section 16440)

Fusible switch assemblies will be Type HD quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F-870. Designed to accommodate Class R fuses.

3.4.15 Nonfused Disconnect Switches (Section 16440)

Nonfusible switch assemblies will be NEMA KS 1; Type HD; quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

3.4.16 Fuses (Section 16440)

Fuses rated 600-volt, 60-Hz, 600-ampere and less will conform to UL 198E, class RK 1. Fuses will have duel element, current limiting, time delay, and one-time fuse functions. The interrupting rating will be 200,000 ampere rms.

3.4.17 Panelboards (Section 16462)

Panelboards will be constructed of galvanized sheet metal, dead front, copper bus, 3- or 4-wire, as shown on the single line diagram, circuit breaker type, conforming with Federal Specification W-P-115. Circuit breakers will be rated for alternating current (ac) and direct current (dc). Circuit breakers will be molded case type conforming with Federal Specification W-C-375 and will have a minimum interrupting rating of 10,000-ampere rms symmetrical for the 120/208-volt panelboards, and 14,000-ampere rms symmetrical for the 480-volt panelboards. Enclosures will be NEMA 1 indoor and NEMA 4 outdoor.

The LCLDS distribution panelboards shall be rated 208/120Vac, three-phase, 60 Hz, 18CKT. The office/storage building will contain a 480Vac, three-phase, 60 Hz, 42 circuit main distribution panel and a 120Vac, single-phase, 60 Hz, 42 circuit power panelboard.

3.4.18 Receptacles (Section 16141)

The 120-volt, 3-wire, grounding type convenience outlets will conform with NEMA Standard configuration. The duplex receptacles will be rated 15 amp, and the single receptacles are rated 20-ampere. Weatherproof receptacles will have a spring door. Receptacles for 208V, three-phase service will match the existing receptacle configuration and be interchangeable. Receptacles used outdoors, in wet locations, or for portable equipment shall contain Ground Fault Circuit Interrupt (GFCI) protection as required by ANSI/NFPA 70-90.

3.4.19 Light Switches (Section 16490)

Switches to control lighting circuits will be toggle type, 15 amp, 150V, ac phenolic body.

3.4.20 Control Relays (Section 16485)

Control relays will be magnetically operated relays with ac coils, and contacts rated 10 amp inductive and continuous duty.

3.4.21 Terminal Box Enclosures (Section 16130)

Control terminal box enclosures outdoors will be NEMA 4X sheet steel construction with hinged door, lock, and stainless steel equipment mounting panels.

3.4.22 Lighting (Section 16500)

Solidified waste slab cells shall contain 250W, 277Vac, single phase, 60 Hz high-pressure, sodium rapid start fixtures. A minimum of 10-foot candles shall be maintained.

Outdoor perimeter lighting shall be high pressure sodium rapid start fixtures rated 250W, 480V, single-phase, 60 Hz. A 1-foot candle shall be maintained.

The office/storage building shall contain 2-foot by 4-foot, 120Vac fluorescent fixtures with F40CW lamps. A minimum of 70-foot candles shall be maintained in the office/storage building.

3.4.23 Emergency Lighting (Section 16535)

Emergency battery lights and exit signs will consist of two 12-watt Model H halogen lamps mounted on the case, a 3-cell, 6-volt, long life, lead calcium battery; an enclosed heavy duty, solid state relays and circuits which automatically and instantaneously disconnect the lamps when power is restored, and an automatic, trickle rate charger with a high grade, full wave selenium rectifier to maintain the battery at full charge without overcharging. Emergency lighting equipment shall conform to the NFPA Life Safety Code.

3.4.24 Uninterruptable Power Supply (Section 16610)

Uninterruptable power supplies (UPS) shall be forward transfer type emergency power systems consisting of rectifier/charger units, storage batteries, and solid state inverters. A static transfer switches shall provide for automatic transfer to and from the UPS system.

The data logging UPS system shall maintain 250W for a 24-hour period. The system shall operate at 120Vac, single-phase, 60 Hz.

The area radiation monitor UPS systems shall maintain 50W for an 8-hour period. The UPS systems shall operate at 120V, single-phase, 60Hz.

3.4.25 Lightning Protection (Section 16670)

A Number 4/0 soft-drawn, bare copper facility ground loop with 3/4-inch by 10-foot copper-clad steel ground rods will be provided. The maximum facility ground resistance will be 5 ohms.

All exposed noncurrent carrying metallic parts of electrical and mechanical equipment, structural elements, and the neutral conductor of the wiring system will be grounded in accordance with the National Electrical Code.

Distribution type lightning arresters will conform to NEMA Standard LA1. Arresters will be equipped with NEMA Standard mounting brackets for the applicable method of mounting on a crossarm. Arresters will be connected by means of a soft drawn copper conductor, not smaller than Number 4 AWG, to a copper or copper-clad steel ground rod, not less than 3/4-inch diameter by 10-foot long. The ground rod will be driven at least 11 feet into the ground, 3 feet minimum out from the base of the pole.

3.5 Instrumentation

3.5.1 Personnel Monitor (Section 13405)

Personnel monitors will be movable hand and foot monitors. Input power will be 120Vac, 60 Hz. The monitors will consist of a minimum of six detectors; each detector will function independently. The

display will indicate the location of the contamination, a red alarm light will come on, and an audible alarm (90 dB at 10 feet) will sound.

3.5.2 Area Radiation Monitor (Section 13405)

The monitors will be able to detect from background level to 3 R/h. Input power will be 120Vac, 60 Hz. A 4-20 mA analog output will be included.

3.5.3 Portable Area Radiation Monitor

The high alarm condition will be indicated by a rotating red beacon and an audible alarm (100 dB at 10 feet). Monitors will include an auxiliary 4-20 mA output and will detect signals from 1 to 1,000 mR/h. Input power will be 120Vac, 60 Hz.

3.5.4 Air Flow Switch (Section 13405)

Paddle-type air flow switches with one dry contact, each rated for a minimum of 24V with a current of 2A.

3.5.5 Leachate Monitoring System

Conductivity probes will consist of two electrodes made from stainless steel and a junction box with 2-inch NPT mounting. Each probe will have a current viewing resistor across the terminals to permit monitoring.

3.5.6 Data Logging System (Section 13405)

The data logging system (computer) will consist of the following:

1) Personal Computer (PC)-Industrial Quality
2) Magnetic storage disk (20 megabyte)
3) Monochrome video monitor
4) 14 slot AT style backplane
5) 16 MHz (min) CPU
6) One megabyte Random Access Memory (RAM)

7) AT 101 spill proof keyboard
8) One parallel interface input port.

3.5.6.1 Printer (Section 13405)

Letter quality 24-pin parallel input port, compatible with the Data Logging System.

3.5.6.2 Multiplexer

The multiplexer will be compatible with a data logging system capable of handling 1,000 analog inputs minimum. The multiplexer will have a dc power supply requiring 120Vac, 60 Hz as the power source, and will be built into a NEMA 4X enclosure.

SECTION 4

DESIGN SUPPORTING DOCUMENTS

Unless specified otherwise in the design specifications, drawings, or purchase orders, the applicable revision for DOE Orders, FEMP site requirements and other federal, state, and industry regulations, standards, or specifications shall be the revision in effect on the design start date.

4.1 Federal, State, and Local Requirements

On-Site Response Actions

Pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(e)(1) and the DOE/EPA Consent Agreement Section XIII, the DOE is not required to obtain any Federal, State, or local permits for response actions conducted entirely on-site. Therefore, a permit for the EWMF would not be required. The Consent Agreement requires that on-site response actions must still satisfy the substantive Federal and State requirements that would have been included in any permits. Per the Consent Agreement, the DOE must identify the permits which would otherwise be required; associated permitting requirements; and how the on-site response action will comply with these associated requirements. The identification of and compliance with these permit requirements will be addressed within the Remedial Action (RA) Work Plan.

The DOE must satisfy all Applicable or Relevant and Appropriate Requirements (ARARs) identified for the EWMF by the EPA and Ohio Environmental Protection Agency (OEPA). These ARARs include Federal and State environmental standards; clean-up standards; and control standards that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site; or standards that specifically address a sufficiently similar problem or situation. Local regulations do not constitute an ARAR under CERCLA unless incorporated into a State regulation or enforced by the State. No local ARARs have been identified. The DOE must explain how the EWMF will satisfy each final ARAR. These explanations will be provided as part of the RA Work Plan.

To date, the EPA has not approved a final list of ARAR requirements for the EWMF. The design criteria currently identified in this document for the EWMF is based upon the draft list of EWMF ARARs, Revision 2, dated February 25, 1991. The design criteria may need to be revised in response to the EPA's final approved list of ARARs. The design related ARARs are provided as Exhibit 1. For each ARAR, the regulatory citation, a summary of the regulatory requirement, and the implementation/compliance strategy are provided. The ARAR design criteria are also incorporated within this report for each of the appropriate system descriptions.

Nonpromulgated federal or state advisories/criteria/guidance documents will also be considered during the design of the EWMF and incorporated as appropriate. The US EPA has identified several advisories/criteria/guidance documents as To-Be-Considered (TBC) documents under 40 CFR 300.400. The incorporation of any TBC requirements into the EWMF design is discretionary and may be subject to DOE/Westinghouse Environmental Management Company of Ohio (WEMCO) review/approval.

Off-site Activities or Effects

Permits must be obtained for any off-site activity or effect (i.e., leachate/stormwater effluents, waste shipment from FEMP). The DOE must notify the US EPA in writing of all permits required for all off-site activities. Upon request of the US EPA, the DOE is to provide copies of all such permit applications and any other documents related to the permitting process.

The discharge of any effluents (i.e., leachate and stormwater) to an off-site surface water body would need to be permitted since the discharge does not qualify as an on-site response action. If the leachate is to be treated at an existing or new wastewater treatment facility, a National Pollutant Discharge Elimination System (NPDES) revision or new NPDES permit would be required. An Ohio EPA Permit-to-Install and Permit-to-Operate may be required for the modified or new treatment facility. A permit package would be required for any construction activity that disturbs more than 5 acres of ground to stormwater under the permitting program being proposed by the US EPA. The identification of the permit requirements and information demonstrating that all applicable standards are satisfied will be provided as part of the RA Work Plan to fulfill the requirements of the Consent Agreement Section XIII. Modifications will need to be submitted for any on-site EWMF activity which affects an existing permit (i.e., NESHAP, NPDES, and Resource Conservation and Recovery Act [RCRA]) issued to the FEMP.

Remedial Design/Remedial Action

In accordance with the DOE/EPA Consent Agreement Section XI, DOE is to submit to the US EPA a Remedial Design (RD) and Remedial Action Work Plan. The RD Work Plan is to include the schedule for the implementation of the tasks and report submittals required to complete the remedial design. The design schedule for the EWMF is to be a part of the RD Work Plan prepared by the Operable Units as appropriate. The RD Work Plan is to be submitted to EPA within 60 days of finalization of the Record of Decision (ROD) for each OU.

In accordance with the EPA approved design schedule provided in the RD Work Plan, DOE must prepare and submit the RA Work Plan. The RA Work Plan is to include the following plans:

1) A sampling and analysis plan which includes a Quality Assurance Program Plan (QAPP), and field sampling plan
2) A health and safety contingency plan
3) A plan for satisfaction of permitting requirements
4) A groundwater monitoring plan
5) An operations and maintenance plan
6) A schedule for implementation of the RA Work Plan (including submission of required reports).

The RD/RA Work Plans are to be developed in conformance with the ROD, the Statement of Work, the National Contingency Plan (40 CFR 300), US EPA RD/RA guidance and policy applicable at the time of the final ROD date, and any additional guidance documents provided by the US EPA.

4.1.1 Federal Laws, Executive Orders, and Regulations

The EWMF project shall comply with the following Federal laws, Executive Orders, and regulations. The below list includes both identified ARARs and other non-environmental requirements which affect the design and operation of the EWMF. The specific environmental requirements were identified in the EWMF Functional Requirements and are shown in Exhibit 1.

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Federal Laws and Executive Orders

CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
Executive Order 11988	Floodplain Management
Executive Order 11990	Protection of Wetlands
FWCA	Fish and Wildlife Coordination Act
NEPA	National Environmental Policy Act
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
UMTRA	Uranium Mill Tailings Radiation Control Act

Federal Regulations

10 CFR 20	NRC Standards for Protection Against Radiation
10 CFR 61	NRC Licensing Requirements for Land Disposal of Radioactive Waste
10 CFR 1021	DOE National Environmental Policy Act Implementing Procedures
10 CFR 1022	DOE Floodplain/Wetland Management Policy
29 CFR 1910	Occupational Safety and Health Standards
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 122	National Pollutant Discharge Elimination System
40 CFR 125	Criteria and Standards for the National Pollutant Discharge Elimination System
40 CFR 129	Toxic Pollutant Effluent Standards
40 CFR 136	Guidelines Establishing Test Procedures for the Analysis of Pollutants
40 CFR 141	National Primary Drinking Water Regulations
40 CFR 142	National Secondary Drinking Water Regulations
40 CFR 192	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings
40 CFR 249	Guideline for the Federal Procurement of Cement and Concrete Containing Fly Ash
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
41 CFR 101	Federal Property Management Regulations

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Ohio Laws

ORC 3704	Ohio Air Pollution Control Law
ORC 3734	Ohio Solid and Hazardous Waste Management Law
ORC 6111	Ohio Water Pollution Control Law

Ohio Regulations

OAC 3745-50	Ohio Hazardous Waste Management Regulations
OAC 3745-01	Ohio Water Quality Standards
OAC 3745-09	Ohio Water Well Standards
OAC 3745-15	Ohio General Provisions on Air Pollution Control
OAC 3745-17	Ohio Particulate Matter Standards
OAC 3745-20	Ohio Asbestos Emission Control from Renovation, Demolition and Disposal Operations

4.1.2 DOE Orders

All pertinent DOE Orders (environmental as well as nonenvironmental) related to the EWMF design must be complied with independent of CERCLA requirements unless specifically released from so doing by the DOE. The DOE Orders which are applicable to the design of the EWMF are identified in the following list. Some of these DOE Orders prescribe clean-up standards, environmental standards, or control standards and, therefore, are classified as TBC documents (see Section 4.1, Volume 2) under 40 CFR 300.400.

Order	Title
2250.1C	Cost and Schedule Control Systems Criteria
4700.1	Project Management System
5400.1	General Environmental Protection Program
5400.3	Hazardous and Radioactive Mixed Waste Program
5400.5	Radiation Protection of the Public and the Environment
5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.5	Safety of Nuclear Facilities

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5480.7	Fire Protection
5480.11	Radiation Protection for Occupational Workers
5481.1B	Safety Analysis and Review System
5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities
5500.2A	Emergency Notification, Reporting, and Response Levels
5500.3	Reactor and Nonreactor Nuclear Facility Emergency Planning, Preparedness, and Response Program for DOE Operations
5500.4	Public Affairs Policy and Planning Requirements for Emergencies
5633.3	Control and Accountability of Nuclear Materials
5700.6B	Quality Assurance
5820.2A	Radioactive Waste Management
6430.1A	General Design Criteria

4.1.3 FEMP Site Policy and Design Criteria

FMPC-720	Site Policy and Procedure Control of Construction Waste
RM-FMPC-0001	FMPC General Design Criteria Manual

4.2 Pertinent Industry Codes and Standards and Other References

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO-GDHS-84 A Policy on Geometric Design of Highways and Streets

American Conference of Governmental Industrial Hygienists (ACGIH)

Manual for Recommended Practice for Industrial Ventilation

Threshold Limit Values and Biological Exposure Indices

American Concrete Institute (ACI)

ACI 318	Building Code Requirements for Reinforced Concrete
ACI 349	Code Requirements of Nuclear Safety Related Concrete Structures
ACI 350R	Concrete Sanitary Engineering Structures

American Institute of Steel Construction (AISC)

AISC M011	Manual of Steel Construction

American Iron and Steel Institute (AISI)

Manual for Structural Applications of Steel Cables for Buildings

Specifications for the Design of Cold-Formed Steel Structural Members

American Society of Testing Materials (ASTM)

A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A616	Standard Specification for Deformed and Rail-Steel Bars for Concrete Reinforcement
A617	Standard Specification for Deformed and Axle-Steel Bars for Concrete Reinforcement

American Nuclear Society (ANS)

ANS 6.4	Guidelines on the Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants
ANS 6.4.2	Specification for Radiation Shielding Materials

American National Standards Institute (ANSI)

ANSI C2	National Electrical Safety Code
ANSI B56.1	Low and High Lift Trucks

American Society of Civil Engineers (ASCE)

ASCE 7-88	Minimum Design Loads for Buildings and Other Structures (formerly ANSI A58.1)

American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)

Applications Handbook

Equipment Handbook

Fundamentals Handbook

American Welding Society (AWS)

D1.1	Structural Welding Code - Steel
D1.3	Structural Welding Code - Sheet Steel

Department of Energy

DOE/EV/1830-T5 A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA), April 1980

PNL-6577 Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels That Are As Low As Reasonably Achievable (ALARA), July 1988

UMTRA-DOE/AL 400503.00 Remedial Action Planning and Disposal Cell Design - To Comply with the Proposed EPA Standards (40 CFR Part 192), January 1989.

UMTRA-DOE/AL 050424.0002 Technical Approach Document - Revision II, December 1989.

UMTRA-DOE 350124 Project Surveillance and Maintenance Plan, September 1985.

UMTRA-DOE/AL 163 Plan for Implementing EPA Standards for UMTRA Sites, January 1984.

Institute of Electrical and Electronics Engineers (IEEE)

IEEE 141 Recommended Practice for Electric Power Distribution for Industrial Plants

IEEE 142 Recommended Practice for Grounding Industrial and Commercial Power Systems

IEEE 739 Recommended Practice for Energy Conservation and Cost Effective Planning in Industrial Facilities

Illuminating Engineering Society of North America (IES)

IES Lighting Handbook

National Fire Protection Association (NFPA)

NFPA-13	Installation of Sprinkler Systems
NFPA-70	National Electric Code (NEC)
NFPA-101	Life Safety Code
NFPA-110	Standard for Emergency and Standby Power Systems
NFPA 241	Safeguarding Construction, Alteration, and Demolition Operations
NFPA-505	Fire Safety Standard for Powered Industrial Type Trucks

Building Officials and Code Administrators International, Inc. (BOCA)

OBBC	Ohio Basic Building Code

Prestressed Concrete Institute (PCI)

MNL-116	Manual for Quality Control for Plants and Production of Prestressed Concrete Products
MNL-120	Design Handbook

Post-Tensioning Institute (PTI)

Post-Tensioning Manual

Steel Deck Institute (SDI)

Publ. 25	Design Manual for Composite Decks, Form Decks, and Roof Decks
Publ. DDM01	Diaphragm Design Manual

Steel Joist Institute (SJI)

Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders

International Conference of Building Officials (ICBO)

UBC Uniform Building Code

Lawrence Livermore National Laboratory (LLNL)

UCRL 15910 Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards

U.S. Environmental Protection Agency

Health Effects Assessment Summary Tables (HEAST)

EXHIBIT 1
ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

Exhibit 1 presents the regulatory design, construction, operation and closure requirements for the Engineered Waste Management Facility (EWMF). These regulatory requirements are based upon the list of Applicable, or Relevant and Appropriate Requirements (ARARs), Revision 2, dated February 25, 1991, developed for the EWMF.

The ARARs developed for the EWMF were divided into five different categories as identified below. For each ARAR, the regulatory citation, a summary of the regulatory requirement, and the implementation/compliance strategy are provided.

Administrative - Administrative requirements, in general, are not ARARs but are listed in Exhibit 1 to alert DOE of potential impacts to existing programs.

Design - Design requirements are those items which must be incorporated within the design plans. Each design requirement is divided and sorted by the individual design engineering discipline responsible for implementation of the requirement. Nonpromulgated Federal or State advisories/criteria/guidance documents will also be considered during the design of the EWMF. The EPA has identified several advisories/criteria/guidance documents as TBCs. The incorporation of TBC requirements into the EWMF design is discretionary and may be subject to DOE review and approval. The design requirements also include siting constraints which are to be verified as part of the siting investigation. A Site Selection Report will be generated to demonstrate compliance with the siting constraints.

Modelling - Modelling requirements are those items which relate to chemical or radioactive exposure levels. Compliance with these requirements are normally verified by using a model. The modelling results could impact the design of the EWMF; therefore, the modelling is performed in conjunction with design. The design parameters specified by other ARARs are assumed to produce acceptable modelling results; this assumption will be verified as part of the Safety Analysis Report.

Operational and Plan - Operational and Plan requirements are those items which relate to the operations and post-construction activities of the EWMF. Some of these items may not be ARARs but are included in Exhibit 1 for completeness. The implementation of these requirements may need to be addressed in the RA Work Plan which is to be submitted to EPA for approval. The Remediation Contractor is responsible for the actual implementation of any operational or plan requirements.

The ARARs are also separated by hazardous and radioactive waste requirements in the event that the EWMF is designed to have different disposal structures for each type of waste.

EXHIBIT 1

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.37 [OAC 3745-54-37]	Arrangements must be made with the local authorities to ensure proper emergency planning procedures.	Administrative - DOE - Procedures will be consistent with existing arrangements. These arrangements will be described in the RD/RA Work Plan.
40 CFR 264.193 [OAC 3745-55-93]	Secondary containment systems (including leak detection and removal systems) must be provided for each tank and ancillary equipment to prevent release of any hazardous waste to the environment in the event of a spill or leak. The specific design requirements are identified in 40 CFR 264.192.	Design - All Disciplines (Environmental lead) - Design details for secondary containment system will be developed in conjunction with the tank design. If tank is place underground the Underground Storage Tank provisions may become applicable.
40 CFR 264.301(c) [OAC 3745-66-01]	The EWMF shall contain a double liner system with a leachate collection and a leak detection system.	Design - All Disciplines - The design details will be incorporated into the design drawings.
10 CFR 61.52(a)(7) & 40 CFR 264.309 [OAC 3745-66-09]	At least three permanently surveyed benchmarks referenced to USGS or NGS control points shall be established at FMPC to facilitate surveys.	Design - Civil - The establishment of these benchmarks with be included within the construction bid package.
10 CFR 61.52(a)(8) & 61.53(d)	A buffer zone shall be established around the EWMF to allow detection of radionuclides (environmental monitoring) and, if needed, to permit mitigation prior to release beyond the FMPC boundary.	Design - Civil/Geotechnical - A monitoring buffer zone will be established as part of the EWMF design.
40 CFR 264.14 [OAC 3745-54-14] & 10 CFR 61.42	A physical barrier (i.e., fence) or 24-hour surveillance system must be provided to control the unknowing or unauthorized entry of persons or livestock onto the active portion of the EWMF. Signs (legible from a distance of 25 feet) must be posted at each entrance to the active portion and at other locations as required by 40 CFR 264.14(c).	Design - Civil - The EWMF is to be contained within the security fencing of the FMPC. Signs to be posted as required.
40 CFR 264.301(a) [OAC 3745-66-01]	The materials used for the leachate collection and leak detection systems are to have sufficient strengths to prevent collapse due to loads imposed by the waste materials and final cover, or the movement of operating equipment. The leachate collection and leak detection systems are to be designed to maintain ≤1 foot of leachate over the lowest point of the bottom liner and to operate without clogging.	Design - Civil - The appropriate strength calculations will be performed and a statement of the system's acceptability will be included in the RD Wok Plan. The design details will be incorporated into the design drawings.

EXHIBIT 1

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.301(a) [OAC 3745-66-01]	The liners shall have sufficient thickness and strength to prevent failure due to pressure gradients (internal static head and external hydraulic forces), climatic conditions, installation stresses, and daily operational stresses. The liners are to be placed upon a suitable foundation or base which adequately support the liner system and not fail due to pressure gradients (compression or uplift), or settlement.	Design - Civil/Geotechnical - The appropriate calculations will be performed and a statement of the liner's acceptability will be included in the RD/RA Work Plan.
40 CFR 264.301(f) & (g) [OAC 3745-66-01], 10 CFR 61.50(a)(5) & (6), & 10 CFR 61.51(a)(5) & (6)	The drainage system surrounding the EWMF must be capable of preventing run-on (noncontaminated stormwater) from coming into contact with the waste materials during the peak flow of a 25-year storm event. The upstream drainage areas are to be minimized to decrease the amount of run-on. A run-off (contaminated stormwater) retention system must be provided and have a volume ≥24-hour, 25-year storm. The size of the run-off area should be minimized to reduce the amount of potential contaminated stormwater. The disposal area should be well drained and free of areas subject to flooding or ponding. The drainage ditch gradients shall be limited to prevent erosive velocities.	Design - Civil - The drainage systems will be sized using the Rational Method for calculating peak flows and runoff volumes. Drainage system and erosion controls will also comply with any specific requirements of the Butler/Hamilton County Soil Erosion Control documents. Calculations will be available for inclusion in the RD/RA Work Plan.
40 CFR 264.303(a) [OAC 3745-66-03]	Synthetic liners (including final cover systems) must be inspected for uniformity, damage, imperfections, seam/joint tightness, tears, punctures, and blisters during installation of the liners. Soil-based/admixed liners (including final cover systems) must be inspected for uniformity, damage, imperfections, lenses, cracks, channels, root holes, and other structural nonuniformities (that may increase the permeability of the liner) during installation of the liners.	Design - Civil/Environmental/Geotechnical - A QA/QC program will be developed in accordance with the material supplier's specifications, FMPC requirements, and standard industrial practices. The QA/QC program will be part of the construction bid package for liner installation and will also be incorporated into the RD/RA Work Plan.
40 CFR 264.310(a) [OAC 3745-11] & 10 CFR 61.42, 61.51(a)(1) & 61.52(a)(2)	The final cover must (1) minimize infiltration, (2) require minimal maintenance, (3) be sloped to promote drainage, minimize ponding, and minimize erosion/abrasion, (4) accommodate settling/subsidence, (5) have a permeability ≤ the bottom liner system, (6) provide long-term isolation, and (7) resist degradation by geological processes and biotic activity. For radioactive Class C waste disposal, the final cover system is to be either: (1) ≥5 meters thick or (2) have an intruder barrier with a 500 year operating life.	Design - Civil/Geotechnical - Final cover design plans will be developed to meet these requirements.
10 CFR 61.50(a)(2), (3) & (11)	The EWMF must be capable of being characterized, modeled, analyzed, and monitored. The impacts of future development (including existing nearby facilities and activities) and population growth will have on the EWMF should be considered.	Design - Environmental - NRC regulatory guidance, such as NUREG-1199, will be reviewed to assist with interpreting the implementation of this requirement.

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EXHIBIT 1

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 122.41 [OAC 3745-33-05] & 40 CFR 122.44 [OAC 3745-33-04]	Any wastewater discharge from the EWMF to a surface water body must comply with all the requirements of the NPDES program, including monitoring and record keeping. Also applicable are technology-based effluent limitations and standards based under Section 301 of the CWA and technology-based controls for toxic pollutants.	Design - Environmental/Process - Effluent limitations and monitoring requirements for any proposed wastewater discharges will be determined during Title I design and will be consistent with the existing FMPC NPDES requirements.
40 CFR 264.18(b) [OAC 3745-54-18], 10 CFR 61.50(a)(5), 10 CFR 1022, & Executive Orders 11988 & 11990	For hazardous waste disposal, the EWMF shall not be located in a 100-year floodplain unless the EWMF is designed, constructed, operated, and maintained to prevent washout of any hazardous waste. For radioactive waste disposal, the EWMF cannot be located in a 100-year floodplain, coastal high-hazard area, or wetland. The EWMF shall be located outside of a floodplain or wetland, if possible. Under 10 CFR 1022, adverse impacts to floodplains and wetlands are to be avoided. If it is necessary to locate the EWMF within a floodplain or wetland, the effect from the EWMF must be minimized. A floodplain or wetland assessment must be published in the Federal Register prior to taking any action within the floodplain/wetland to allow time for public review and comment. Under Executive Order 11988, the potential effects of any Federal action that will occur in a floodplain must be evaluated. The DOE must consider alternatives to avoid adverse effects and incompatible development in floodplains. If the DOE decides that the only practicable alternative requires siting in a floodplain, the action must be designed to minimize potential harm to the floodplain and a public notice (with prescribed contents) and opportunity for public comment provided. Under Executive Order 11990, Federal agencies are to avoid construction within a wetlands unless there are no practicable alternatives and all practicable measures are included in the construction project to minimize any impacts to the wetland. Early review of the proposed action is to be provided to the public.	Design - Environmental/Civil - Areas which are within a 100-year floodplain or wetland will be avoided. The evaluation criteria identified in Executive Orders 11988 and 11990, 10 CFR 1022, and NEPA guidance documents will be utilized to evaluate and demonstrate compliance for any activities which may be within a floodplain or wetland. Compliance with these requirements will be described within the Site Selection Report.
40 CFR 264.95 [OAC 3745-54-95] & 264.97 [OAC 3745-54-97]	Groundwater monitoring wells are to be provided at the point of compliance in sufficient numbers and locations to allow detection of contaminant migration from the EWMF into the upper most aquifer.	Design - Environmental/Geotechnical - Monitoring wells locations will be established based upon the EWMF site layout. The locations and construction details will be consistent with established FMPC standards. The monitoring program will be initiated prior to constructing the EWMF to obtain baseline information for the establishment of a monitoring program.

EXHIBIT 1

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
10 CFR 61.50(a)(10)	For radioactive waste disposal, areas subject to surface geological processes (i.e., mass wasting, erosion, slumping, landslides, and weathering) which significantly affect the ability of the EWMF to meet the performance objectives shall be avoided.	Design - Geotechnical - Existing information will be utilized to confirm that the EWMF is not located where surface geological processes which could impact the integrity of the EWMF or otherwise not permit compliance with the performance objectives. If present, additional design requirements may need to be specified. Compliance with this requirement will be described within the Site Selection Report.
10 CFR 61.50(a)(4)	Areas that contain known natural resources which, if exploited, cause a failure of the EWMF such that the performance objectives would not be meet, are to be avoided.	Design - Geotechnical - A record/file search and review will be conducted to determine if any such known natural resources exist at the FMPC. If such resources are present, the performance objective impacts will be considered. Findings will be discussed in the RD/RA Work Plan. Compliance with this requirement will be described within the Site Selection Report.
10 CFR 61.50(a)(7) & (8)	Radioactive waste disposal is not to occur within the water table fluctuation zone. The EWMF is to be designed to prevent the discharge of groundwater from the hydrogeologic unit into the disposal cell.	Design - Geotechnical - Geological and hydrogeological information will be obtained to ensure that these provisions will be meet. Compliance with this requirement will be described within the Site Selection Report.
40 CFR 264.18(a) [OAC 3745-54-18] & 10 CFR 61.50(a)(9)	For hazardous waste disposal, the EWMF shall not be located within 200 feet of a fault which has had displacement in the Holocene time. For radioactive waste disposal, areas subject to tectonic processes (i.e., faulting, folding, seismic activity, and vulcanism) which significantly affect the ability of the EWMF to meet the performance objectives shall be avoided.	Design - Geotechnical - Existing information will be utilized to confirm that the EWMF is located beyond 200 feet of this type of fault and is not in a tectonic area. If present, additional design requirements may need to be specified. Compliance with this requirement will be described within the Site Selection Report.
40 CFR 264.192(a)(5) [OAC 3745-55-92]	Tank systems will be designed to ensure the foundations support the load of a full tank, tanks are anchored to prevent floatation, and withstand frost heave.	Design - Geotechnical/Civil/Mechanical - Design calculations will be provided and included with the assessment report.
40 CFR 264.192(c) [OAC 3745-55-92]	Underground tanks and components must be backfilled with a noncorrosive, porous, homogeneous substance. The backfill material must be placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.	Design - Geotechnical/Mechanical - The backfill materials will be specified on the design drawings and specifications.

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EXHIBIT 1

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
OAC 3745-09-10	Upon completion of testing, test holes must be filled with grout or other material to prevent contaminants from entering groundwater, or converted into a well. Wells which are neither use for supplying groundwater nor use for monitoring (i.e., quality, quantity, or water level measures) must be filled with grout or other material to prevent contaminants from entering groundwater, or maintained in accordance with OAC 3745-9-09.	Design - Geotechnical - All test holes which are installed as part of an EWMF siting investigation will either be closed or converted into a monitoring well in accordance with OAC 3745-9-10. Any existing monitoring wells within the EWMF boundaries that required to be abandoned or replaced will be closed as required by OAC 3745-9-10. Provisions for sealing test holes and abandoning monitoring wells will be specified within the design package.
40 CFR 264.32 [OAC 3745-54-32]	Unless demonstrated otherwise, the following equipment must be provided: 1) an internal communications or alarm system, 2) telephone or two-way radio to summon emergency assistance, 3) portable fire extinguishers, spill control equipment, and decontamination equipment, and 4) water at adequate volume and pressure.	Design - Instrumentation/Environmental/Fire Protection - Specific equipment needs will be consistent with FMPC and existing RCRA Part B requirements. The equipment requirements or demonstrations will be included in the RD/RA Work Plan.
40 CFR 264.301(a) & (c) [OAC 3745-66-01]	The top and bottom liners shall be constructed of materials which prevent the migration of any waste constituent into the top liner and through the bottom liner for a time period equal to the sum of the disposal operations and post-closure care period. The liners are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure.	Design - Materials Specialist - The rationale for material selection will be described in the RD/RA Work Plan.
40 CFR 264.301(a) [OAC 3745-66-01]	The materials used for the leachate collection and leak detection systems are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure.	Design - Materials Specialist - The rationale for material selection will be described in the RD/RA Work Plan.
40 CFR 264.192(a)(3) [OAC 3745-55-92]	A corrosion evaluation shall be performed for tank systems or components in which the external shell of a metal tank or any external metal component will be in contact with the soil or with water. The corrosion evaluation will include those items listed in 40 CFR 264.192(a)(3).	Design - Mechanical - A corrosion evaluation will be conducted as part of the design/selection of any metal tanks and/or tank components. Any corrosion protection requirements will be specified on the design drawings and specifications.
40 CFR 264.192(a)(4) [OAC 3745-55-92]	Underground tank systems (including underground pipes) shall be protected against adverse affects by vehicular traffic by either design or operational measures.	Design - Mechanical/Geotechnical/Civil - A design calculation will be prepared to demonstrate that the tank system is adequately protected. If required, operational controls regarding vehicular traffic will be noted on the appropriate design documents and DOE will be notified.

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ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.192(b) [OAC 3745-55-92], 40 CFR 264.192(d) [OAC 3745-55-92], & 264.192(f) [OAC 3745-55-92]	The installation of the tank system is to be inspected by an independent, qualified installation inspector or an independent, qualified registered professional engineer for structural damage or inadequate construction/installation (i.e., weld breaks, punctures, scrapes of protective coatings, cracks, and corrosion). The installation of any required corrosion protection system that is field fabricated must be supervised by an independent corrosion expert. The tank and ancillary equipment must be leak tested prior to being covered, enclosed or placed into service.	Design - Mechanical - This requirement will be incorporated into the specification for the tank installation. An installation report will be required to be prepared by the inspector/engineer. Any required repairs and field fabrication of a corrosion protection system will be documented in the installation report. The installation report will be certified in accordance with 40 CFR 270.11(d).
40 CFR 264.192(e) [OAC 3745-55-92]	Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. API Publication 1615 (Nov. 1979), ANSI B31.3, and ANSI B31.4 may be used, where applicable, for the installation of piping systems.	Design - Mechanical - The appropriate support and protection will be specified on the design drawings and specifications.
40 CFR 264.194 [OAC 3745-55-94]	The tank is to be equipped with spill prevention devices (i.e., check valves, dry disconnect couplings) and overfill controls (i.e., liquid level probes, high level alarms, interlocks to stop inflow, or a bypass system to a standby tank). For open top tanks, sufficient freeboard shall be maintained to prevent overtopping by wave or wind action or by precipitation.	Design - Mechanical/Instrumentation - The appropriate mechanical and instrument controls will be specified on the design drawings and specifications.
40 CFR 264.31 [OAC 3745-54-31]	The EWMF must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.	Design - N&SS - The design of the EWMF will be evaluated as part of the Safety Analysis Report. A statement to address this item will be included in the RD/RA Work Plan.
OAC 3745-01	Design must ensure that the construction/operation of the EWMF does not violate the minimum water quality requirements for the Great Miami River. The EWMF shall not be a source of floating debris, materials producing odor, and/or color change, and substances in toxic concentrations. The specific water use designation for the Great Miami River and Paddy's Run is identified in OAC 3745-1-21. The corresponding water quality criteria is listed in OAC 3745-1-07. "Mixing Zones" may be established for each discharge pursuant to OAC 3745-1-06.	Design - Process/Environmental - Where possible, existing wastewater outfalls and discharge limitations will be utilized for any wastewater generated as a result of EWMF operations (i.e., leachate). If any new wastewater discharges to either the Great Miami River or Paddy's Run are required to be established, a mixing zone demonstration will be prepared to ensure that the water quality criteria (OAC 3745-1) will be obtained. This mixing zone demonstration may be required to be included with the RD/RA Work Plan.

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REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 141 [OAC 3745-81]	Pursuant to CERCLA Section 121(d)(2)(A)(ii) and 40 CFR 300.430(e)(2)(i)(B), MCLs and nonzero MCLGs established under the Safe Drinking Water Act are specified to be relevant and appropriate for attainment in situations where remedial actions are being taken to cleanup ground and surface waters which are potential drinking water sources. The MCLs for inorganic pollutants are established under 40 CFR 141.11 [OAC 3745-81-11] and 40 CFR 141.62 [OAC 3745-81-12]. The MCLs for organic pollutants are established under 40 CFR 141.12 [OAC 3745-81-12] and 40 CFR 141.61. The MCLs for radioactivity are established under 40 CFR 141.15 [OAC 3745-81-15] and 40 CFR 141.16 [OAC 3745-81-16]. The MCLGs for inorganic and organic pollutants are established under 40 CFR 141.50 and 40 CFR 141.51.	Modelling - Geotechnical - In accordance with the ARARs identified for the EWMF, the MCLs and nonzero MCLGs will be utilized to develop design-based performance criteria for the EWMF to ensure that the underlying aquifer is adequately protected. A groundwater transport model will be used to determine if the regulatory specified EWMF design requirements are adequate to meet the MCLs and nonzero MCLGs. If these regulatory levels are not adequate, additional design criteria for the EWMF will be specified. It is anticipated that this modelling will be conducted during the Title I design effort.
10 CFR 20.1301	The total effective dose equivalent to members of the public are limited to 0.1 rem in a year, exclusive of the disposal of radioactive material into sanitary sewerage in accordance with 10 CFR 20.2003. The dose in unrestricted areas is limited to 0.002 rem in 1 hour.	Modelling - N&SS - Calculations will be performed as part of the Safety Analysis Report to ensure that the EWMF design will maintain these exposure limits. If required and practicable, engineering controls will be provided to maintain exposure below specified limits; otherwise, recommendations for a control program will be provided. This information will incorporated as part of RD/RA Work Plan.
10 CFR 61.41	The maximum radioactive release to the environment shall comply with ALARA principles and shall not expose any member of the public to an annual dose exceeding an equivalent of 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any other organ.	Modelling - N&SS - Calculations will be performed as part of the Safety Analysis Report to ensure that the EWMF design will maintain these environmental exposure limits. This information will incorporated as part of RD/RA Work Plan.
10 CFR 61.52(a)(6)	Upon completion of the post-closure period, the radiation limits specified in 10 CFR 20.105 shall not be exceeded at the surface of the final cover.	Modelling - N&SS - The design of the EWMF will be evaluated as part of the Safety Analysis Report. A statement to address this item will be included in the RD/RA Work Plan.

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ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 61.192 & 40 CFR 192 Subpart A & C	As required by 40 CFR 61.192, no more than 20 $\rho Ci/m^2$-sec of Radon-222 (as an average for the entire source) shall be emitted into the air from the EWMF. The provisions of 40 CFR 192.02 requires that the radon controls shall be designed to be effective for at least 200 years and up to 1000 years. The radon control design is to provide reasonable assurance that releases of Radon-222 to the atmosphere will not exceed an average (for the entire disposal site surface and for at least a one year period) release rate of 20 $\rho Ci/m^2$-sec. Guidance regarding the design and implementation of this radon control standard is provided in 40 CFR 192 Subpart C.	Modelling - N&SS - Calculations will be consistent with the existing NESHAP program requirements, the implementation guidance provided in 40 CFR 192 Subpart C, and the requirements identified in the DOE UMTRA guidance documents. Results will be part of the Safety Analysis Report and be addressed as part of RD/RA Work Plan.
40 CFR 61.92 & 61.93	The off-site public exposure (ambient air) to radionuclide emissions (excluding Radon-220 and 222) shall be limited to 10 mrem/yr (above background). This limit is for an effective dose equivalent as calculated per the International Commission on Radiological Protection's Publication No. 26. Modelling and sampling procedures are specified in 40 CFR 61.93.	Modelling - N&SS - Calculations will be integrated with existing NESHAP program, including any emission testing notifications required under 40 CFR 61.13. Results will be part of the Safety Analysis Report and be addressed as part of RD/RA Work Plan.
10 CFR 20.1201(a), 10 CFR 20.1201(b), 10 CFR 20.1201(d), 10 CFR 20.1201(e), 10 CFR 20.1201(f), 10 CFR 20.1206, 10 CFR 20.1207, 10 CFR 20.1208	The annual limit which is the more limiting of 1) total effective dose equivalent of 5 rems or 2) the annual limit to the lens of the eye, to the skin, and to the extremities are an eye-dose equivalent of 15 rems and a shallow-dose equivalent of 50 rems to the skin or to any extremity. Derived air concentration (DAC) and annual limit on intake (ALI) presented in Table 1 of Appendix B of 10 CFR 20.1001-20.2401 may be used to determine the individual dose. The intake of soluble uranium is limited to 10 milligrams per week. Planned special exposures may be authorized for an adult worker in addition to, and accounted for separately from, the provisions of 10 CFR 20.1201. The limit on these special doses cannot exceed any of the provisions of 10 CFR 20.1201(a) in any year and five times the annual dose limits in 10 CFR 20.1201(a) during the individual's lifetime. The annual occupational dose limit for minors is 10 percent of the annual dose limits for adult workers in 10 CFR 1201. The dose to an embryo/fetus during the entire pregnancy due to occupational exposure of a declared pregnant woman is limited to 0.5 rem. If the dose to the embryo/fetus is found to exceed 0.5 rem or is within 0.05 rem of this dose, by the time the woman declares the pregnancy, the licensee shall be deemed in compliance with 10 CFR 20.1208(a) if the additional dose to the embryo/fetus does not exceed 0.05 rem during the remainder of the pregnancy.	Operational - DOE - Existing DOE programs will be followed to limit worker radiation exposure in lieu of 10 CFR 20.

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REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
10 CFR 61 Subpart G	**FOR RADIOACTIVE WASTE DISPOSAL:** The operating record is to include the following reports: (1) disposal records (location, quantity, date, waste package condition and radiation levels, any required repacking, and manifest discrepancies), and (2) radiation monitoring results.	Operational - DOE - The operating record and reports, if required, will identified in the RD/RA Work Plan. The EWMF operating record and reporting will be integrated with any existing FMPC program. Each required report form will have instructions for placing a copy of the completed form into the EWMF Operating Record.
40 CFR 264.301(h) & (i) [OAC 3745-66-01], 10 CFR 61.52(a)(4), (5), (9) & (10)	The run-on and runoff control systems are to emptied and managed expeditiously after storm events to maintain design capacities. The wind dispersal of any particulate matter is to be controlled. Void space between waste packages is to be minimized during disposal operations and filled to reduce future subsidence within the EWMF. Partial closure activities (closure of individual disposal units) are to be initiated upon reaching capacity. Ongoing operations are not to impact any areas which have been closed.	Operational - DOE - Any required operational procedures will be identified in the RD/RA Work Plan. The need to fill between waste packages to prevent subsidence will be considered as part of the EWMF design.
40 CFR 264.71, 264.72 & 264.76 [OAC 3745-54-71, 72 & 76]	The State of Ohio manifest system is to be utilized for any off-site shipment of hazardous wastes from the EWMF. The manifest procedures and reports (including manifest discrepancies and unmanifested acceptance) specified under 40 CFR 264.71, 264.72 and 264.76 are to be followed.	Operational - DOE - Manifesting procedures and reports, if required, will identified in the RD/RA Work Plan. The EWMF manifesting program will be integrated with any existing FMPC program.
40 CFR 264.73, 264.74, 264.75, 264.77, 264.195(d), 264.309 & 264 Appendix I [OAC 3745-54-73, 74, 75 & 77]	**FOR HAZARDOUS WASTE DISPOSAL:** The operating record is to include the following reports: (1) as-built drawings of the location, dimension, and depth of each disposal cell with respect to permanently surveyed benchmarks, (2) disposal records (type, quantity, location, and manifest number) for each waste shipment, (3) waste analysis, (4) contingency plan incidents, (5) groundwater monitoring results, (6) annual waste minimization certification, (7) LDR treatment/generator certifications, (9) inspection reports, and (10) training records. The operating record is to be available for on-site inspection by EPA/OEPA. A biennial report is to be submitted to EPA/OEPA in accordance with 40 CFR 264.75.	Operational - DOE - The operating record and biennial reports, if required, will identified in the RD/RA Work Plan. The EWMF operating record and biennial reporting will be integrated with any existing FMPC program. Each required report form will have instructions for placing a copy of the completed form into the EWMF Operating Record.
40 CFR 61.94 & 61.95 [OAC 3745-54-94 & 95]	An annual report must be submitted to EPA headquarters and regional offices by June 30. This report includes the monitoring results as recorded in DOE's Effluent Information System and the effective dose equivalent calculations, as required by 40 CFR 61.93, for the previous year. Records as specified under 40 CFR 61.95 must be maintained for at least 5 years.	Operational - DOE - This reporting requirement will be integrated with the existing record keeping and reporting system established for the currently issued NESHAP permits. Requirement will be addressed in the RD/RA Work Plan.

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ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
OAC 3745-15-07, OAC 3745-17-05 & OAC 3745-17-08	As specified in OAC 3745-15-07, the emission or escape into open air from any source whatsoever in such a manner or in such amounts as to endanger the health, safety, or welfare of the public, or to cause unreasonable injury or damage to property shall be declared a public nuisance and is prohibited. The significant and avoidable deterioration of air quality shall be prohibited as required by OAC 3745-17-05. As required by OAC 3745-17-08, the visible emissions of fugitive dust generated during grading, loading, or construction operations, and other practices which emit fugitive dust are to minimized or eliminated.	Operational - DOE - During construction and operation of the EWMF, precautions (such as controlling dust emissions, prohibiting open burning, etc) will be taken to prevent the occurrence of a public nuisance, to minimize or eliminate visible fugitive dust emissions, and to avoid the significant deterioration of air quality.
OAC 3745-20-06 [40 CFR 61.154]	No visible emissions are allowed during the disposal of asbestos waste unless the provisions of OAC 3745-20-06(B) are meet [includes waste handling and operational restrictions, and the posting of warning signs]. The regulatory requirements of 40 CFR 763 Subpart G (Asbestos Abatement Projects) may also be relevant and appropriate for the disposal to asbestos material at the EWMF.	Operational - DOE - it is envisioned that the disposal operations at the EWMF will be conducted without causing the release of visible emissions to the atmosphere. Therefore, provisions for posting warning signs will not be addressed as part of the EWMF design.
10 CFR 61.55, 61.56, & 61.52(a)(11)	**FOR RADIOACTIVE WASTE DISPOSAL:** Wastes are classified as either Class A, B, C, or greater than Class C in accordance with 10 CFR 61.55. Class A wastes are to be segregated unless they meet the stability requirements listed in 10 CFR 61.56(b). Greater than Class C cannot be placed into the EWMF, 10 CFR 61.55 requires that these wastes be placed in a geologic repository. Class A, B and C wastes disposal criteria are as follows: 1) cardboard or fiberboard packages are not allowed for disposal, 2) liquid waste shall be solidified or packed with twice the amount of absorbent required, 3) solid wastes shall contain ≤1% (volume) free liquids, 4) explosive waste are prohibited, 5) waste which generate gases, vapors, or fumes in quantities resulting in an occupational exposure above the 10 CFR 20 limits is prohibited, 6) pyrophoric wastes must be rendered (treated or packaged) nonflammable, 7) gases are to be packaged so that pressure ≤1.5 atm @ 20°C and activity ≤100 Ci/container, 8) hazardous, biological, pathogenic, and infectious wastes are to be treated to minimize their hazards, and 9) waste packages are to be labelled (Class A, B, or C). Additional disposal criteria for Class B and C are as follows: 1) the waste shall be treated or packaged to maintain structural stability (physical dimensions and form) under disposal conditions (overburden weight, equipment loads, moisture, microbial attack, and radiation and chemical exposure), 2) stabilized waste are to contain ≤0.5% (volume) free liquids, and 3) maximize waste density and minimize the void space within the waste container. Only waste containing or contaminated with radioactive materials is to be placed into the EWMF.	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP. The capabilities of the on-site laboratory, if built, will be considered during the development of the WAP. Existing radioactive waste characteristics and classifications will be used to prepare the WAP.

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REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 125.100 & 40 CFR 125.104	The EWMF shall be operated under Best Management Practices (BMP) for toxic pollutant effluents as defined under 40 CFR 125. The toxicity of the pollutants, quantity of the pollutants used/produced/discharged, history of NPDES violations, history of significant leaks or spills of hazardous pollutants, potential for adverse impact of public health, and other relevant factors shall be considered when developing the BMP plan.	Plan - Environmental - The BMP plan for the EWMF will be developed during Title I design and will be consistent with the existing FMPC BMP plan (Topical Manual FMPC/SUB-011, Feb. 1988). The BMP plan for the EWMF may be required to be submitted to EPA as part of RD/RA Work Plan.
40 CFR 136.1 to 40 CFR 136.4	The test procedures listed in 40 CFR 136 are required to be followed for monitoring any wastewater effluent discharged from the EWMF. The specific monitoring parameters are determined pursuant to the NPDES permitting process. Test procedures exist for biological, inorganic, nonpesticide organic, pesticide, and radiological constituents. The required containers, preservation techniques, and holding times are also specified under 40 CFR 136. The use of alternate test procedures can be granted by the EPA.	Plan - Environmental - An effluent monitoring plan will be developed during Title I design for the discharge of any EWMF wastewater. This monitoring plan will be consistent with existing FMPC procedures. Any required in-line sampling/monitoring equipment will be specified as part of the design package.
40 CFR 264 Subpart G, 264.197 & 264.310(b), & 10 CFR 61.59(b)	A closure plan, which describes the procedures to be followed when closing the EDF (including tanks and installation of the final cover), and a post-closure plan, which describes the maintenance activities (final cover repairs, leachate collection/removal operation, groundwater monitoring, inspections/surveillance, drainage system maintenance, surveyed benchmark maintenance), are to be submitted along with the design information. The post-closure care period is to extend for a minimum of 30 years and is not to be relied upon for more than 100 years.	Plan - Environmental/N&SS - The closure and post-closure plan will be developed consistent with FMPC goals. The plan will be part of the RD/RA Work Plan.
40 CFR 264 Subpart D	A Contingency Plan and Emergency Procedures are to be developed for the EWMF in accordance with 40 CFR 264 Subpart D. The emergency procedures will include procedures for notifying off-site officials as required by 40 CFR 264.56(d) in the event of a situation which could threaten human health or the environment.	Plan - Environmental/N&SS - Contingency plan contents and emergency procedures will be consistent with existing RCRA program. The contingency plan and emergency procedures will be described in the RD/RA Work Plan.

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ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.13, 264.17, 264.198, 264.199, 264.312, 264.313, 264.314, 264.315, 264.316 & 264 Appendix V [OAC 3745-54-13 & 17]	**FOR HAZARDOUS WASTE DISPOSAL:** Detailed chemical and physical analysis of a representative sample must be obtained prior to disposal of any waste. A Waste Analysis Plan (WAP), specifying the sampling and analytical procedures, and rationale and frequency for analysis, must be prepared in accordance with 40 CFR 264.13. Reactive wastes cannot be placed into the EWMF. Ignitable waste may be placed into the EWMF provided that the ignitable wastes are placed in nonleaking containers, safely handled, covered daily with soil or other noncombustible materials, and isolated from potential sources of ignition. Precautions shall be taken to ensure that incompatible waste are not mixed together which could cause any of the conditions identified in 40 CFR 264.17(b). Bulk liquids or bulk waste containing free liquids, regardless of adding an absorbent, cannot be placed into the EWMF. Lab packs (40 CFR 264.316) and specially designed containers can be disposed of with free liquids. Absorbents or other methods can be used by the generator to eliminate free liquids in a container prior to disposal. Waste containers must either be 90% full or their volume minimized (shredding, crushing or other means) prior to being placed into the EWMF (40 CFR 264.315). The disposal of hazardous wastes F020, F021, F022, F023, F026, and F027 requires an EPA approved management plan (40 CFR 264.317).	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP. The capabilities of the on-site laboratory, if built, will be considered during the development of the WAP. Existing hazardous waste characteristics and classifications will be used to prepare the WAP.
40 CFR 264.15, 264.33, 264.195, & 264.303(b) [OAC 3745-54-15 & 33]	**FOR HAZARDOUS WASTE DISPOSAL:** The EWMF must be inspected to prevent an event which may cause the release of hazardous waste constituents to the environment or pose a threat to human health. The inspection items and frequencies are to be specified in an Inspection Plan. All inspections are to be recorded and maintained in an inspection log. Inspection items are to included: (1) testing and maintenance of emergency equipment (including facility communications, alarms, and decontamination equipment), (2) tank overfill control, (3) the aboveground tank portions of the tank system and secondary containment for corrosion, erosion and spills/leaks each operating day, (4) the functionality of tank monitoring and leak detection equipment each operating day, (5) the proper operation of the cathodic protection after six months of installation and annually thereafter, (6) impressed current sources at least bimonthly, (7) drainage systems, wind dispersal controls, and (8) leachate collection/removal system accumulation/function each week and after storms.	Plan - Environmental - The Inspection Plan will be included as part of the RD/RA Work Plan. The inspection frequencies are not to violate ALARA radiation protection principles. The need for computerized tracking will be determined during Title I design.

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REGULATORY REQUIREMENTS

REGULATORY CITATION	REQUIREMENT	IMPLEMENTATION RESPONSIBILITY AND COMPLIANCE STRATEGY
40 CFR 264.16 [OAC 3745-54-16]	All EWMF personnel must be trained within six months from their date of hire or reassignment, and participate in annual reviews. The training requirements are to be specified in a Training Plan. Employees hired after April 15, 1981, are not to work unsupervised unless the requirements of OAC 3745-54-16(A) are fulfilled.	Plan - Environmental - The Training Plan will be included as part of the RD/RA Work Plan.
40 CFR 264.192	A written assessment report must be prepared and submitted for the hazardous waste tank(s). The assessment report is to be reviewed and certified by an independent, qualified registered professional engineer attesting that the tank system(s) has sufficient integrity and is acceptable for storing hazardous waste. The contents of the assessment report are identified in 40 CFR 264.192.	Plan - Environmental/Mechanical - The assessment report will be included with the RD/RA Work Plan. The assessment report will be certified in accordance with 40 CFR 270.11(d).
40 CFR 264.92, 264.93, 264.94, 264.96, 264.97, 264.98 & 264 Appendix IX [OAC 3745-54-92, 93, 94, 96, 97 & 98], & 10 CFR 61.53	A detection groundwater monitoring program must be developed to ensure that the specified groundwater protection standard is not exceeded. The monitoring program is to consist of a list of monitoring parameters and associated limits, monitoring frequency, sampling and analytical procedures, and statistical evaluation procedures. Baseline monitoring data (including ecological, meteorological, climatical, hydrological, geological, geochemical, and seismological) shall be established prior to disposal operations.	Plan - Environmental - The groundwater monitoring program will be integrated with the existing FMPC monitoring programs. The monitoring program will be part of the RD/RA Work Plan.
OAC 3745-20-05 [40 CFR 61.150]	**FOR ASBESTOS WASTE DISPOSAL:** All friable asbestos-containing waste material shall be sealed into durable leak-tight disposal containers or use an approved alternative disposal system as specified in OAC 3745-20-05(C).	Plan - Environmental - WAP is to be part of the RD/RA Work Plan. Any required precautions will be included in the WAP.
40 CFR 264.194 & 40 CFR 264.196 [OAC 3745-55-90]	Operating procedures and spill/leak response procedures need to be specified.	Plan - Mechanical/Environmental - An operating plan for the tank systems will be prepared and included as part of the RD/RA Work Plan.

4.3 Conceptual Drawings

Drawing Number	Title	Revision
96X5900G00001	EWMF Vaults Master Plan	--
96X5900G00002	EWMF Vaults Site Plan - Sheet 1	--
96X5900G00003	EWMF Vaults Site Plan - Sheet 2	--
96X5900G00004	EWMF Vaults Closure Plan - Sheet 1	--
96X5900G00005	EWMF Vaults Closure Plan - Sheet 2	--
96X5900G00006	EWMF Vaults Construction Strategy (Year 8) - Sheet 1	--
96X5900G00007	EWMF Vaults Construction Strategy (Year 8) - Sheet 2	--
96X5900G00008	EWMF Vaults Closure Concept Site Cross Sections - Sheet 1	--
96X5900G00009	EWMF Vaults Closure Concept Site Cross Sections - Sheet 2	--
96X5900S00017	EWMF Vaults Plan and Sections	--
96X5900G00018	EWMF Vaults Leachate Collection System Section and Details	--
96X5900F00019	Leachate Collection/Leak Detection Process Flow Diagram	--
96X5900A00022	Facility Support Building Plan	--
96X5900S00023	EWMF Vaults Storage Layout	--
96X5900E00026	Single Line Diagrams	--
96X5900E00027	Vault Electrical Layout and Riser Diagrams	--
96X5900E00032	LCLD and Radiation Monitoring Systems - Sheet 1	--
96X5900E00033	LCLD and Radiation Monitoring Systems - Sheet 2	--
96X5900E00034	LCLD and Radiation Monitoring Systems - Sheet 3	--
96X5900N00035	LCLD and Radiation Monitoring Systems - Riser Diagram	--
96X5900N00038	LCLD and Radiation Monitoring Systems - Instrument Arrangement Plan - Sheet 1	--
96X5900N00039	LCLD and Radiation Monitoring Systems - Instrument Arrangement Plan - Sheet 2	--
96X5900N00040	LCLD and Radiation Monitoring Systems - Instrument Arrangement Plan - Sheet 3	--

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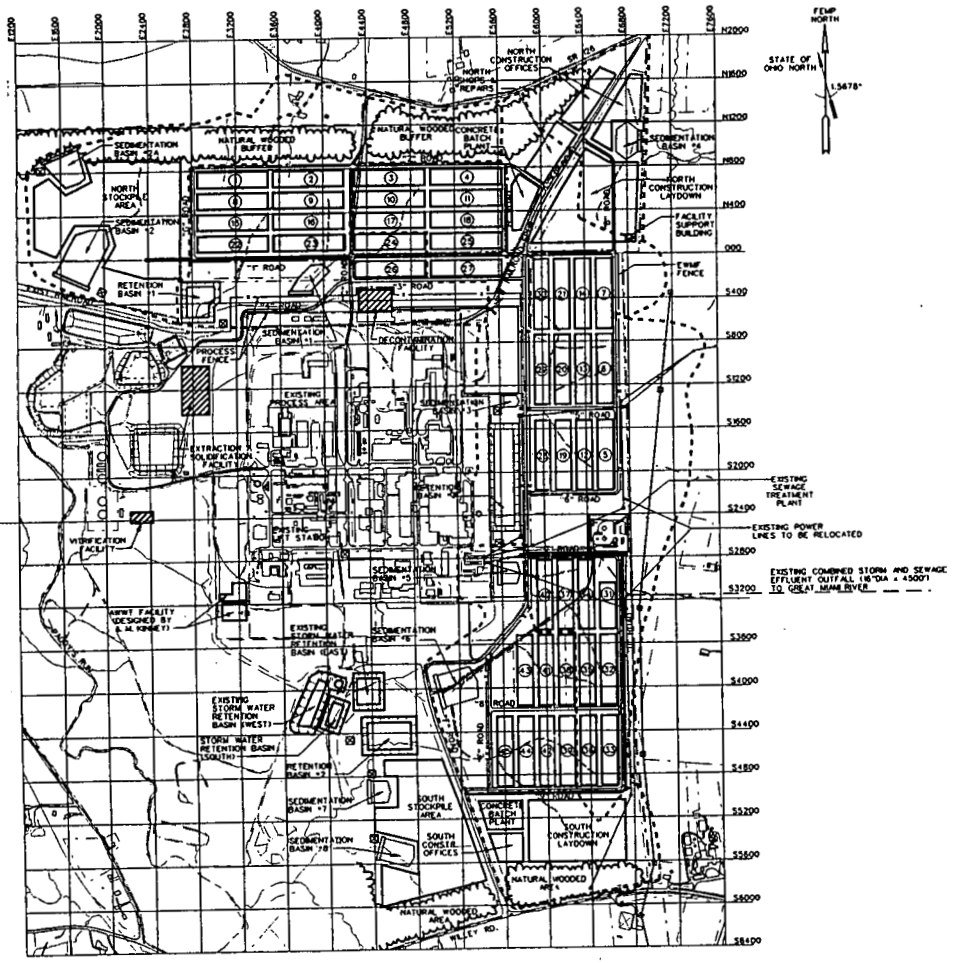


NOTES

DRAWING SCHEDULE:

SHEET NO.	TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0003	SITE PLAN - SHEET 2
G0004	CLOSURE PLAN - SHEET 1
G0005	CLOSURE PLAN - SHEET 2
G0006	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1
G0007	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 2
G0008	SITE CROSS SECTIONS - SHEET 1
G0009	SITE CROSS SECTIONS - SHEET 2
G0010	LEACHATE COLLECTION SYSTEM SECTION AND DETAILS
S0001	EWMF VAULTS PLAN AND SECTIONS
S0002	STORAGE LAYOUT
A0001	PLANS, ELEVATIONS, AND SECTIONS FACILITY SUPPORT BUILDING

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- DRAINAGE BOUNDARY
- PROPOSED NEW FACILITES FOR PO #8

0201

BY	ISSUE OF REVISION PURPOSE - DESCRIPTION	DATE	APPROVED	CODE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE
MASTER PLAN
EWMF VAULTS

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
D. THOMPSON	1-8-91			T. PICKERING	7-8-91

SCALE: 1"=100'-0"

BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-C-00001	G0001	-

NOTES

6420

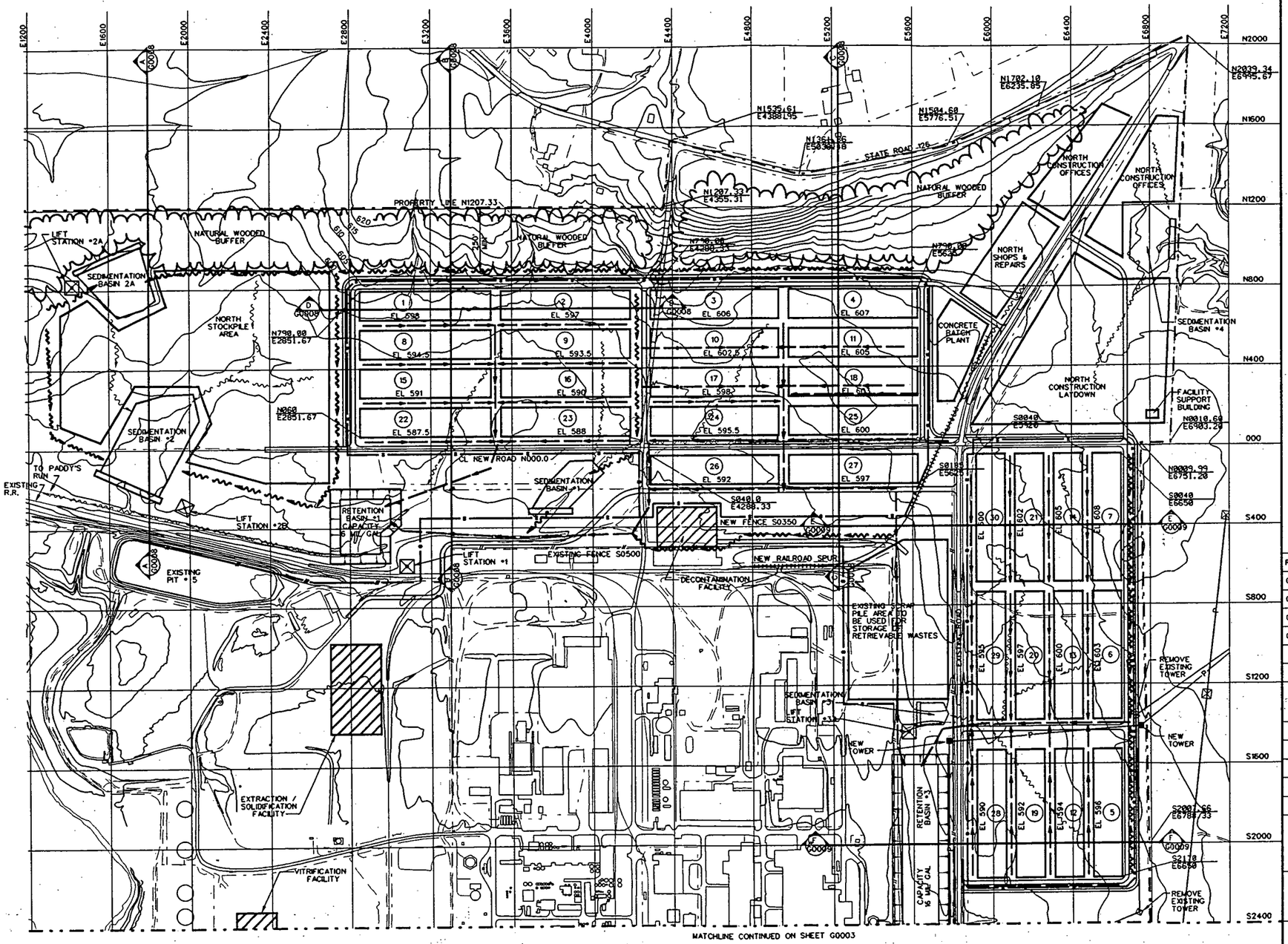
FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- PROPOSED NEW FACILITIES FOR PO #8



MATCHLINE CONTINUED ON SHEET G0003

REFERENCE DWG.*	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0003	SITE PLAN - SHEET 2
G0008	SITE CROSS SECTION - SHEET 1
G0009	SITE CROSS SECTION - SHEET 2

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA

ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE

SITE PLAN - SHEET 1

EWMF VAULTS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

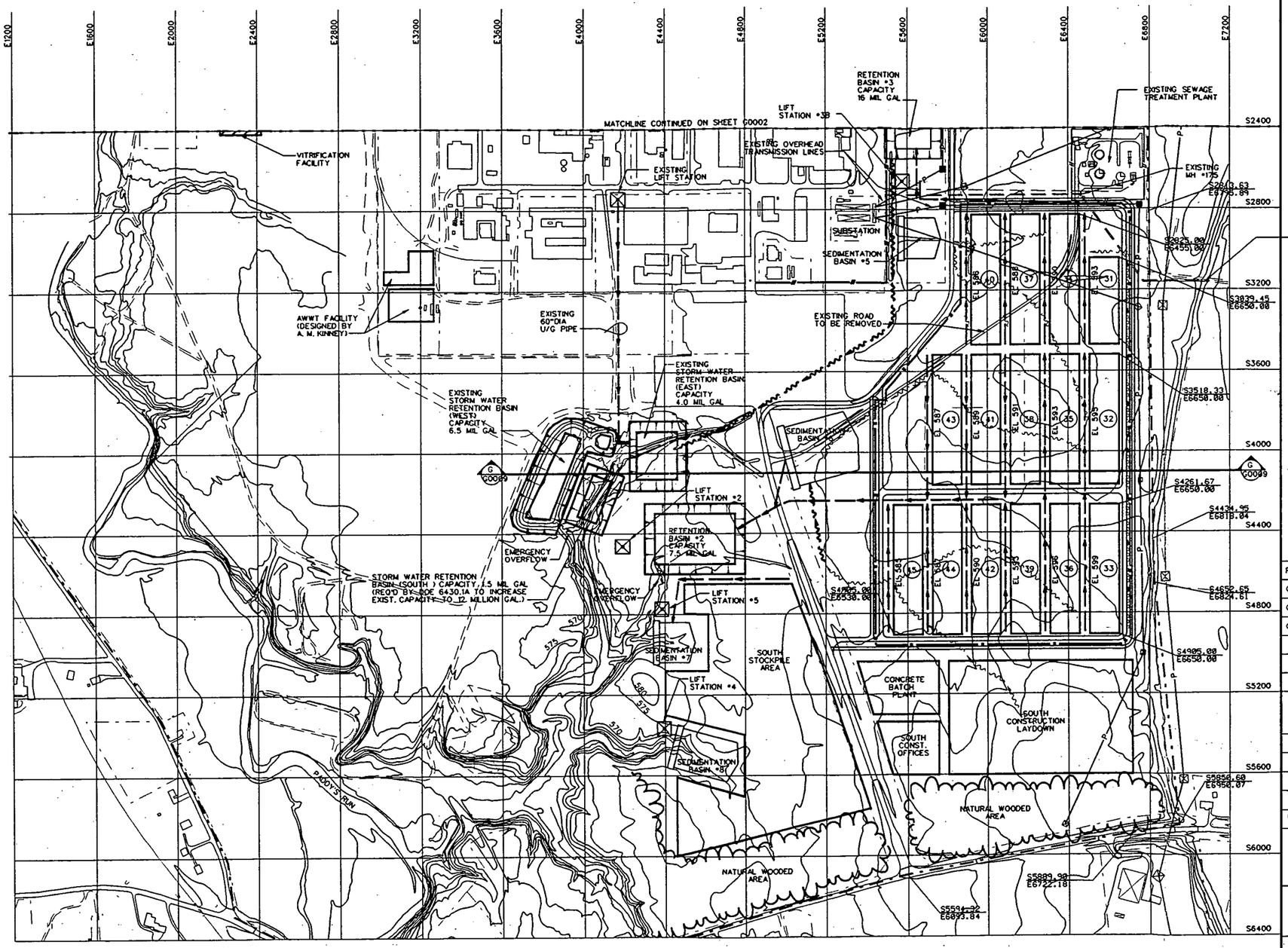
PLANT-BLDG. NO. | FLOOR | SCALE 1"=200'-0" | CLASS

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | DRAWN, APPROVED

A-E DATE | OPERATING CONTRACTOR DATE | DOE DATE

DOE PROJECT NO.	PROJECT-WORK-TYPE NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00002	G0002	-

0202



NOTES

6420

FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- PROPOSED NEW FACILITIES FOR PO #8

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0009	SITE CROSS SECTION - SHEET 2

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		DETAILS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE

SITE PLAN - SHEET 2
EWMF VAULTS

DRAWN BY	DATE	VERIFIED/CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PLANT/BLDG. NO. | FLOOR | SCALE 1"=200'-0" | CLASS

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | APPROVED/APPROVED

A-E DATE | OPERATING CONTRACTOR DATE | DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00003	G0003	-

0203

6420

NOTES

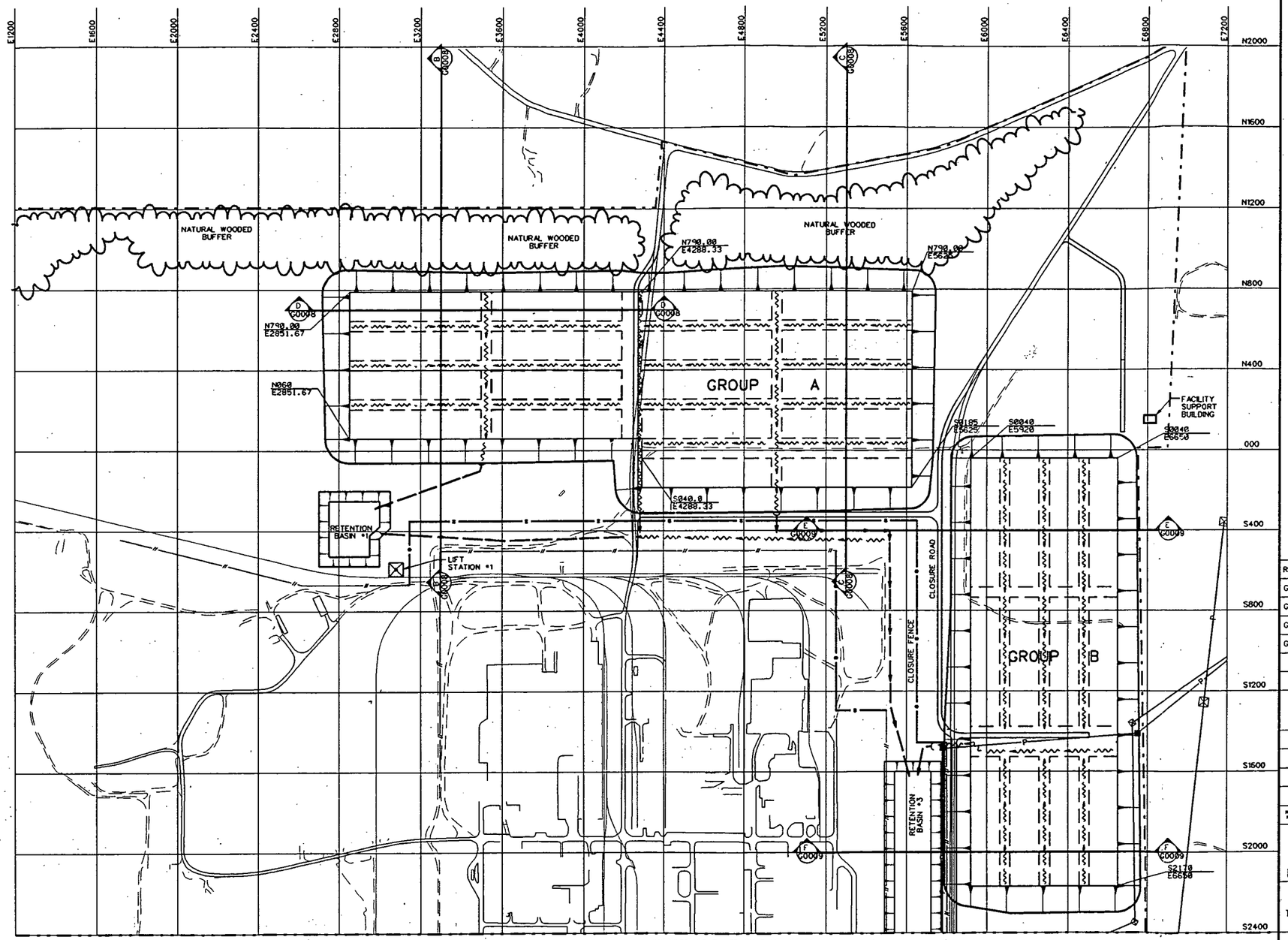
FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- TRANSMISSION TOWER
- OVERHEAD POWER LINE



MATCHLINE CONTINUED ON SHEET G0005

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0005	CLOSURE PLAN - SHEET 2
G0008	SITE CROSS SECTION - SHEET 1
G0009	SITE CROSS SECTION - SHEET 2

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA

ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE

CLOSURE PLAN - SHEET 1

EWMF VAULTS

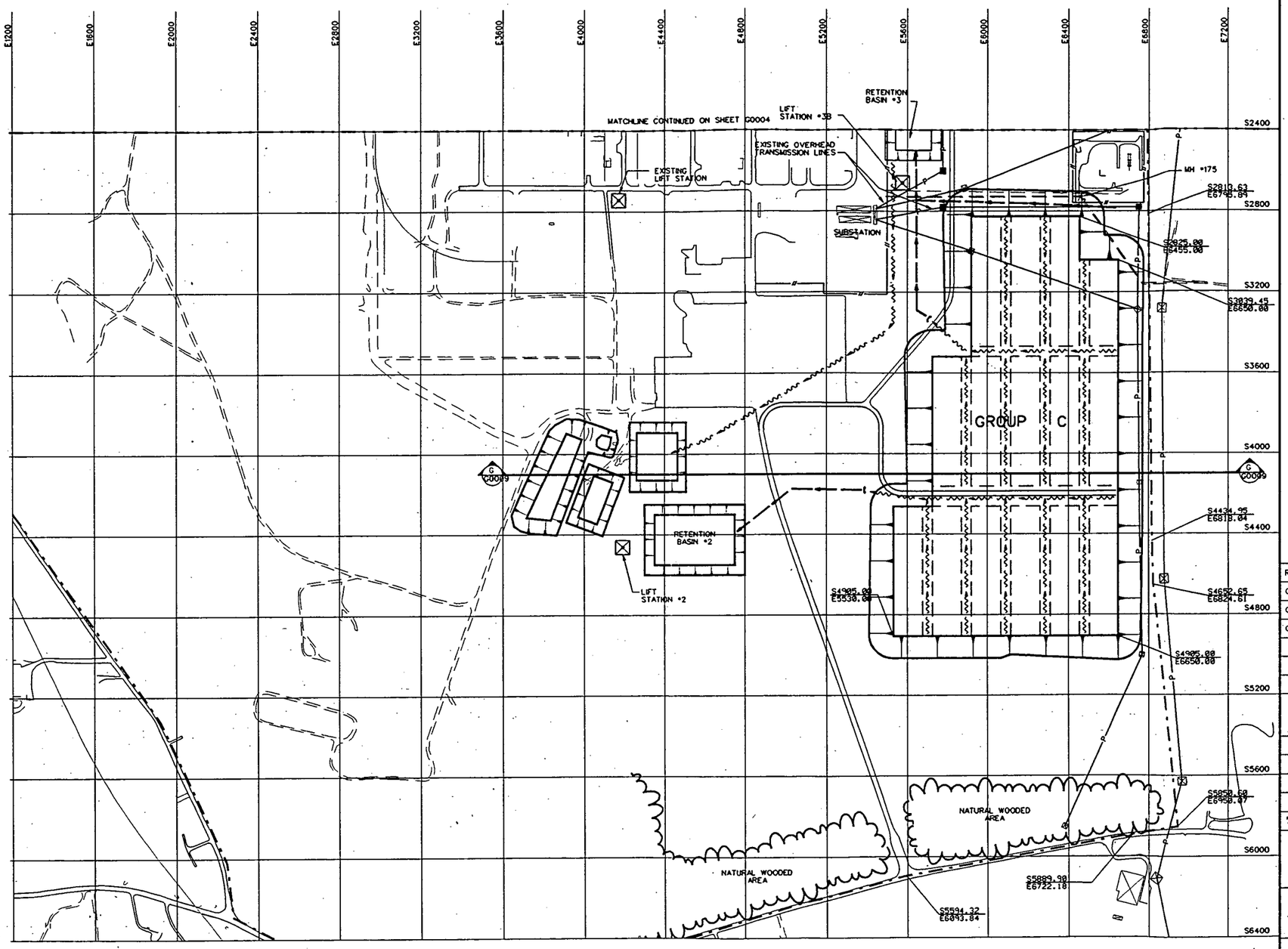
DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'-0"	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPERATOR PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00004	G0004	-

0204



NOTES

6420

FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- TRANSMISSION TOWER
- OVERHEAD POWER LINE

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0004	CLOSURE PLAN - SHEET 1
G0009	SITE CROSS SECTION - SHEET 2

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE

CLOSURE PLAN - SHEET 2
EWMF VAULTS

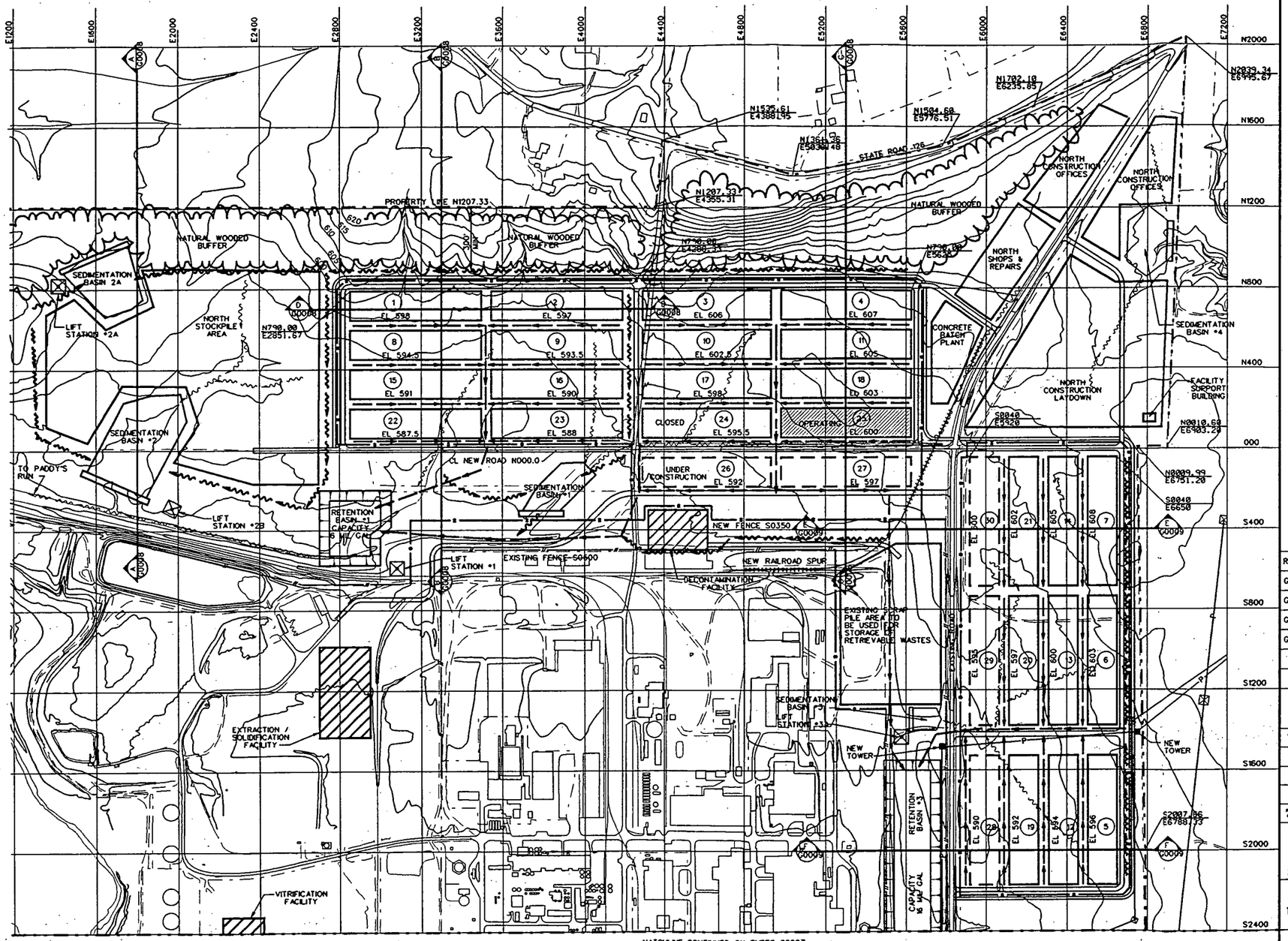
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'-0"	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	PARSONS PROJECT NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00005	G0005	-

0205



MATCHLINE CONTINUED ON SHEET G0007

0206

NOTES

6420

FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- VAULT UNDER CONSTRUCTION
- VAULT CLOSED
- VAULT OPERATING
- PROPOSED NEW FACILITIES FOR PO #8

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0007	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 2
G0008	SITE CROSS SECTIONS - SHEET 1
G0009	SITE CROSS SECTIONS - SHEET 2

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA

ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE

CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1

EWMF VAULTS

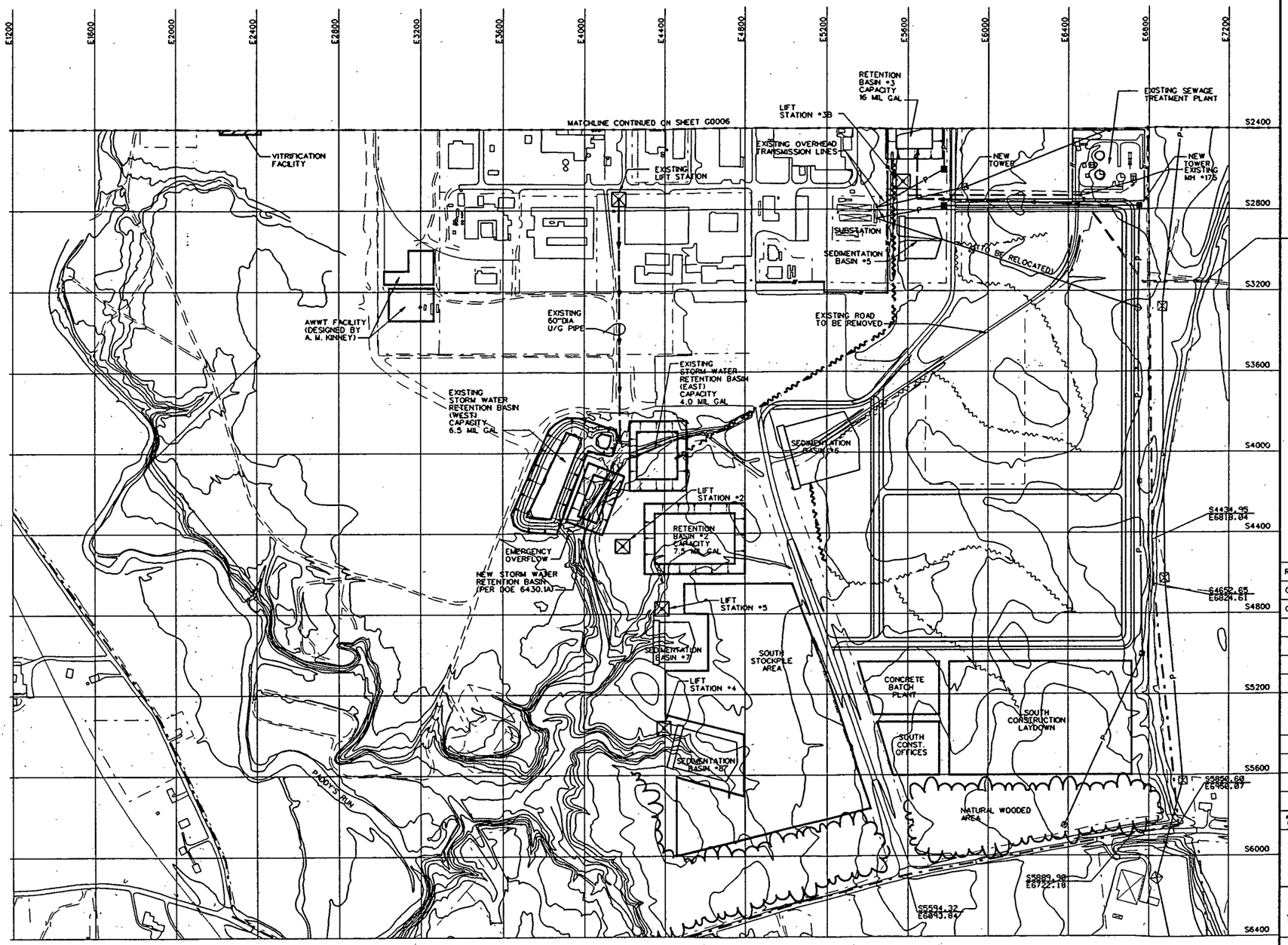
DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=200'-0"	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER./WASTE PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00006	G0006	-

6420



NOTES:

FEMP NORTH

STATE OF OHIO NORTH

1.5678°

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- PROPOSED NEW FACILITIES FOR PO #8

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0006	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA

ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE

CONSTRUCTION STRATEGY (YEAR 8) - SHEET 2

EWMF VAULTS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1" = 200'-0"	

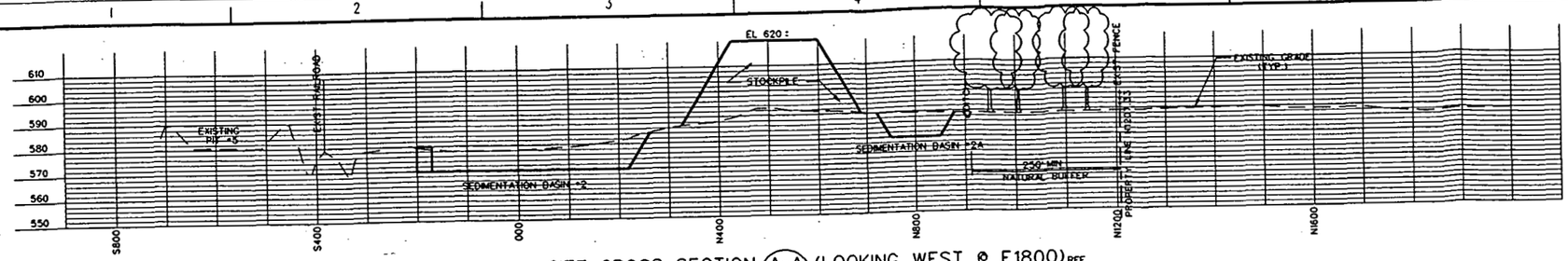
SUBMITTED FOR APPROVAL — A-E — DATE

APPROVAL RECOMMENDED — OPERATOR, CONSTRUCTION — DATE

DRAWING APPROVED — DOE — DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.L3 00-90701	96X-5900-G-00007	G0007	-

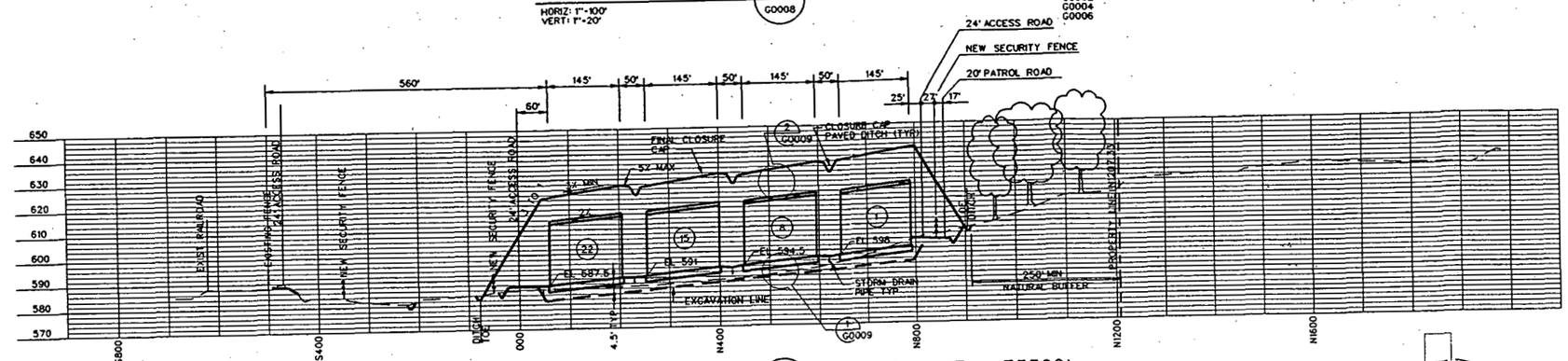
0207



SITE CROSS SECTION A-A (LOOKING WEST @ E1800) REF G0002 G0004 G0006

HORIZ: 1"=100'
VERT: 1"=20'

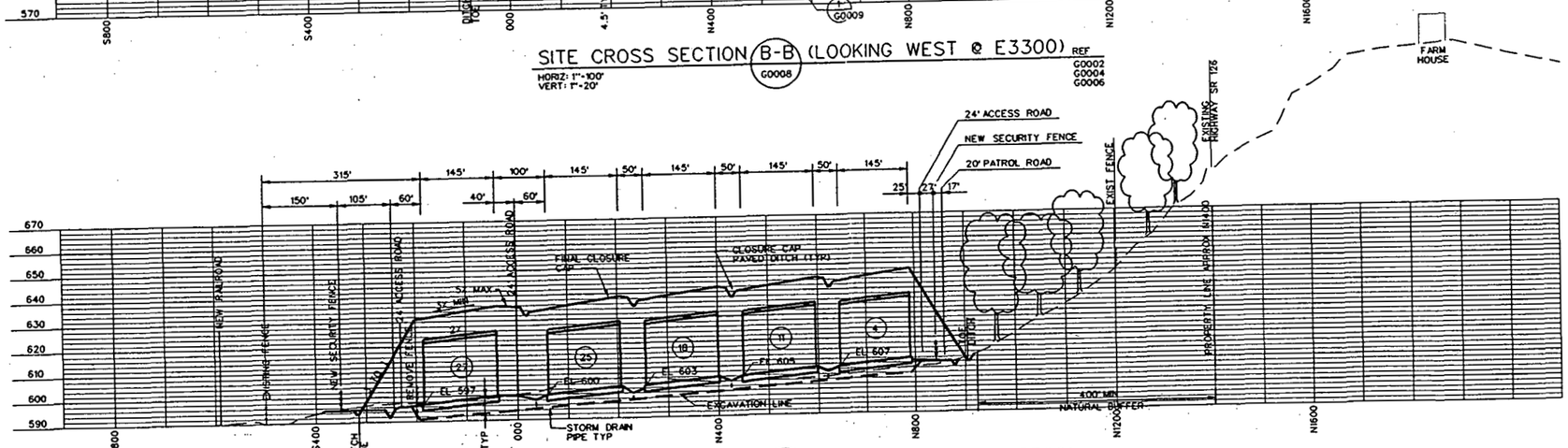
G0008



SITE CROSS SECTION B-B (LOOKING WEST @ E3300) REF G0002 G0004 G0006

HORIZ: 1"=100'
VERT: 1"=20'

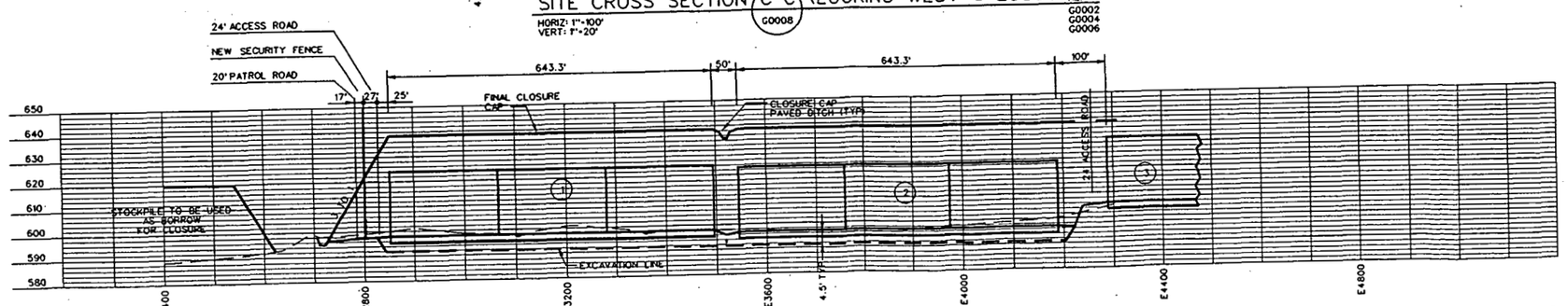
G0008



SITE CROSS SECTION C-C (LOOKING WEST @ E5300) REF G0002 G0004 G0006

HORIZ: 1"=100'
VERT: 1"=20'

G0008



SITE CROSS SECTION D-D (LOOKING NORTH @ N700) REF G0002 G0004 G0006

HORIZ: 1"=100'
VERT: 1"=20'

G0008

0208

NOTES

6420

FINAL CLOSURE

1. ROADS TO BE ABANDONED IN PLACE
2. FENCING TO BE REMOVED AND REUSED AS NECESSARY.
3. UNDERGROUND STORM SEWERS TO BE PLUGGED AND ABANDONED IN PLACE.
4. MANHOLES TO BE CONSTRUCTED TO PROVIDE ACCESS TO LEACHATE COLLECTION SYSTEM AND FOUNDATION UNDERDRAIN SUMPS.

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0004	CLOSURE PLAN - SHEET 1
G0006	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP · ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
SITE CROSS SECTIONS - SHEET 1
EWMF VAULTS

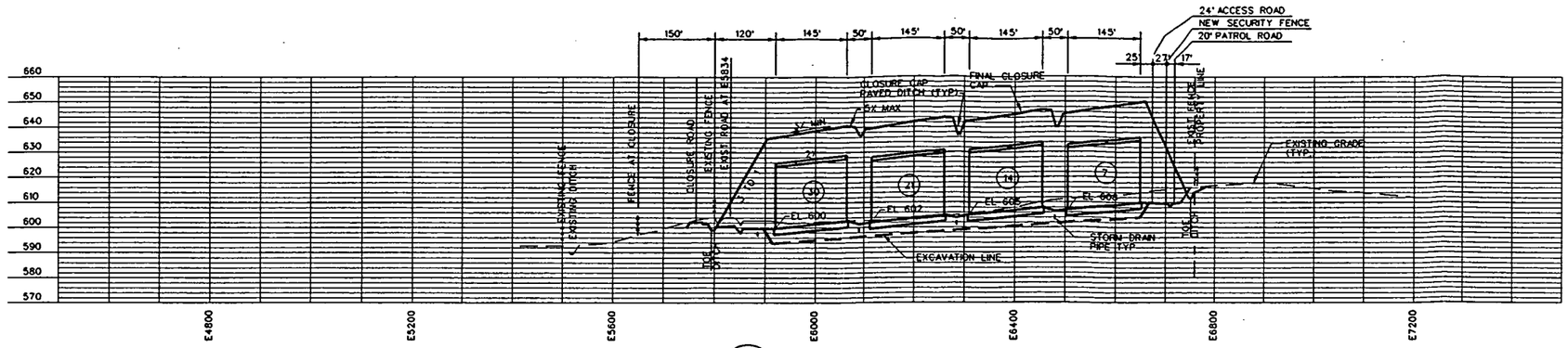
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-24-91			T. PICKERING	7-16-91

PLANT/BLDG. NO. | FLOOR | SCALE H- 1"=100' V- 1"=20' | CLASS

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | DRAWING APPROVED

A-E DATE | OPERATOR, CONTRACTOR DATE | DOE DATE

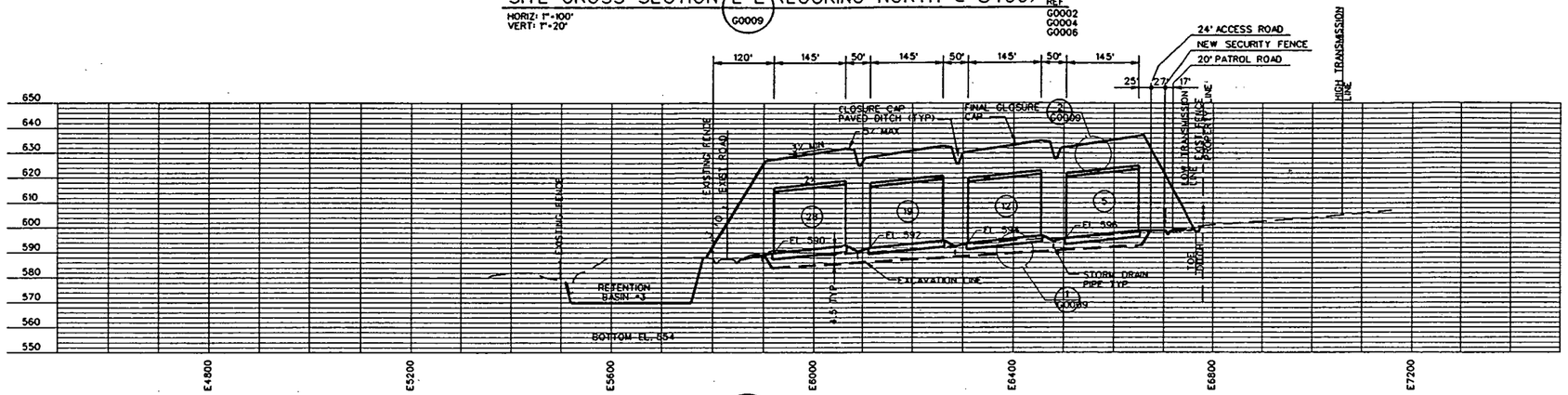
DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00008	G0008	-



SITE CROSS SECTION E-E (LOOKING NORTH @ S400) G0009

HORIZ: 1"=100'
VERT: 1"=20'

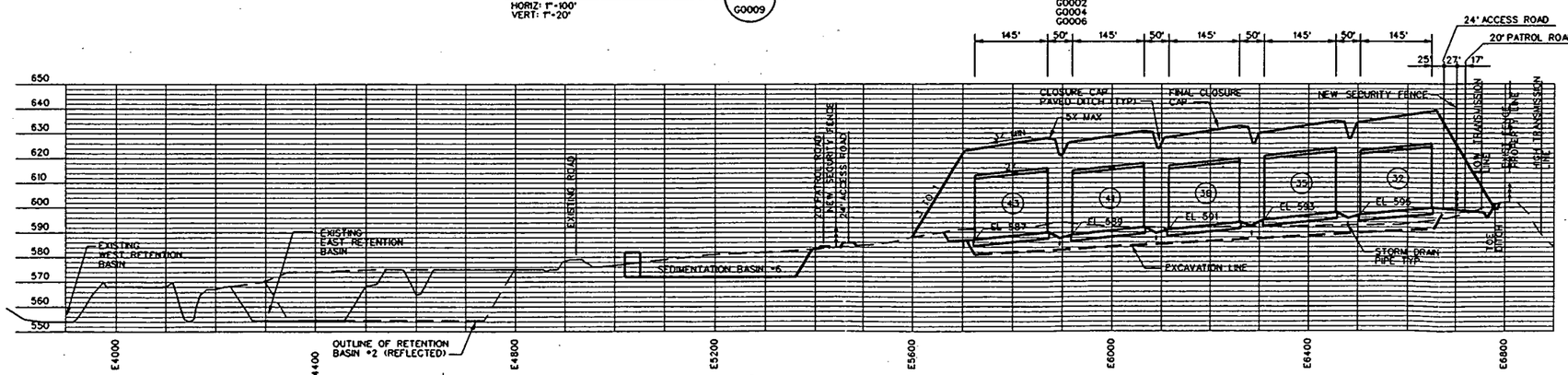
REF G0002 G0004 G0006



SITE CROSS SECTION F-F (LOOKING NORTH @ S2000) G0009

HORIZ: 1"=100'
VERT: 1"=20'

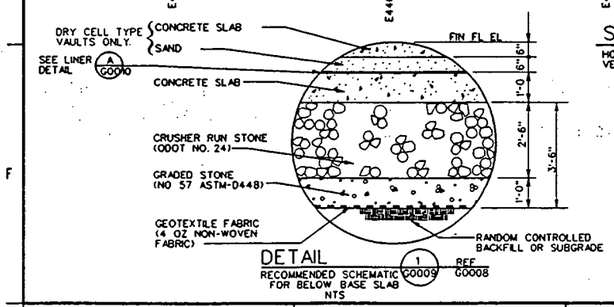
REF G0002 G0004 G0006



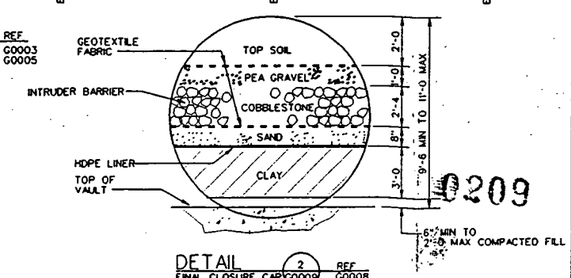
SITE CROSS SECTION G-G (LOOKING NORTH @ S4100) G0009

HORIZ: 1"=100'
VERT: 1"=20'

REF G0003 G0005



DETAIL 1 G0009 REF G0008
RECOMMENDED SCHEMATIC FOR BELOW BASE SLAB
NTS



DETAIL 2 G0009 REF G0008
FINAL CLOSURE CAP
NTS

0209

NOTES

6420

FINAL CLOSURE

1. ROADS TO BE ABANDONED IN PLACE.
2. FENCING TO BE REMOVED AND REUSED AS NECESSARY.
3. UNDERGROUND STORM SEWERS TO BE PLUGGED AND ABANDONED IN PLACE.
4. MANHOLES TO BE CONSTRUCTED TO PROVIDE ACCESS TO LEACHATE COLLECTION SYSTEM AND FOUNDATION UNDERDRAIN SUMPS.

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0003	SITE PLAN - SHEET 2
G0004	CLOSURE PLAN - SHEET 1
G0005	CLOSURE PLAN - SHEET 2
G0006	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1
G0008	SITE CROSS SECTIONS - SHEET 1
G0010	LEACHATE COLLECTION SYSTEM

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

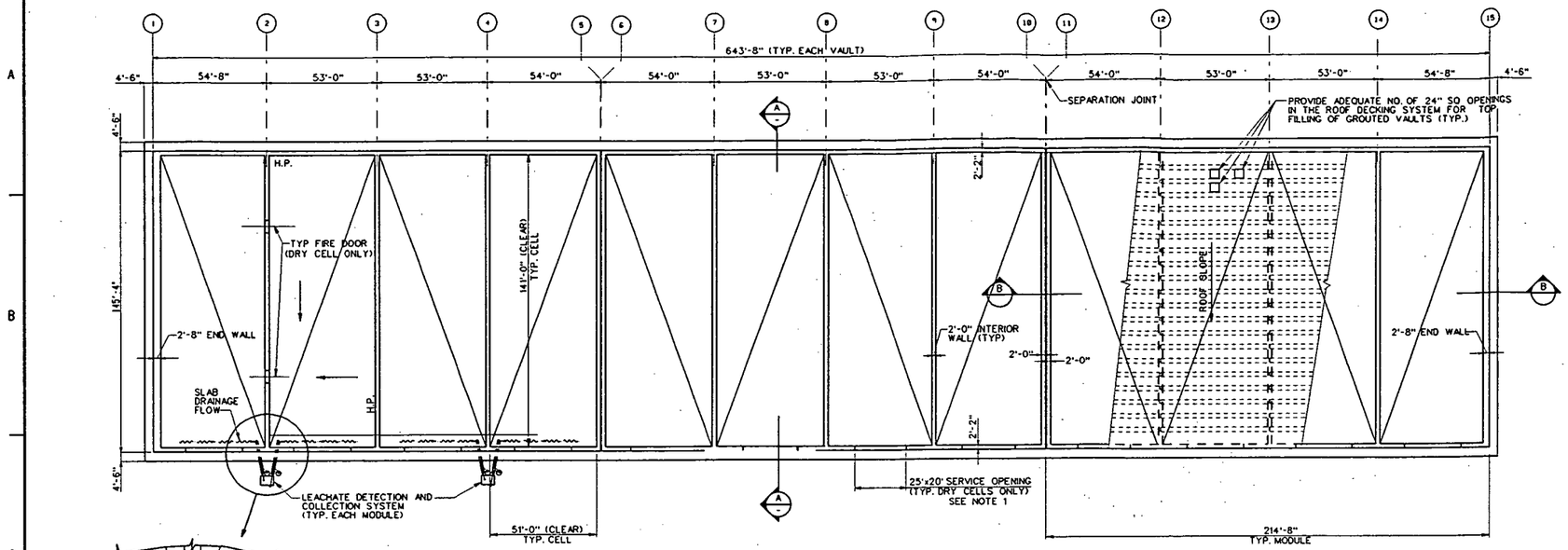
PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
SITE CROSS SECTIONS - SHEET 2
EWMF VAULTS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-24-91			T. PICKERING	7-16-91
PLANT/BLDG. (#)		FLOOR		SCALE H- 1"=100' V- 1"=20'	CLASS

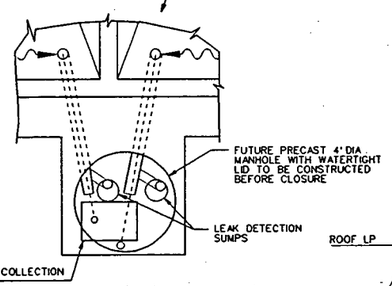
SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

D.O.E. PROJECT (#)	OPER. CONTR. PROJ. (#)	DRAWING (#)	SHEET (#)	REV. (#)
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00009	G0009	-

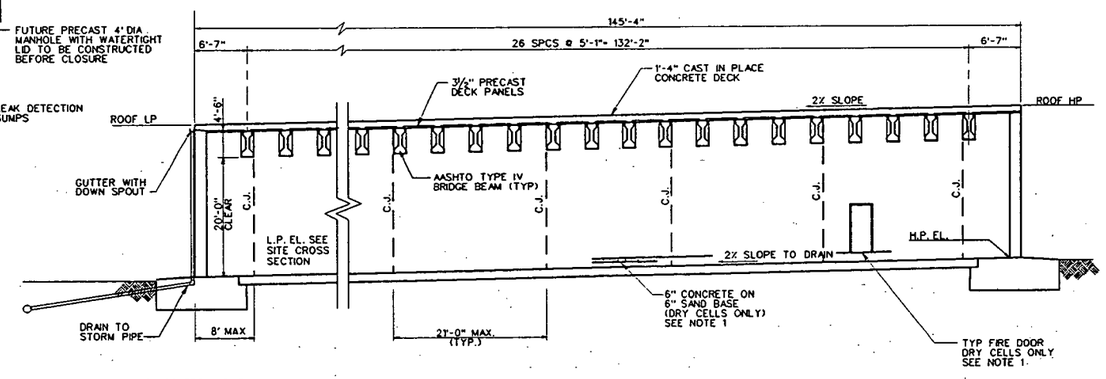


TYPICAL FOUNDATION AND FLOOR SLAB PLAN

NO SCALE



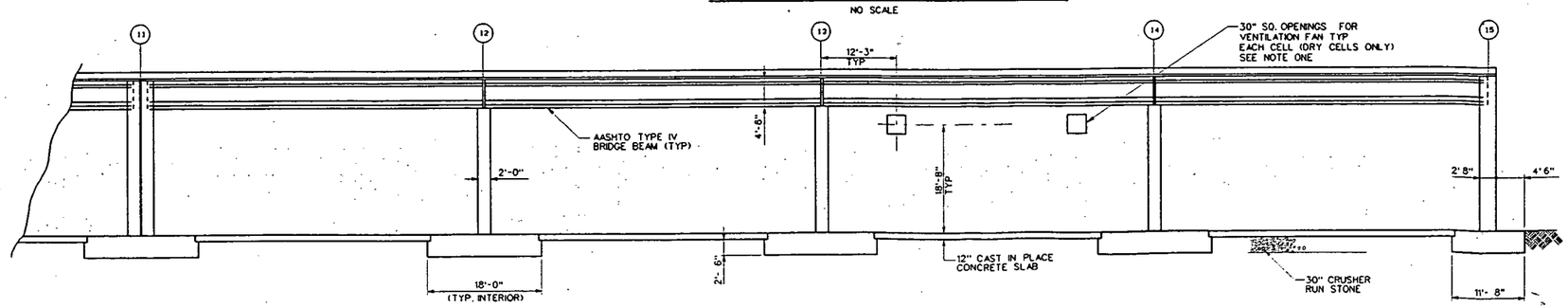
DETAIL



C.J: CONTROL JOINT

SECTION A-A (TYP INTERIOR WALL ELEVATION)

NO SCALE



SECTION B-B

NO SCALE

0210

NOTES

1. THE FOLLOWING INTERIM PROVISIONS ARE INCLUDED ONLY FOR THE DRY CELL TYPE VAULTS.
   - A) 25' X 20' SERVICE OPENINGS AND OTHER OPENINGS TO BE FILLED IN WITH CONCRETE AT INTERIM CLOSURE.
   - B) ADDITIONAL 6" CONCRETE FLOATING SLAB ON 6" SAND LAYER DESIGNED TO PROTECT LINER FROM FORKLFT TRAFFIC.
   - C) FIRE DOORS IN THE INTERIOR WALLS TO BE REMOVED AND FILLED IN WITH CONCRETE AT INTERIM CLOSURE.

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
EWMF VAULTS PLAN AND SECTIONS
EWMF VAULTS

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	7-8-91			C. V. CHAR	7-16-91

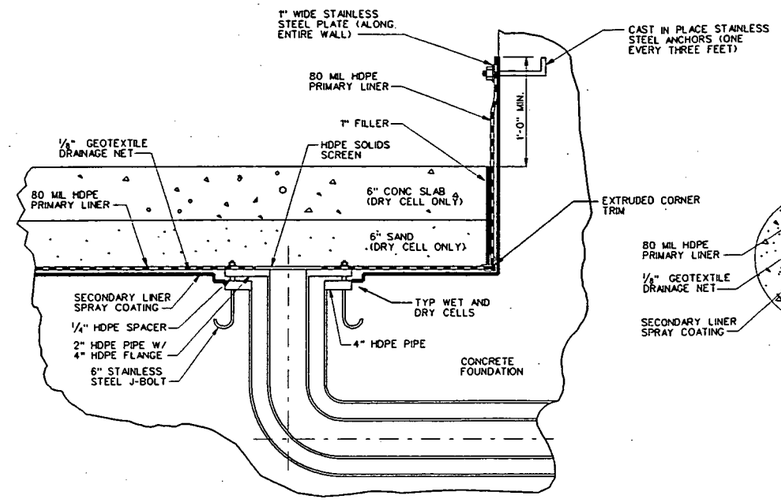
PLANT/BUILDING	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
DATE	CONTRACTOR, SUBCONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	PROJECT NO.	DRAWING NO.	SHEET NO.	REVISION
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-S-00017	S0001	-

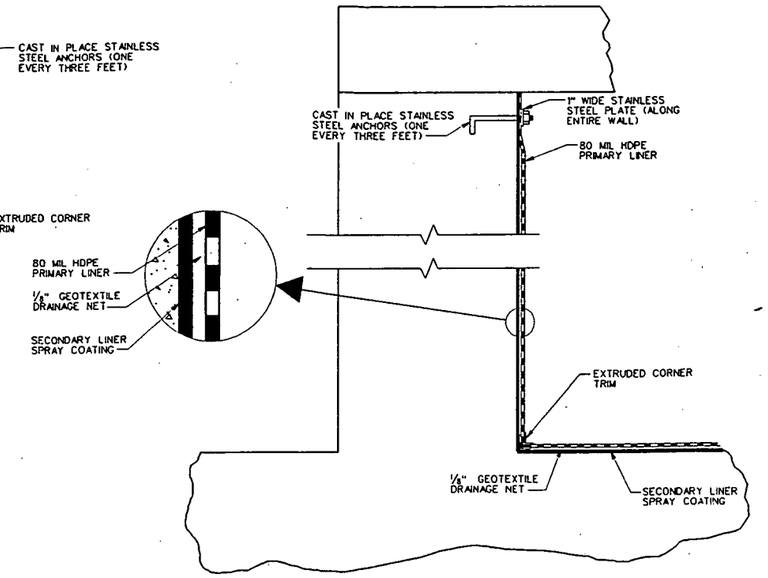
NOTES

6420



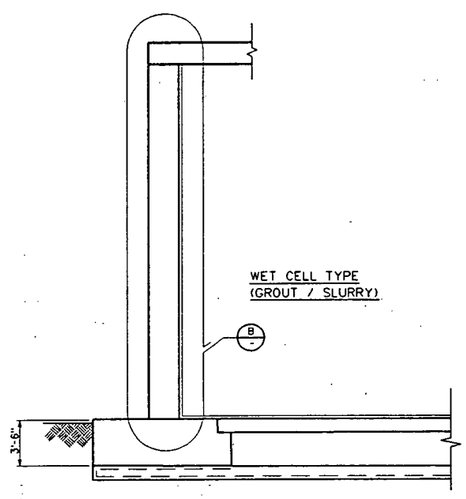
SUMP DRAIN DETAIL (A) REF G0010 G0009

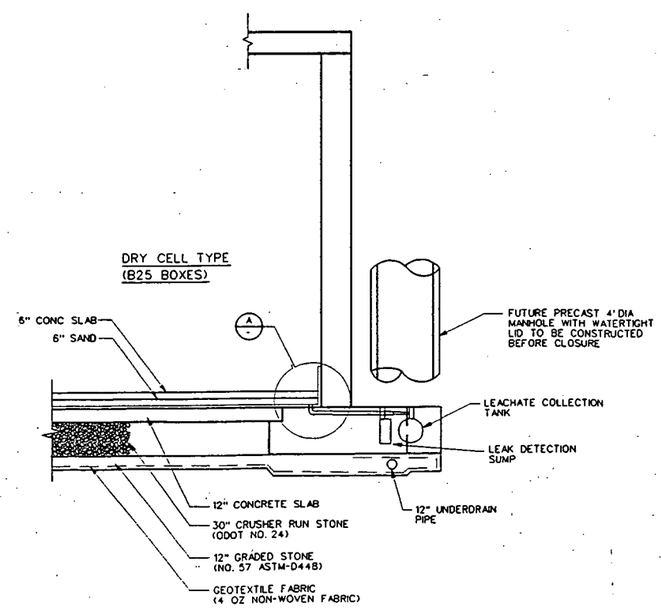
NO SCALE



LINER FASTENING DETAIL (B)

NO SCALE





TYPICAL FOUNDATION SECTION

NO SCALE

0211

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	CONTRACTOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

PARSONS

THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME

FEMP ERA

ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE

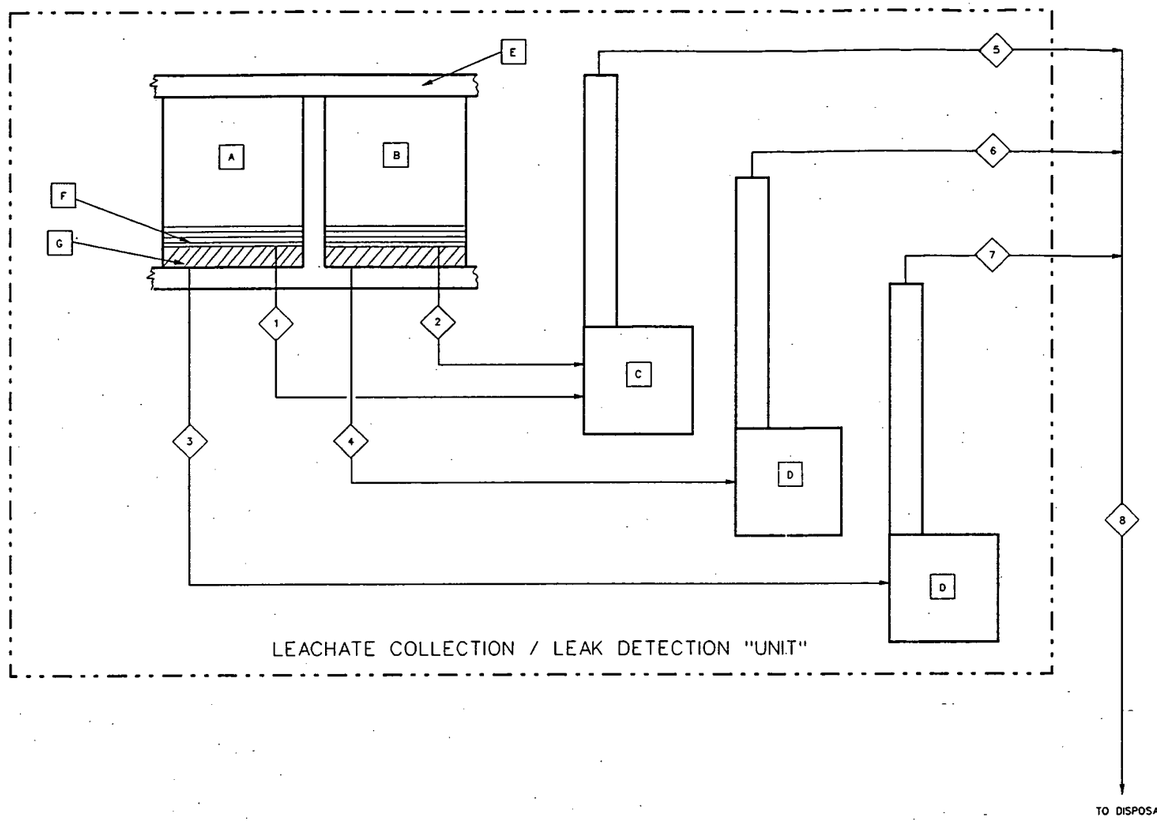
LEACHATE COLLECTION SYSTEM
SECTION AND DETAILS
EWMF VAULTS

DRAWN BY	DATE	LEGAL/ CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	7/9/91			S. HOFFMAN	7-16-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

CYC PROJECT NO.	CHEP/CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REVISION
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00018	G0010	-



LEACHATE COLLECTION / LEAK DETECTION "UNIT"

	1	2	3	4	5	6	7	8			
	LEACHATE	LEACHATE	LEAK COLLECTION	LEAK COLLECTION	COMBINED LEACHATE PUMP-OUT	LEAK DETECTION PUMP-OUT	LEAK DETECTION PUMP-OUT	TOTAL UNIT LIQUID FLOW			
FLOW RATE											
TDS											
S.S.											
URANIUM											

NOTES

1. TYPICAL UNIT SHOWN. ENTIRE EWMF SYSTEM CONSISTS OF 268 LEACHATE COLLECTION / LEAK DETECTION UNITS.
2. FLOW DATA WILL BE UNAVAILABLE UNTIL EWMF SYSTEM IS IN OPERATION.

6420

LEGEND

A - VAULT CELL
B - VAULT CELL
C - LEACHATE COLLECTION TANK
D - LEAK DETECTION SUMP
E - VAULT ROOF
F - LEACHATE COLLECTION AREA
G - LEAK DETECTION AREA

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LEACHATE COLLECTION / LEAK DETECTION PROCESS FLOW DIAGRAM

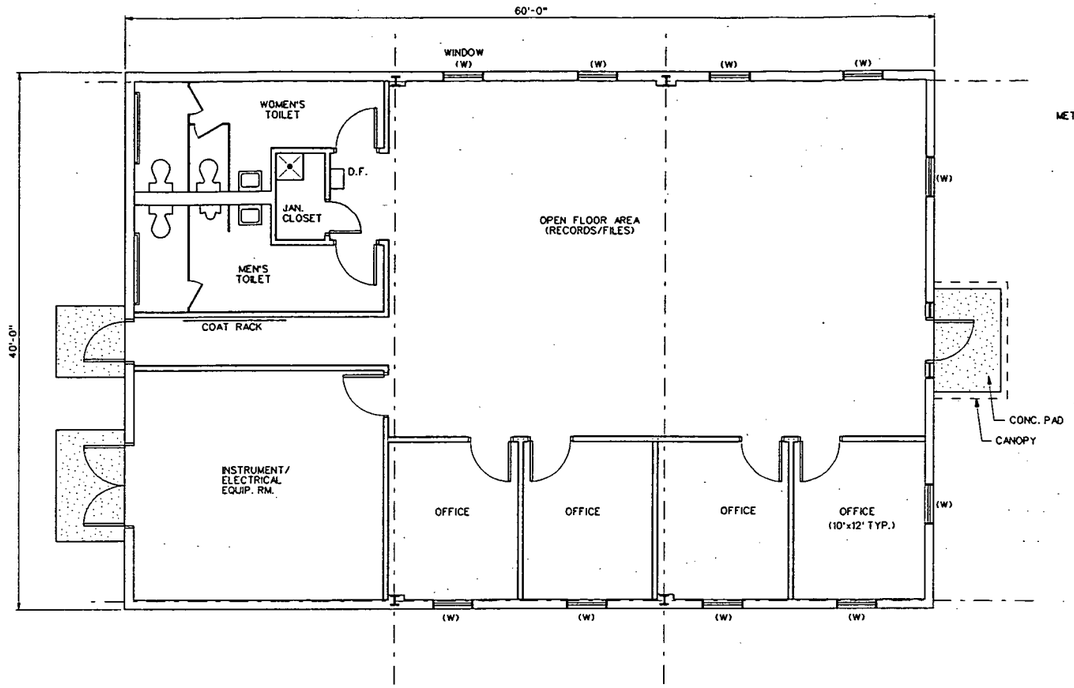
DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
R PROSKI	7/8/91				

PLANT/BLDG. NO.	FLOW	SCALE	CLASS
		NONE	

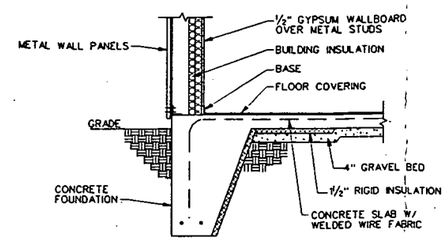
SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATOR/CONTRACTOR DATE	DOE DATE

DOE APPROVED NO.	WASTE LINE APPLICATION	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-F-00019	F0001	-

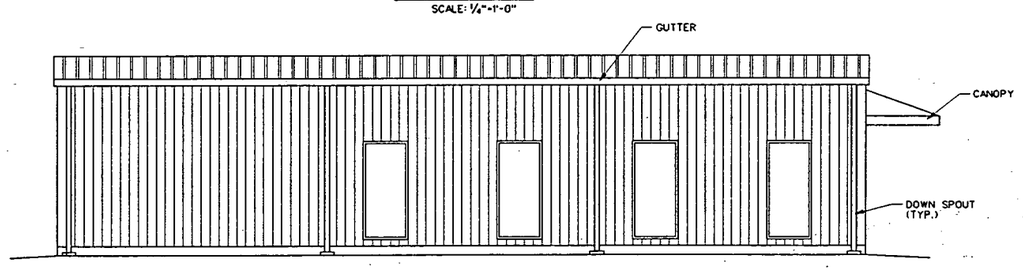
0213



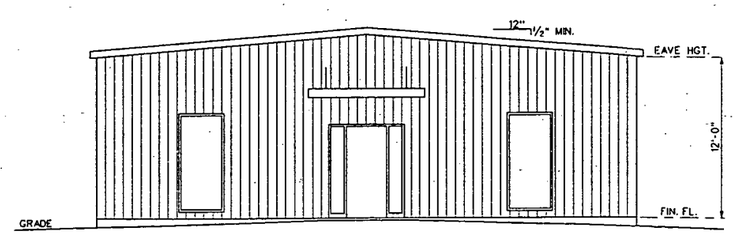
FLOOR PLAN
SCALE: 1/4"=1'-0"



TYPICAL EXT. WALL SECTION
SCALE: 3/4"=1'-0"



SIDE ELEVATION
SCALE: 1/4"=1'-0"



FRONT ELEVATION
SCALE: 1/4"=1'-0"

NOTES

1. GENERAL BLDG. DESCRIPTION: **6420**
   a) PRE-ENGINEERED BUILDING ON A CONCRETE SLAB ON GRADE AND WITH INSULATED METAL WALLS AND ROOF.
   b) INTERIOR PARTITIONS OF METAL STUDS W/ GYPSUM WALLBOARD (PAINTED).
   c) SUSPENDED ACOUSTICAL TILE CEILING SYSTEM.
   d) CARPET AND VINYL TILE FLOOR COVERING
   e) FIXED GLASS INSULATED WINDOW UNITS.
   f) TOILET FIXTURES AND ACCESSORIES.
2. MECHANICAL EQUIPMENT WILL BE PAD MOUNTED ON BLDG. EXTERIOR.
3. CONCRETE PADS WILL BE INSTALLED AT EACH EXTERIOR DOOR.

REFERENCE DWG.#	REFERENCE DWG. TITLE
G0001	MASTER PLAN

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
FENGINEERED WASTEMANAGEMENT FACILITY /P06

DRAWING TITLE
PLANS, ELEVATIONS, AND SECTIONS
FACILITY SUPPORT BUILDING

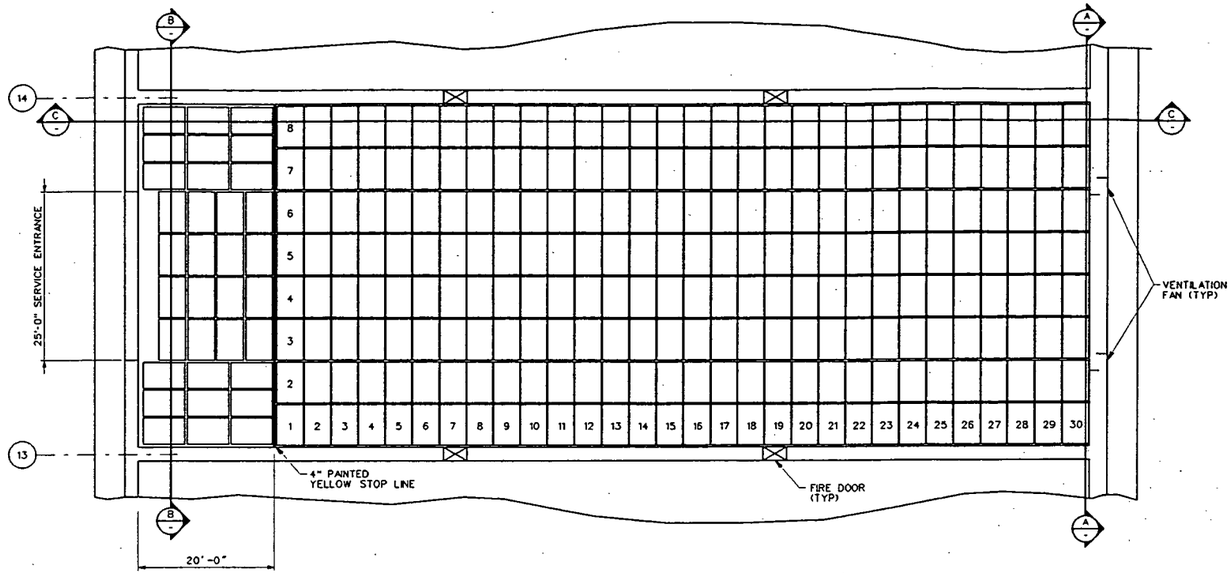
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	8-26-91			S. SMITH	9-17-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS NOTED	

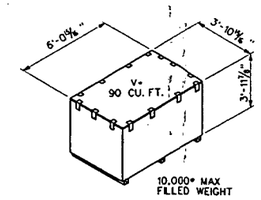
SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-A-00022	A0001	-

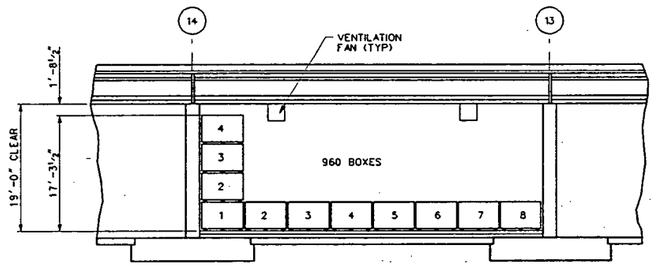
0213



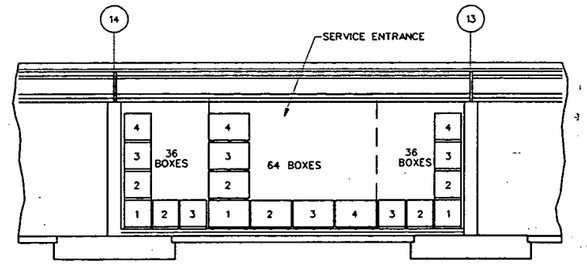
TYPICAL DRY CELL PLAN
1/8"=1'-0"



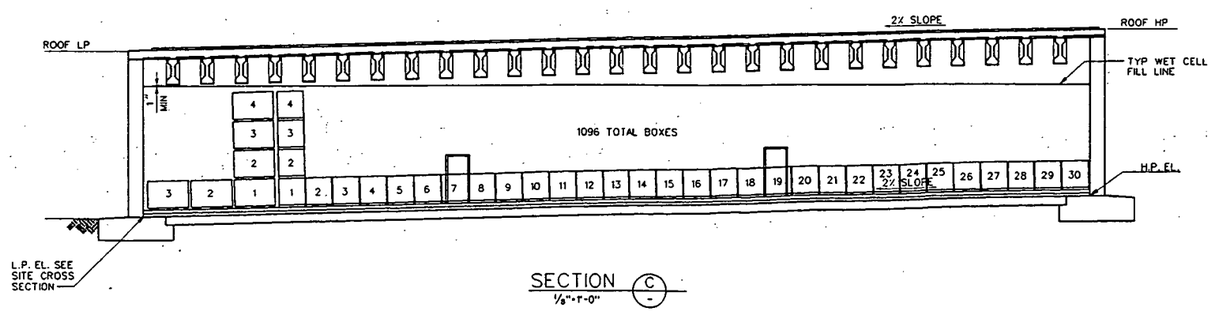
B-25 BOX
NO SCALE



SECTION A
1/8"=1'-0"



SECTION B
1/8"=1'-0"



SECTION C
1/8"=1'-0"

NOTES

6420

REFERENCE DWG.*	REFERENCE DWG. TITLE
G0001	MASTER PLAN
G0010	LEACHATE COLLECTION SYSTEM SECTION AND DETAILS
S0001	EWMF VAULTS PLAN AND SECTIONS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
STORAGE LAYOUT
EWMF VAULTS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
D. THOMPSON	8-26-91			T. PICKERING	8-30-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS NOTED	

SUBMITTED FOR APPROVAL — A-E — DATE
APPROVAL RECOMMENDED — OPERATOR/CONTRACTOR — DATE
DRAWING APPROVED — DOE — DATE

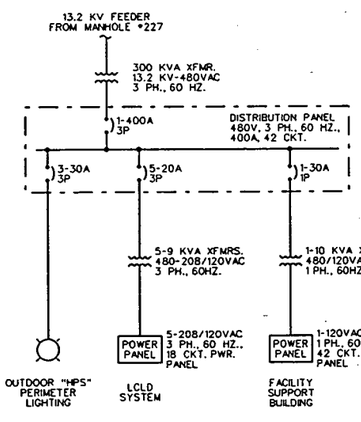
D.O.E. PROJECT NO.	OPER. CONTR. TITLE NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-S-00023	S0002	-

0214

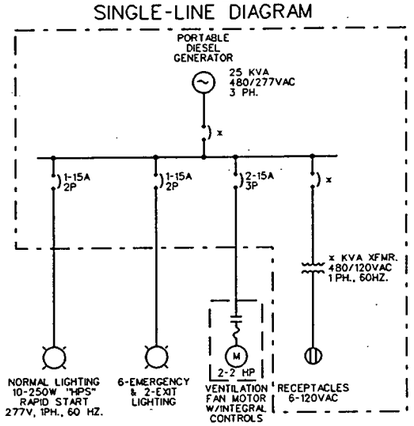
NOTES

6420

EWMF MAIN DISTRIBUTION PANEL SINGLE-LINE DIAGRAM

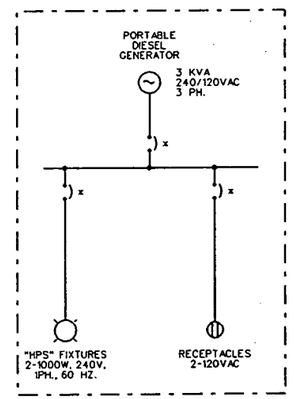


DRY CELL SINGLE-LINE DIAGRAM



x SIZE TO BE DETERMINED BY GENERATOR SUPPLIER
NOTE : CIRCUIT BREAKERS, XFMR., AND RECEPTACLES WILL BE INTEGRAL WITH GENERATOR.

WET CELL SINGLE-LINE DIAGRAM



x SIZE TO BE DETERMINED BY GENERATOR SUPPLIER
NOTE : CIRCUIT BREAKERS, LIGHTING AND RECEPTACLES WILL BE INTEGRAL WITH GENERATOR.

0215

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
SINGLE LINE DIAGRAMS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L HAGAMAN	8-30-91			B YUSKO	9-4-91

FE-WATERLOO NO.	FLOOR	SCALE	CLASS
		NONE	

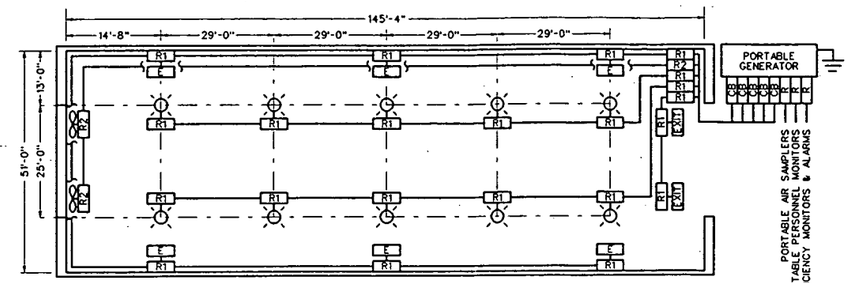
SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DATE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-E-00026	E001	-

NOTES

6420

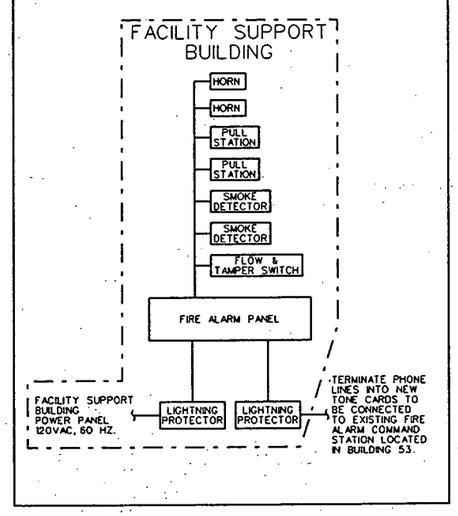
DRY CELL ELECTRICAL LAYOUT (TYPICAL)



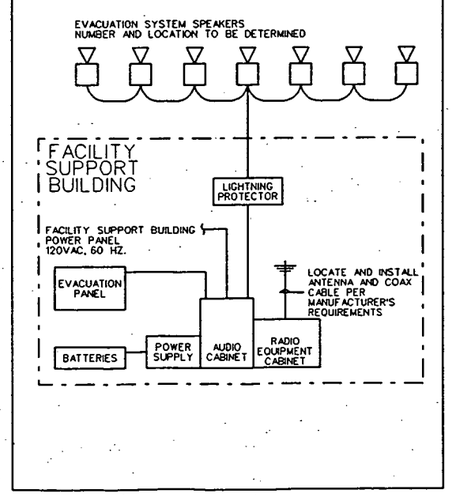
LEGEND

CB	CIRCUIT BREAKER
E	PORTABLE WALL MOUNTED EMERGENCY LIGHTING W/PLUG
EXIT	PORTABLE WALL MOUNTED EXIT SIGN & LIGHTS W/PLUG
R	120V RECEPTACLE
R1	277V RECEPTACLE
R2	480V RECEPTACLE
	PORTABLE CEILING MOUNTED 480V LIGHTING UNIT W/PLUG
	PORTABLE WALL MOUNTED VENT EXHAUST FAN W/PLUG

EWMF FIRE ALARM RISER DIAGRAM



EWMF EVACUATION SYSTEM RISER DIAGRAM



0216

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

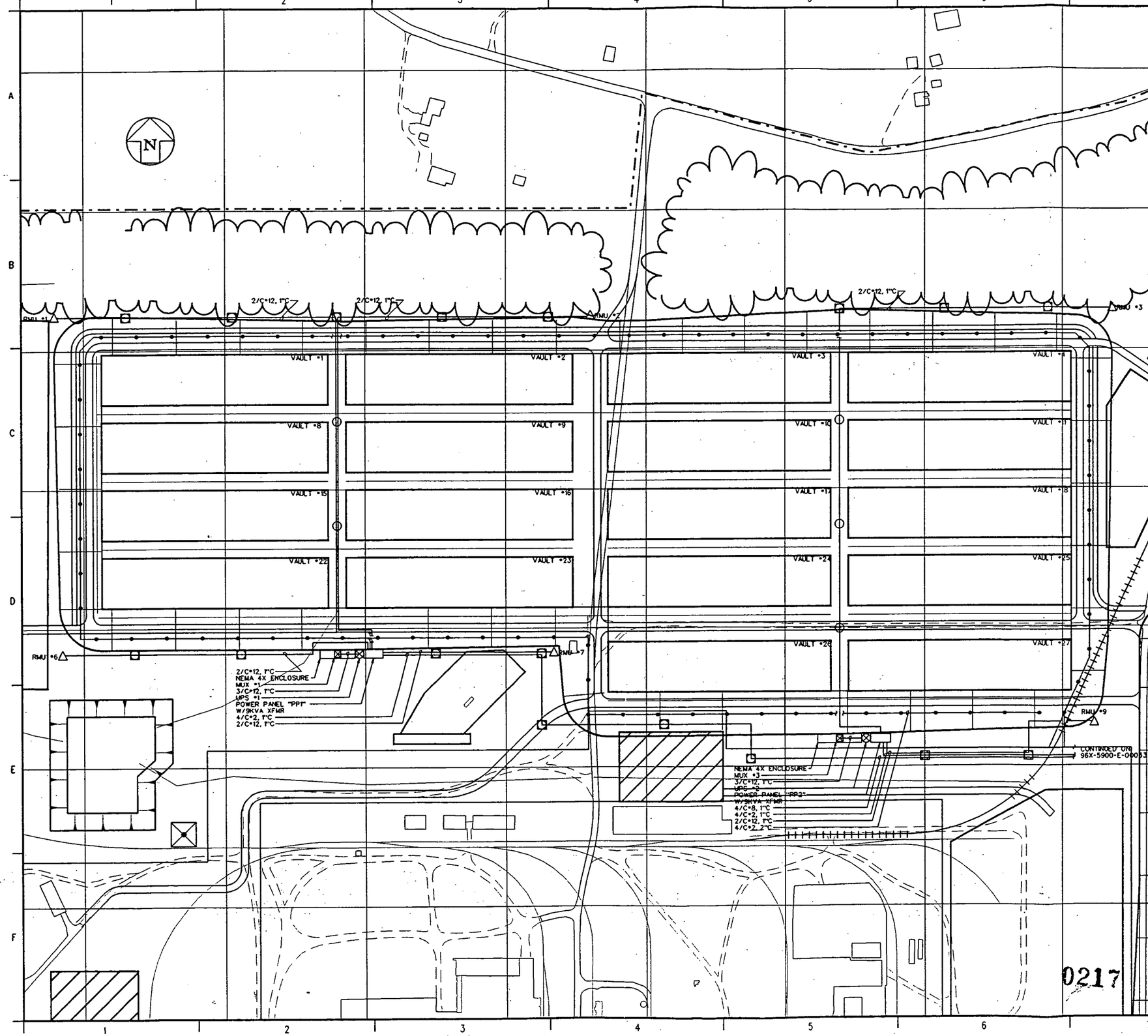
DRAWING TITLE
VAULT ELECTRICAL LAYOUT AND RISER DIAGRAMS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L HAGAMAN	8-30-91			B YUSKO	9-4-91

PLANT-BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

CVE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-E-00027	E002	-



NOTES

1. ALL CONDUIT TO BE EMBEDDED. CONDUIT ROUTING AND EQUIPMENT DEPICTED FOR ESTIMATING ONLY. (NOT TO SCALE)

6420

LEGEND

- HANDHOLE (LOCATED OUTSIDE "FINAL CLOSURE")
- MANHOLE (LOCATED INSIDE "FINAL CLOSURE")
- MULTIPLEXER - MUX
- RADIATION MONITOR UNIT - RMU
- 120V UNINTERRUPTIBLE POWER SUPPLY - UPS
- LIGHT POLE WITH 480V, 250W "HPS" LIGHT & LIGHT FIXTURE. (TO BE REMOVED BEFORE "FINAL CLOSURE")

REFERENCE DWG.*	REFERENCE DWG. TITLE
96X-5900-E-00033	POWER & LIGHTING ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-E-00034	POWER & LIGHTING ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-E-00029	INSTRUMENT ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-E-00026	SINGLE LINE DIAGRAMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
POWER & LIGHTING ARRANGEMENT PLAN SHEET 1 OF 3

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	7-30-91			B YUSKO	9-4-91

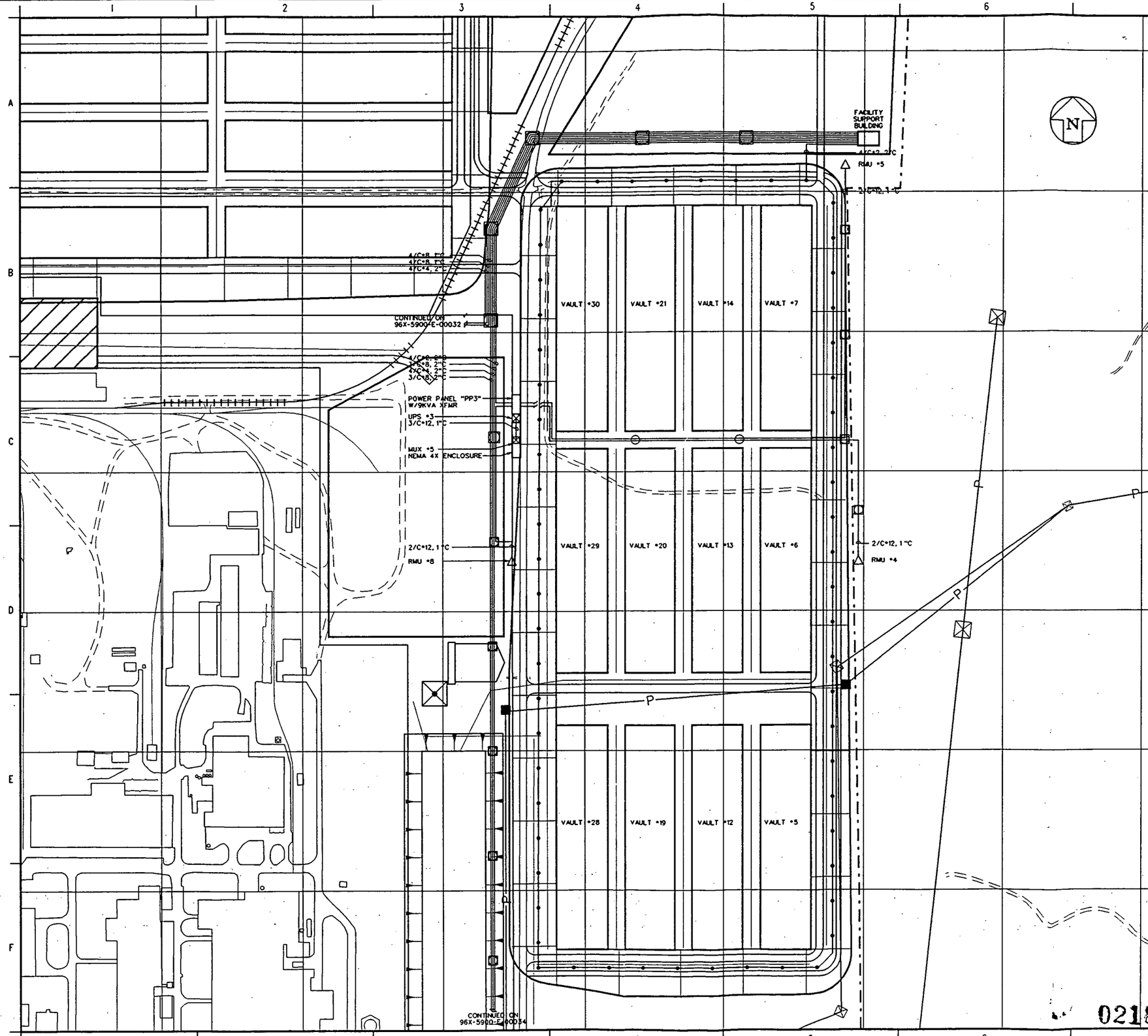
PLANT-BLDG. NO. | FLOOR | SCALE 1" = 100' | CLASS

SUBMITTED FOR APPROVAL | SERVICE RECOMMENDED | DRAWING APPROVED

A-E DATE | OPERATING INVESTIGATOR DATE | DOE DATE

DOE CONTRACT NO.	SUPP. CONTR. TYPE NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-E-00032	E0007	-

LARRY HAGAMAN Sep. 18, 1991 08:38:03



NOTES

1. ALL CONDUIT TO BE EMBEDDED. CONDUIT ROUTING AND EQUIPMENT DEPICTED FOR ESTIMATING ONLY. (NOT TO SCALE)

6420

LEGEND

- HANDHOLE (LOCATED OUTSIDE "FINAL CLOSURE")
- MANHOLE (LOCATED INSIDE "FINAL CLOSURE")
- MULTIPLEXER - MUX
- RADIATION MONITOR UNIT - RMU
- 120V UNINTERRUPTIBLE POWER SUPPLY - UPS
- LIGHT POLE WITH 480V, 250W "HPS" LIGHT & LIGHT FIXTURE. (TO BE REMOVED BEFORE "FINAL CLOSURE")

REFERENCE DWG.#	REFERENCE DWG. TITLE
96X-5900-E-00033	POWER & LIGHTING ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-E-00034	POWER & LIGHTING ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-E-00030	INSTRUMENT ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-E-00026	SINGLE LINE DIAGRAMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
POWER & LIGHTING ARRANGEMENT PLAN SHEET 2 OF 3

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	7-30-91			B YUSKO	9-4-91

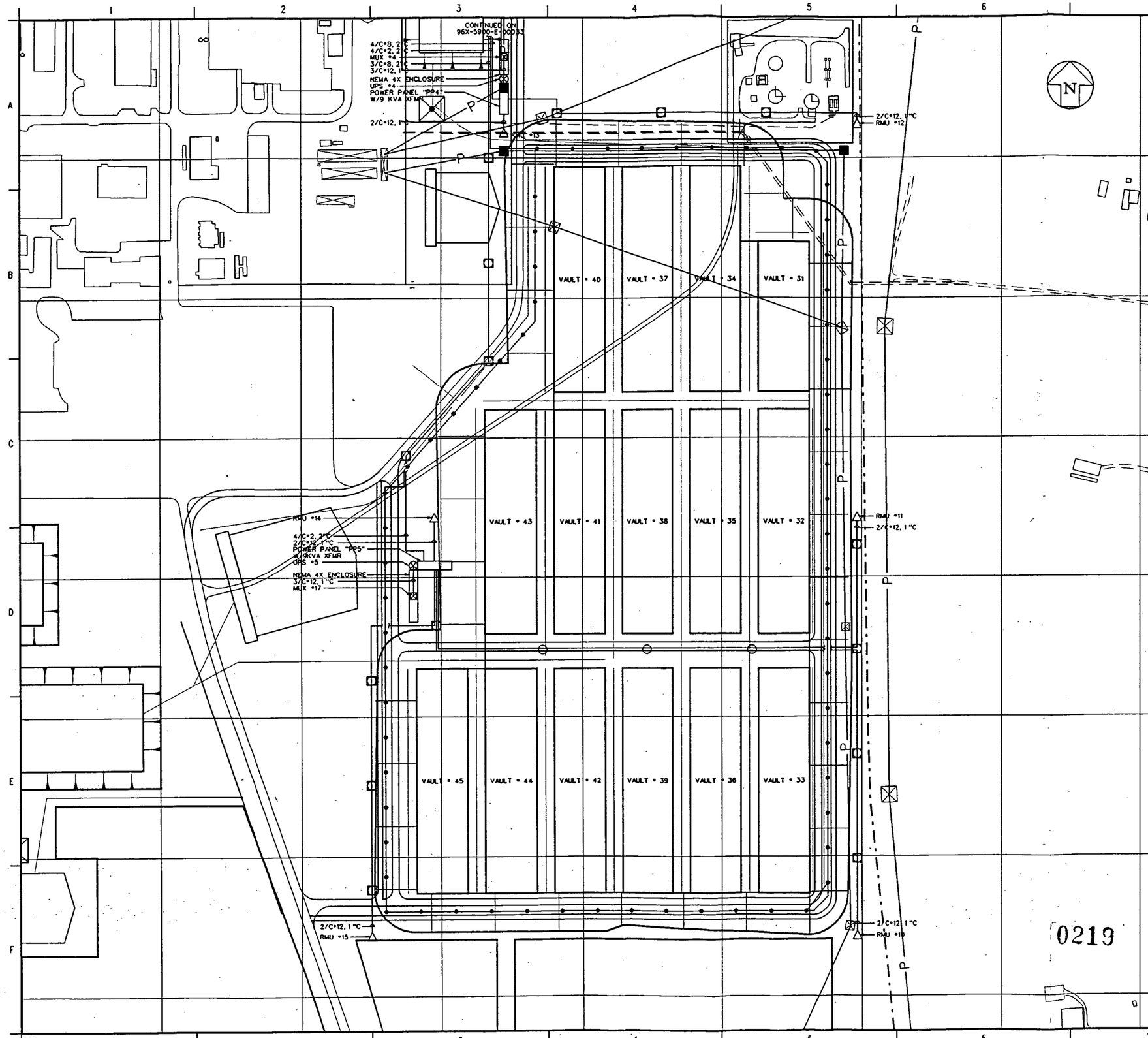
FE-MT/BLDG. NO. | FLOOR | SCALE 1" = 100' | CLASS

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | OPERATING APPROVED

A-E DATE | OPERATING CONTRACTOR DATE | DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-E-00033	E0008	-

LARRY HAGAMAN Sep. 12, 1991 17:35:18



NOTES

1. ALL CONDUIT TO BE EMBEDDED. CONDUIT ROUTING AND EQUIPMENT DEPICTED FOR ESTIMATING ONLY. (NOT TO SCALE)

6420

LEGEND

- HANDHOLE (LOCATED OUTSIDE "FINAL CLOSURE")
- MANHOLE (LOCATED INSIDE "FINAL CLOSURE")
- MULTIPLEXER - MUX
- RADIATION MONITOR UNIT - RMU
- 120V UNINTERRUPTIBLE POWER SUPPLY - UPS
- LIGHT POLE WITH 480V, 250W "HPS" LIGHT & LIGHT FIXTURE. (TO BE REMOVED BEFORE "FINAL CLOSURE")

REFERENCE DWG.#	REFERENCE DWG. TITLE
96X-5900-E-00032	POWER & LIGHTING ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-E-00033	POWER & LIGHTING ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-E-00031	INSTRUMENT ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-E-00026	SINGLE LINE DIAGRAMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION
MONITORING SYSTEMS
POWER & LIGHTING ARRANGEMENT PLAN SHEET 3 OF 3

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	8-01-91			B YUSKO.	9-4-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-E-00034	E0009	-

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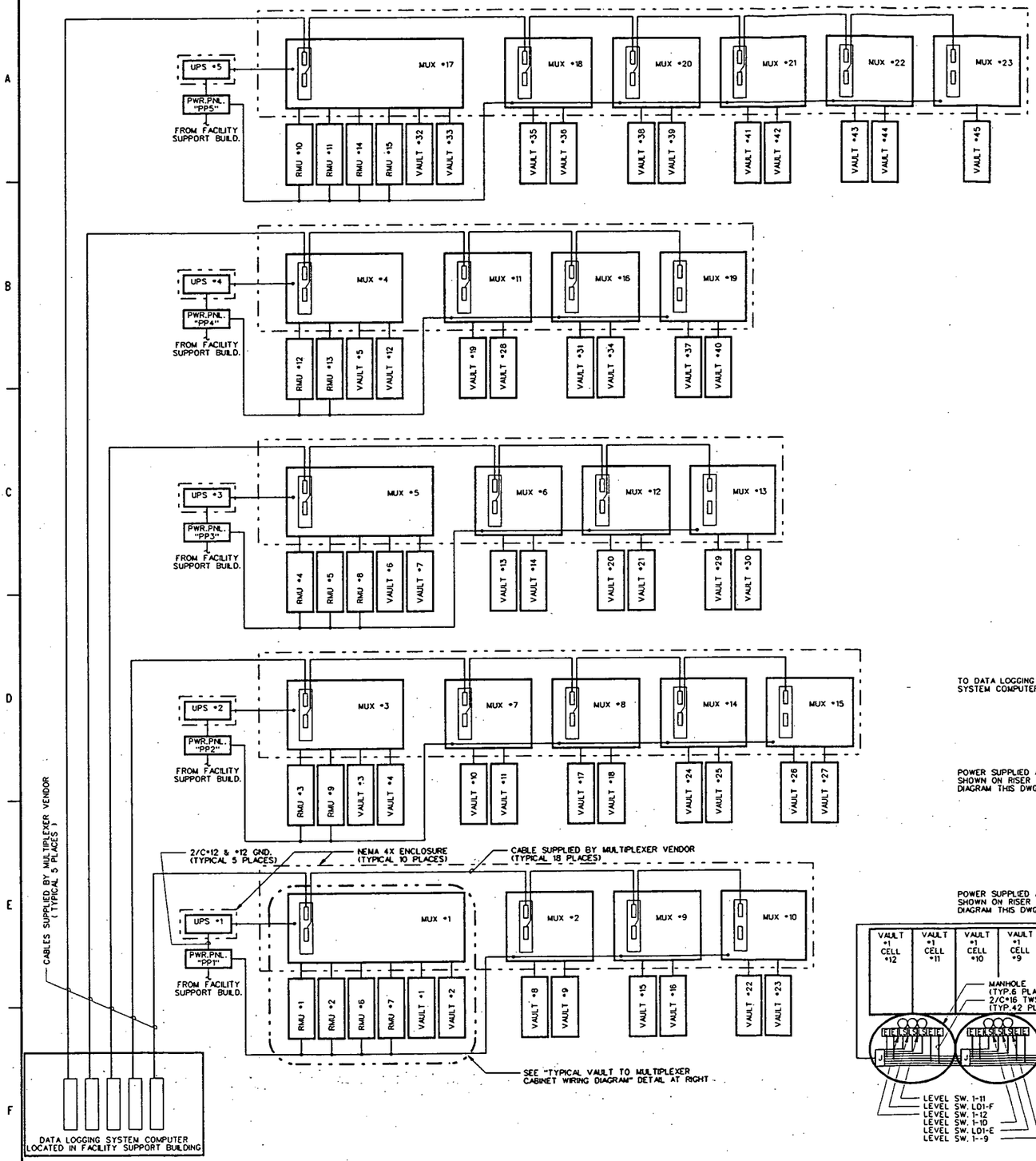
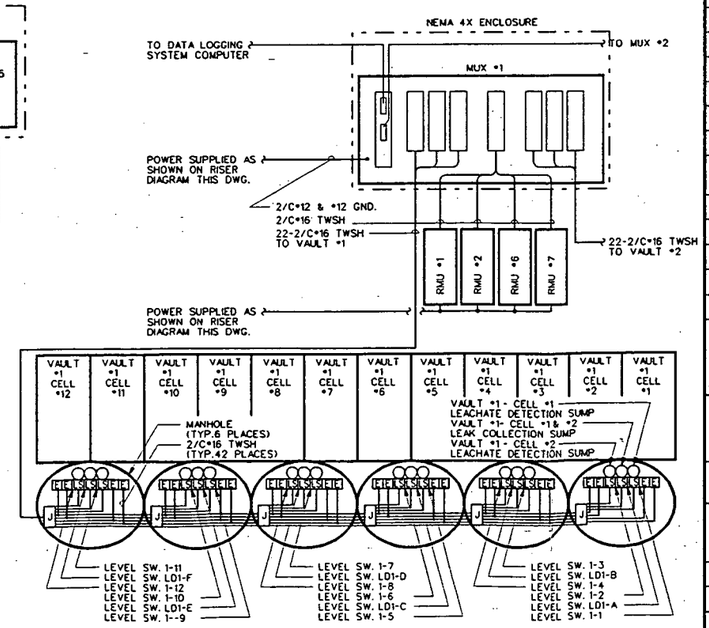


LCLD & RADIATION MONITORING SYSTEMS RISER DIAGRAM



TYPICAL VAULT TO MULTIPLEXER CABINET WIRING DIAGRAM

(VAULT #1 SHOWN--TYPICAL FOR ALL VAULTS EXCEPT: VAULT #31-8 CELLS ONLY)

NOTES

6420 - 2

LEGEND

MUX - MULTIPLEXER
RMU - RADIATION MONITORING UNIT
UPS - UNINTERRUPTIBLE POWER SUPPLY
E - PORTABLE EXHAUST FAN SIGNAL OUTLET
J - JUNCTION BOX
LS - LEVEL SWITCH

REFERENCE DWG.*	REFERENCE DWG. TITLE
96X-5900-N-00038	INSTRUMENT ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-N-00039	INSTRUMENT ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-N-00040	INSTRUMENT ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-E-00032	POWER & LIGHTING ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-E-00033	POWER & LIGHTING ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-E-00034	POWER & LIGHTING ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-N-00028	SINGLE LINE DIAGRAMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
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THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
RISER DIAGRAM

DRAWN BY	DATE	DESIGNED/CALCULATED BY	DATE	CHECKED BY	DATE
R PROSKI	7-22-91			B YUSKO	9-4-91

PLANT/BLDG. NO. | FLOOR | SCALE: NONE | CLASS

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | DRAWING APPROVED
A-E DATE | OPERATING CONTRACTOR DATE | DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-N-00035	N0003	-

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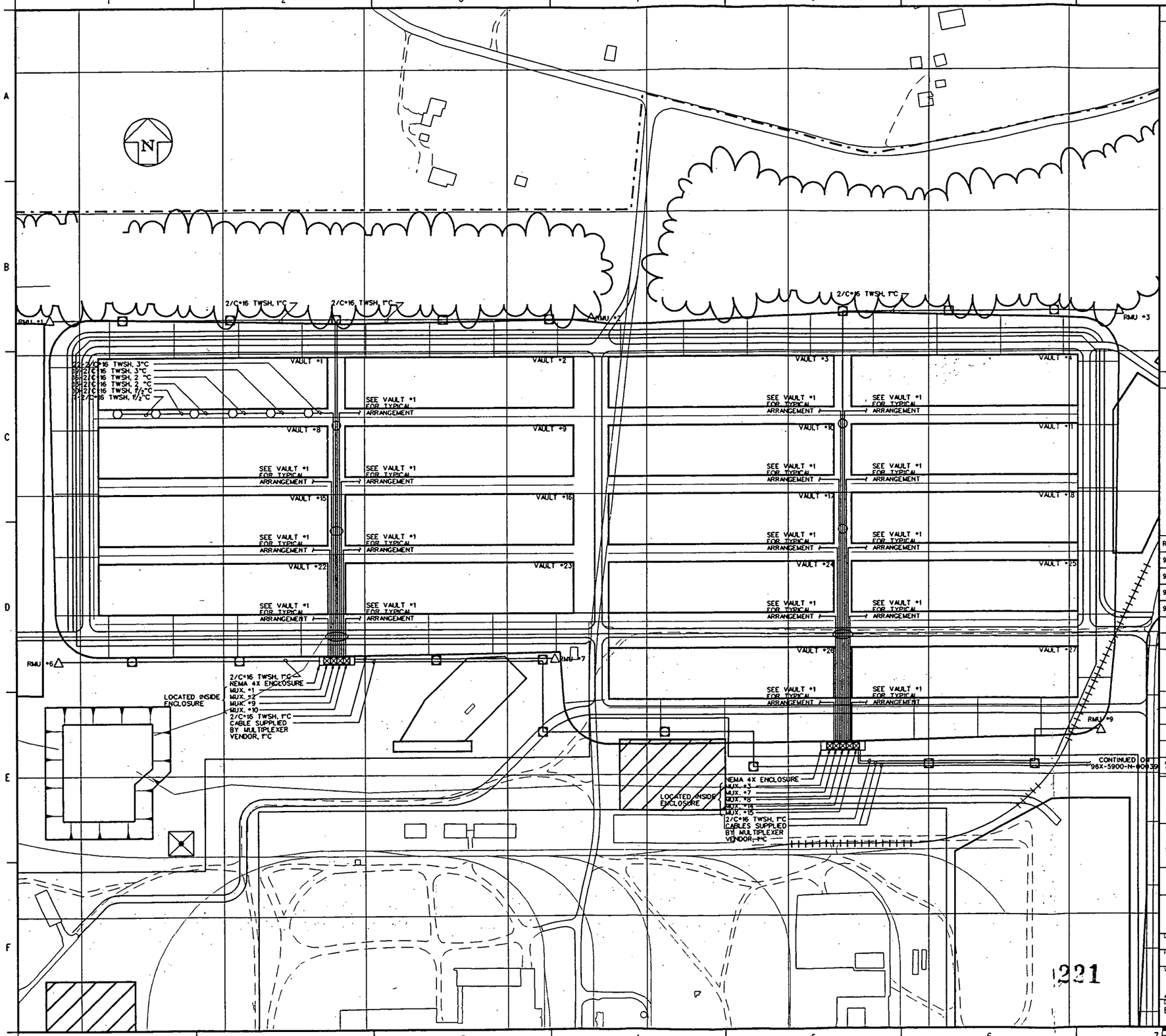

NOTES

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6420

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- MANHOLE (LOCATED INSIDE "FINAL CLOSURE")
- MULTIPLEXER - MUX
- RADIATION MONITOR UNIT - RMU

REFERENCE DWG.#	REFERENCE DWG. TITLE
96X-5900-N-00039	INSTRUMENT ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-N-00040	INSTRUMENT ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-N-00035	INSTRUMENT RISER DIAGRAM
96X-5900-E-00032	POWER & LIGHTING ARRANGEMENT PLAN SHEET 1 OF 3

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
INSTRUMENT ARRANGEMENT PLAN SHEET 1 OF 3

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	7-30-91			B YUSKO	9-4-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1" = 100'	

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — DRAWING APPROVED

A-E DATE — OPERATING CONTRACTOR DATE — DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-N-00038	N0004	-

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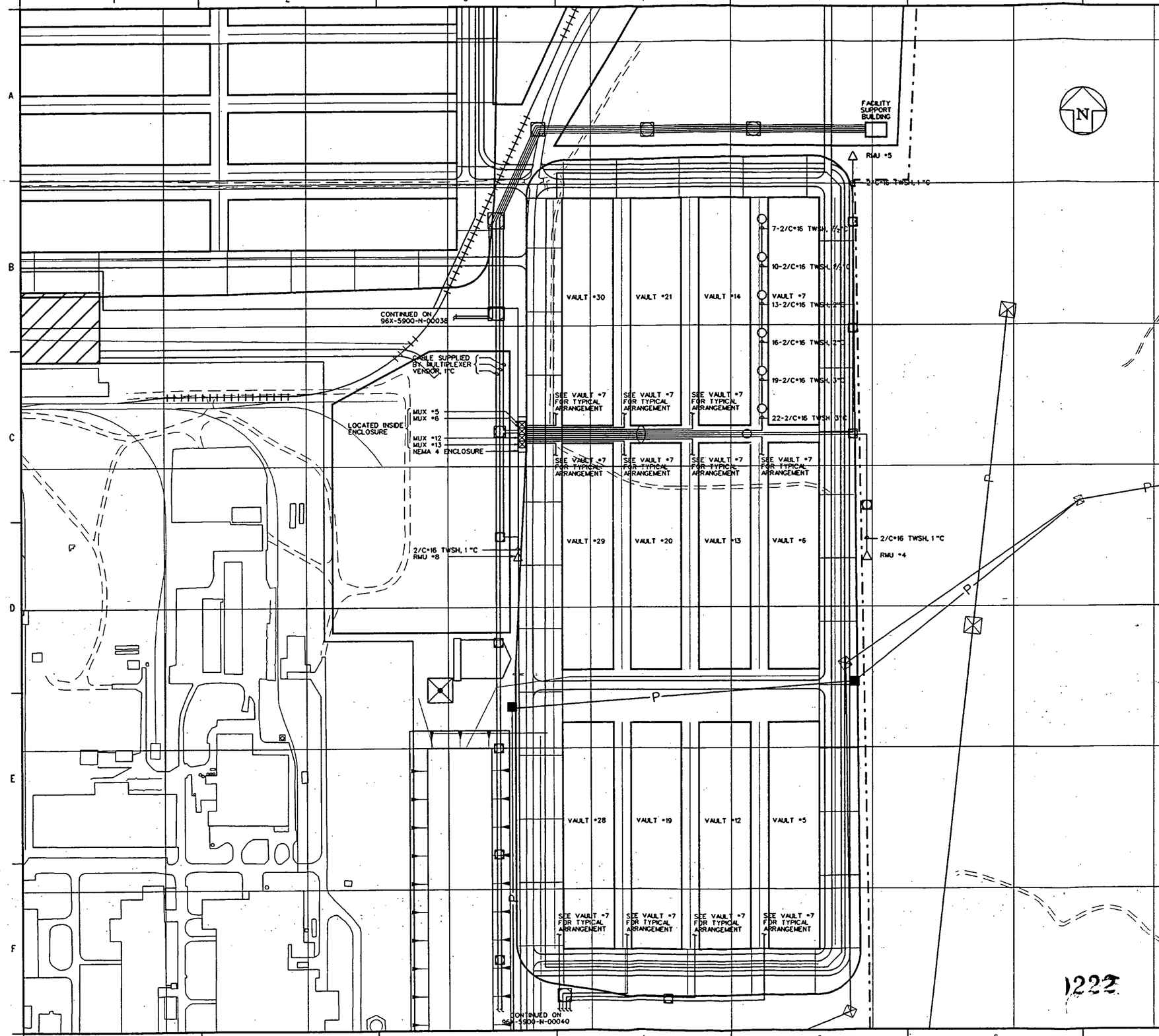

NOTES

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- MULTIPLEXER - MUX
- RADIATION MONITOR UNIT - RMU

REFERENCE DWG.#	REFERENCE DWG. TITLE
96X-5900-N-00038	INSTRUMENT ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-N-00040	INSTRUMENT ARRANGEMENT PLAN SHEET 3 OF 3
96X-5900-E-00028	INSTRUMENT RISER DIAGRAM
96X-5900-E-00033	POWER & LIGHTING ARRANGEMENT PLAN SHEET 2 OF 3

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPCWOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
INSTRUMENT ARRANGEMENT PLAN SHEET 2 OF 3

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	7-30-91			B YUSKO	9-4-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1" - 100'	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-N-00039	N0005	-

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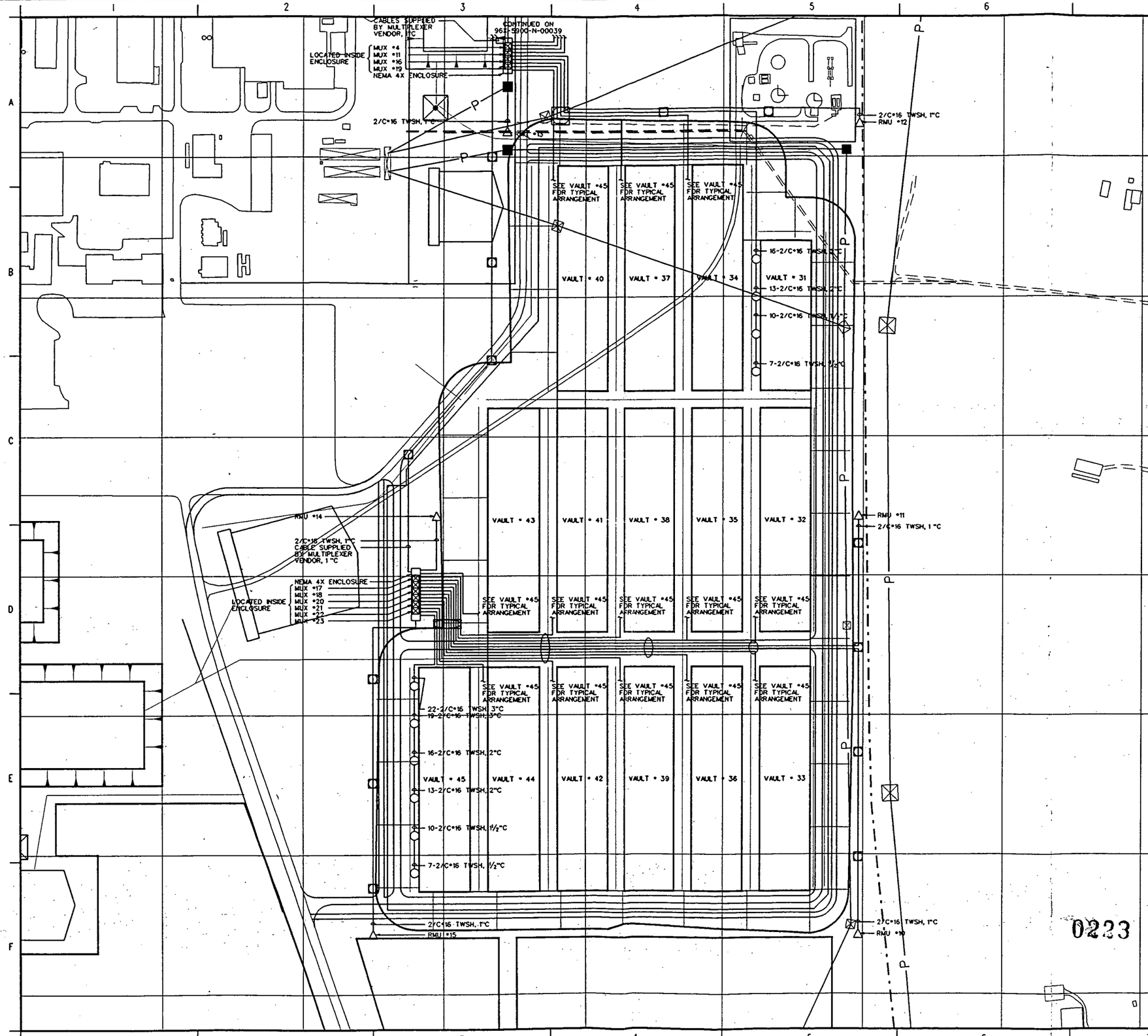

NOTES

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REFERENCE DWG.#	REFERENCE DWG. TITLE
96X-5900-N-00038	INSTRUMENT ARRANGEMENT PLAN SHEET 1 OF 3
96X-5900-N-00039	INSTRUMENT ARRANGEMENT PLAN SHEET 2 OF 3
96X-5900-N-00035	INSTRUMENT RISER DIAGRAM
96X-5900-E-00034	POWER & LIGHTING ARRANGEMENT PLAN SHEET 3 OF 3

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
LCLD & RADIATION MONITORING SYSTEMS
INSTRUMENT ARRANGEMENT PLAN SHEET 3 OF 3

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
L.N.HAGAMAN	8-01-91			B YUSKO	9-4-91

PLANT/BLDG. NO.	FLOOR	SCALE	U.L.P.O.

SUBMITTED FOR APPROVAL	APPROVED, RECOMMENDED	DRAWING APPROVED
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	00-90701	96X-5900-N-00040	N0006	-

HARRY HAGAMAN 13, 1991 18:15:12

4.4 Equipment List

An equipment list appears on the following pages.

PARSONS

EQUIPMENT LIST

25-Oct-91

PROJECT ORDER NO. 6
PROJECT TITLE: ENGINEERED WASTE MANAGEMENT FACILITY CDR

EQUIPMENT NUMBER	DISCIPLINE	DESCRIPTION	DRAWING NUMBER	SPEC. SECTION	REMARKS
V101	MECH.	FORK LIFT TRUCK		14685	10,000 lbs capacity
V102	MECH.	BOOM TRUCK		14685	10,000 lbs capacity
AA101	MECH.	PORTABLE EYEWASH/ SAFETY SHOWER STATION		15050	Unit to be trailer mounted for ease of transportation.
J101A,B	MECH.	LEACHATE SUMP PUMP TRAILER		15160	Trailer mounted pumping unit, 150-gallon water priming tank, 10 gpm minimum pump capacity
AJ101A,B	MECH.	VENTILATION FANS		15500	10,000 cfm capacity, 1/8-inch static pressure
AS101	MECH.	HVAC UNIT		15500	7 1/2 tons cooling, 100,000 BTU/hr heating capacity
AJ102	MECH.	ROOF EXHAUST FAN		15500	600 cfm, 1/2-inch static pressure
W101	MECH.	FIRE PROTECTION SYSTEM		15300	Wet-pipe sprinkler system and 20-pound Fire Extinguishers

0225

PARSONS

EQUIPMENT LIST

25-Oct-91

PROJECT ORDER NO. 6
PROJECT TITLE: ENGINEERED WASTE MANAGEMENT FACILITY CDR

EQUIPMENT NUMBER	DISCIPLINE	DESCRIPTION	DRAWING NUMBER	SPEC. SECTION	REMARKS
	ELEC.	DISTRIBUTION PANEL		16462	480 Vac with 600A Main Fuse
	ELEC.	PORTABLE DIESEL GENERATOR		16210	25 kW, 480/277 Vac, 3-Phase
	ELEC.	PORTABLE FLOOD LIGHTING WITH DIESEL GENERATOR		16210	3 kW, 240 Vac, Single-Phase with 1,000 W HPS lamps
	INST.	CONDUCTANCE PROBE 2-INCH NPT MOUNTING		13405	804 PROBES
	INST.	PERSONNEL MONITOR (HFM)		13405	2 items
	INST.	AREA MONITOR (GAMMA MONITOR)		13405	16 items
	INST.	PORTABLE AREA MONITOR (GAMMA RADIATION)		13405	2 items
	INST.	AIR SAMPLER/MONITOR (ALPHA)		13405	2 items
	INST.	AIR FLOW SWITCH (PADDLE TYPE)		13405	2 items
	INST.	286 PC (INDUSTRIAL QUALITY 14 EXPANSION SLOTS)		13405	1 items

0226

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0221

PARSONS

25-Oct-91

PROJECT ORDER NO. 6
PROJECT TITLE: ENGINEERED WASTE MANAGEMENT FACILITY CDR

EQUIPMENT NUMBER	DISCIPLINE	DESCRIPTION	DRAWING NUMBER	SPEC. SECTION	REMARKS
	INST.	24 PIN PRINTER		13405	1 item
	INST.	ENCLOSURES NEMA4 20 X 20 X 12		13405	22 items
	INST.	MULTIPLEXER SYSTEM (ANALOG)		13405	22 items
	INST.	RACK		13405	22 items
	INST.	INTERFACE BOARD		13405	22 items
	INST.	100W POWER SUPPLY		13405	22 items
	INST.	ANALOG INPUT BOARDS		13405	22 items
	INST.	DRIVER BOARDS (286 COMPATABLE)		13405	5 items

4.5 Significant Supporting Calculations

Civil

1) Site Stormwater Retention

2) Traffic

3) Box/Grout Ratio to Vault Volume

4) Closure Cap

5) Underground Piping Systems and Materials

6) Pavement Design

Structural

1) Concrete Vault Design

2) Prestressed concrete bridge girder

3) Concrete slab on grade

ENGINEERING CALCULATIONS
TITLE AND SUMMARY SHEET

Date 8/5/91

Revision No. _____

Project No. 6 Calculation No. C-1 Sheet 1 of 7

Project Title Engineered Waste Management Facility

Calculation Subject Site Stormwater Retention

STATUS: PRELIMINARY _____ FINAL X SUPERSEDED _____ VOID _____

STATEMENT OF PROBLEM
• Determine Required Total Site Retention For Development of The EWMF. • PUMP RATE FOR RETENTION DRAW DOWN (40CFR264)

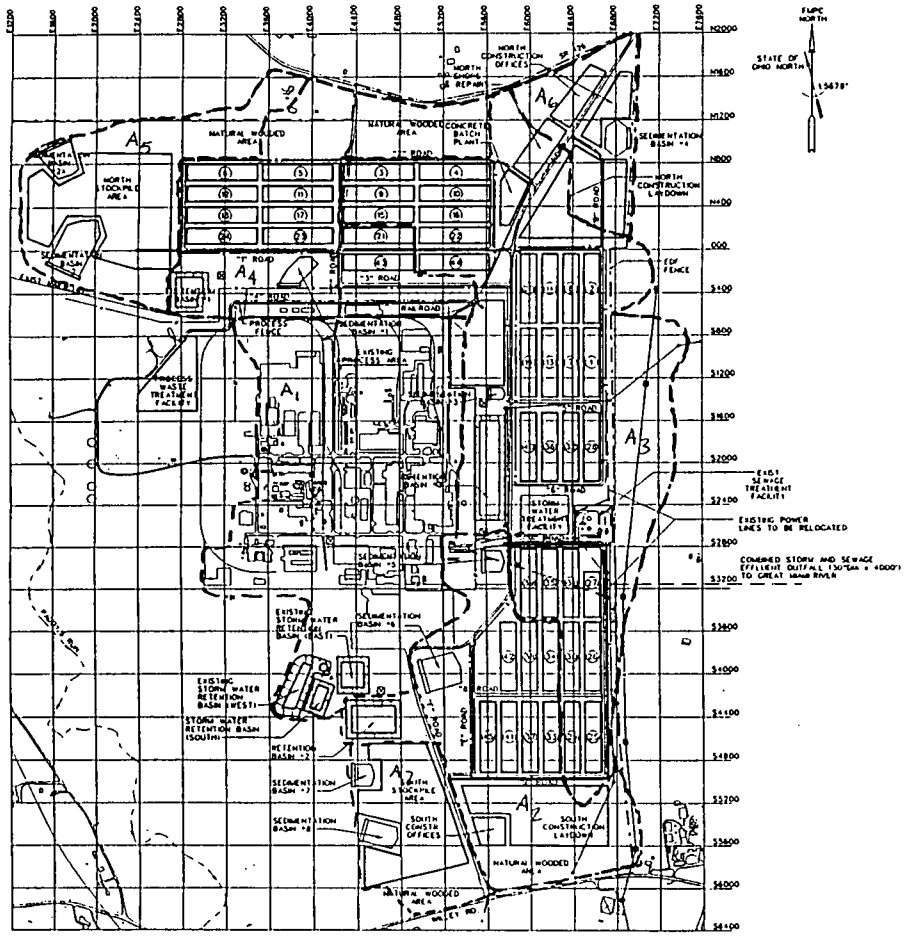
SUMMARY OF CONCLUSIONS	Originator's Signature and Date
TOTAL RETENTION REQUIRED = ±40,500,000	THOMAS C. Pickering 8/5/91
CHECKING METHOD	**Checker's Signature and Date**
	William J. Overholt 8/22/91

Rev. No.	Sheet No.	Description	Reviser's Signature/Date	Checker's Signature/Date	Approved by Signature/Date

Page Redacted

Contains Personally Identifiable Information

SHEET 3 OF 7



SCHEME C

NOTES

DRAWING SCHEDULE:

SHEET NO	TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0003	SITE PLAN - SHEET 2
G0004	CLOSURE PLAN - SHEET 1
G0005	CLOSURE PLAN - SHEET 2
G0006	CONSTRUCTION STRATEGY YEAR 8 - SHEET 1
G0007	CONSTRUCTION STRATEGY YEAR 8 - SHEET 2
G0008	CROSS SECTIONS - SHEET 1
G0009	CROSS SECTIONS - SHEET 2

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- DRAINAGE BOUNDARY

REV NO	DESCRIPTION	BY	CHECKED	DATE
A	50% REVIEW 7-19-91			

UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER

PARSONS
THE RALPH M. PARSONS CO. - DIVISION OF ENGINEERING-SCIENCE, INC
CINCINNATI, OHIO

FMPC ERA

EWMF VAULTS
MASTER PLAN

DRAWN BY	DATE	DESIGNED BY	DATE
ECC	4-19-91	W. P. TAYLOR	3-4-91

SCALE: 1"=400'-0"

BY DOE	DRAWING NO	DRAWING NO	SHEET NO	REV NO
LATER	WBS 1218.11.3 00-90701	95X5900G00001	G0001	A

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0231

Next 173 Pages Redacted

Contains Personally Identifiable Information

PARSONS

6120 South Gilmore Road
Fairfield Executive Center
Fairfield, OH 45014
(513) 870-0300
FAX (513) 870-0444

August 2, 1991

DC No. 06LO08029101
P-L-EWMF-26

Mr. G. J. Krieger
Project Manager, EWMF
Feed Materials Production Center
Westinghouse Materials Company of Ohio
P. O. Box 398704
Cincinnati, Ohio 45239-8704

Subject: Effects of Storage vs. Disposal Requirements on EWMF Design
Engineered Waste Management Facility
DOE No. DE-AC05-90OR21951
Environmental Remedial Action Project

Dear Mr. Krieger:

The EWMF was defined in Project Order No. 6 (then EDF) as a permanent disposal facility. Subsequently, the CDR Functional Requirements defined the EWMF as a disposal facility which would allow the possibility of retrieval of the waste. In order to support the evaluation by DOE/WMCO of alternatives to permanent on-site disposal, PARSONS was asked to perform a brief analysis of the requirements of long-term (50 years) storage of treated waste. This paper summarizes the results of that analysis, and identifies the effects of storage *vs.* disposal requirements on the design of the EWMF.

Defining the EWMF as a long-term storage facility from which waste would certainly be retrieved, as opposed to defining it as a disposal facility from which retrieval would be possible, would have substantial effects on the design. These design effects are discussed below as they relate to regulatory considerations, waste form, hazard classification, facility structure, and cost. The primary points are summarized in Table 1 attached.

EWMF115.013

0404

Regulatory Considerations:

Designing the EWMF as a storage facility rather than as a disposal facility would invoke a different set of regulations. These regulations are summarized in Table 2. Under these new regulations, the design of a storage facility would differ from the design presented in the EWMF CDR in the following ways:

- No liner system would be required. A spill containment system which is able to drain and remove liquids, and has sufficient capacity to contain the contents of the largest container or ten percent of the total contents would be required. The specific requirements for this spill containment system are given in Table 2.
- No leachate collection/leak detection system would be required.
- No final cover is required unless wastes or residues remain on site.
- There would be no requirements for a 500-year intruder barrier and 200- to 1000-year radon control.
- The waste containers or forms would have to be regularly inspected and maintained if necessary. Aisle space would have to be included between the stacks of boxes to allow inspection and maintenance.
- Groundwater monitoring would still be required, but the EPA would be more likely to require a less stringent program or grant a waiver for a storage facility.
- Many siting restrictions (such as siting over a sole-source aquifer) would be less stringent.

Waste Form:

Retrievability is more a function of the waste form than of the design of the disposal facility. The current reference waste form is a grout slurry which would be pumped into the vaults; possibly into forms within the vaults to aid retrieval. This concept economizes on emplacement at the expense of retrieval. If the EWMF were a storage rather than a disposal facility, we would economize on retrieval at the expense of emplacement. The retrievable waste form considered in this anaylsis is grout poured into containers which are then stacked inside the vaults. For this analysis PARSONS assumed that the containers would be B-25 boxes. As each box would hold about 4 tons of grout, approximately 763,000 boxes would be required to contain 2,500,000 cubic yards of waste.

The waste would not have to meet many of the waste acceptance criteria listed in the Functional Requirements document prior to being accepted for storage, such as those relating to free liquids, void space, and the 300-year waste form/container design life. However, these disposal requirements would have to be met at the time the waste was removed from storage and sent to disposal. The storage of untreated LDR hazardous waste is prohibited unless the storage is for the purpose of accumulating sufficient quantities of waste for treatment, which is not the purpose of the EWMF.

It should be noted that waste treatment requirements are likely to change during the 50-year storage period assumed in this paper. Waste treated and stored under requirements prevailing at the time would have to be re-treated to meet any new requirements when it was removed from storage.

Hazard Classification:

Hazard classification, like retrievability, is a function of waste form. The EWMF is assumed to be a moderate hazard facility in the Functional Requirements document because of uncertainty as to the waste form. If the waste materials were packaged in such a way that there would be little possibility of a design-basis accident or other event resulting in an off-site release, the EWMF could be classified as a low-hazard, rather than a moderate-hazard, facility under FMP Guideline SP-A-01-013 and DOE Order 5481.1B. The storage of boxed grout would probably allow the EWMF to be classified as a low hazard facility.

Facility Structure:

The factors discussed above (no liner system, no LC/LDS, no final cover, no design life requirements, low-hazard classification) indicate that for the purpose of storage the concrete vaults could be replaced by prefabricated buildings made of metal or precast concrete panels. The purpose of these buildings would be to protect the boxes from weathering rather than to contain the waste. Some (one or two) vaults might still be required to contain, for example, the material in the K-65 silos.

Cost:

We estimated the effects on cost of storage *vs.* disposal considering the following factors:

- A 300' by 600' metal building (about the size of two reference vaults) can be erected in a few months at a cost of about $500,000. About 25 to 30 of these buildings would be required to contain 763,000 boxes and leave space for handling, inspection, and maintenance.
- 763,000 B-25 boxes at $1,000 per box would cost $763,000,000.
- It costs approximately three times as much to transport material by truck and stack it into place as it costs to pump material by pipeline and pour it into place.
- The maintenance of the metal buildings and of the waste boxes would probably cost somewhat more than maintenance of the covered EWMF.

Based on these factors, we estimate that, *in current dollars,* the cost of storage would be essentially the same as the *unescalated cost* of the vaults reported in Volume 1, Section 3 of the EWMF CDR. Substantial cost savings would, however, be obtained in escalated dollars because the prefabricated storage buildings could be constructed in a fraction of the time required to build the vaults.

Recommendations:

The above discussion demonstrates that the missions of disposal and of temporary storage are essentially incompatible. While the current reference vault concept can be adapted for retrievability with only minor modifications (eg. stacking boxes inside the vaults), designing a vault as a temporary storage facility would result in an over-engineered structure and would greatly increase the cost of storage and disposal. Conversely, a structure designed for long-term storage could not be adapted for permanent disposal without essentially tearing down and rebuilding the structure, also at great expense. Therefore, a timely decision on the mission of the EWMF and on the ultimate disposition of the material stored within would ease considerably the design of the waste form, the treatment facility that processes the waste form, and the EWMF.

If you have any questions, please call me at 870-8108.

Very truly yours,
PARSONS

S. Y. Latham

S. Y. Latham
EWMF Manager

SYL/cl

Attachment

c: W. E. Pasko, DOE-FMPC
R. Allen, DOE-FMPC
J. R. Chew, WMCO (w/o att.)
J. P. Hopper, WMCO (2, w/o att.)
S. M. Peterman, WMCO
Document Control Code 5

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TABLE 1

SUMMARY OF EWMF DESIGN DIFFERENCES: DISPOSAL vs. STORAGE

	Disposal	Storage
Structure	Concrete vault	Metal building
Hazard classification	Moderate hazard or low hazard	Low hazard
Liner and cover	Yes	No
LCLDS	Yes	No
Reference waste form	Grout slurry	Grout in B-25 boxes
Transportation	Pumped to vault	Trucked
Emplacement	Poured into vault	Stacked
Retrieval	Cut into slabs and lift out	Unstack

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Construction - Benchmarks	At least three permanently surveyed benchmarks referenced to USGS or NGS control points shall be established at FMPC to facilitate surveys. 10 CFR 61.52(a)(7) & 40 CFR 264.309 [OAC 3745-66-09]	There is no regulatory requirement to establish benchmarks.
Construction - Containment System	The disposal facility shall contain a double liner system with a leachate collection and a leak detection system. 40 CFR 264.301(c) [OAC 3745-66-01] In accordance with the ARARs identified for the disposal facility, the MCLs and non-zero MCLGs will be utilized to develop design-based performance criteria for the disposal facility to ensure that the underlying aquifer is adequately protected. A groundwater transport model will be used to determine if the regulatory specified disposal facility design requirements are adequate to meet the MCLs and non-zero MCLGs. If these regulatory levels are not adequate, additional design criteria for the disposal facility will be specified.	The storage area must have a containment system that is designed and operated to drain and remove accumulated liquids (i.e., slope containment area, elevate or protect containers from contact with accumulated liquids). If the storage area is used to store containers holding free liquids or F020, F021, F022, F023, F026 or F027 (liquid or solid), the containment system must also: 1) be free of cracks and gaps and is sufficiently imprevious to contain accumulated liquids until they are removed, 2) have a capacity to contain the larger of either 10% of the volume of the containers which hold free liquids or the volume of the largest container which holds free liquids, 3) prevent run-on from entering the containment system unless it has sufficient capacity to accomodate any run-on which may enter the containment area, and be operated to remove accumulated liquids in a timely manner to prevent overflow of the collection system. 40 CFR 264.175 MCLs and MCLGs do not need to be considered in the design of the storage facility.
Construction - Containment System (Leachate Collection and Leak Detection Systems)	The materials used for the leachate collection and leak detection systems are to have sufficient strengths to prevent collapse due to loads imposed by the waste materials and final cover, or the movement of operating equipment. The leachate collection and leak detection systems are to be designed to maintain ≤1 foot of leachate over the lowest point of the bottom liner and to operate without clogging. The materials used for the leachate collection and leak detection systems are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure. 40 CFR 264.301(a) [OAC 3745-66-01]	The leachate collection and leak detection systems are not required for the storage facility.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Construction - Containment Systems (Liners)	The top and bottom liners shall be constructed of materials which prevent the migration of any waste constituent into the top liner and through the bottom liner for a time period equal to the sum of the disposal operations and post-closure care period. The liners are to be chemically resistant to physical contact with the waste and leachate and exposure to sun/elements to prevent failure. 40 CFR 264.301(a) & (c) [OAC 3745-66-01] The liners shall have sufficient thickness, strength, and be placed upon a suitable foundation to prevent failure due to pressure gradients (internal static head and external hydraulic forces), climatic conditions, installation stresses, settlement, and daily operational stresses. 40 CFR 264.301(a) [OAC 3745-66-01] Synthetic liners (including final cover systems) must be inspected for uniformity, damage, imperfections, seam/joint tightness, tears, punctures and blisters during installation of the liners. Soil-based/admixed liners (including final cover systems) must be inspected for uniformity, damage, imperfections, lenses, cracks, channels, root holes, and other structural non-uniformities (that may increase the permeability of the liner) during installation of the liners. A QA/QC program will need to be developed in accordance with the material supplier's specifications, FMPC requirements, and standard industrial practices. 40 CFR 264.303(a) [OAC 3745-66-03]	Liners (including the final cover) are not required for the storage facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Construction - Drainage System	The drainage system surrounding the disposal facility must be capable of preventing run-on (non-contaminated storm water) from coming into contact with the waste materials during the peak flow of a 25-year storm event. The upstream drainage areas are to be minimized to decrease the amount of run-on. A run-off (contaminated storm water) retention system must be provided and have a volume ≥24-hour, 25-year storm. The size of the run-off area should be minimized to reduce the amount of potential contaminated storm water. The disposal area should be well drained and free of areas subject to flooding or ponding. The drainage ditch gradients shall be limited to prevent erosive velocities. 40 CFR 264.301(f) & (g) [OAC 3745-66-01], 10 CFR 61.50(a)(5) & (6), & 10 CFR 61.51(a)(5) & (6) Drainage system and erosion controls may need to comply with the Butler/Hamilton County Soil Erosion Control requirements.	Drainage system and erosion controls may need to comply with the Butler/Hamilton County Soil Erosion Control requirements.
Construction - Security Fencing	A physical barrier (i.e., fence) or 24-hour surveillance system must be provided to control the unknowing or unauthorized entry of persons or livestock onto the active portion of the disposal facility. Signs (legible from a distance of 25 feet) must be posted at each entrance to the active portion and at other locations as required by 40 CFR 264.14(c). 40 CFR 264.14 [OAC 3745-54-14] & 10 CFR 61.42	Same as the disposal facility.
Construction - Tank Systems	The tank is to be equipped with spill prevention devices (i.e., check valves, dry disconnect couplings) and overfill controls (i.e., liquid level probes, high level alarms, interlocks to stop inflow, or a bypass system to a standby tank). For open top tanks, sufficient freeboard shall be maintained to prevent overtopping by wave or wind action or by precipitation. 40 CFR 264.194 [OAC 3745-55-94]	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.
Construction - Tank Systems	Tank systems will be designed to ensure the foundations support the load of a full tank, tanks are anchored to prevent floatation, and withstand frost heave. 40 CFR 264.192(a)(5) [OAC 3745-55-92]	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Construction - Tank Systems	The installation of the tank system is to be inspected by an independent, qualified installation inspector or an independent, qualified registered professional engineer for structural damage or inadequate construction/installation (i.e., weld breaks, punctures, scrapes of protective coatings, cracks, and corrosion). The installation of any required corrosion protection system that is field fabricated must be supervised by an independent corrosion expert. The tank and ancillary equipment must be leak tested prior to being covered, enclosed or placed into service. 40 CFR 264.192(b) [OAC 3745-55-92], 40 CFR 264.192(d) [OAC 3745-55-92], & 264.192(f) [OAC 3745-55-92] An installation report will be required to be prepared by the inspector/engineer. Any required repairs and field fabrication of a corrosion protection system will be documented in the installation report.	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.
Construction - Tank Systems	A corrosion evaluation shall be performed for tank systems or components in which the external shell of a metal tank or any external metal component will be in contact with the soil or with water. 40 CFR 264.192(a)(3) [OAC 3745-55-92]	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.
Construction - Tank Systems	A written assessment report must be prepared and submitted for the hazardous waste tank(s). The assessment report is to be reviewed and certified by an independent, qualified registered professional engineer attesting that the tank system(s) has sufficient integrity and is acceptable for storing hazardous waste. 40 CFR 264.192	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Construction - Tank Systems	Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. API Publication 1615 (Nov. 1979), ANSI B31.3, and ANSI B31.4 may be used, where applicable, for the installation of piping systems. 40 CFR 264.192(e) [OAC 3745-55-92] Underground tank systems (including underground pipes) shall be protected against adverse affects by vehicular traffic by either design or operational measures. 40 CFR 264.192(a)(4) [OAC 3745-55-92] Underground tanks and components must be backfilled with a non-corrosive, porous, homogeneous substance. The backfill material must be placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported. 40 CFR 264.192(c) [OAC 3745-55-92] Secondary containment systems (including leak detection and removal systems) must be provided for each tank and ancillary equipment to prevent release of any hazardous waste to the environment in the event of a spill or leak. 40 CFR 264.193 [OAC 3745-55-93] If tank is place underground the Underground Storage Tank provisions may become applicable.	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Final Closure	A closure plan, which describes the procedures to be followed when closing the disposal facility (including tanks and installation of the final cover), and a post-closure plan, which describes the maintenance activities (final cover repairs, leachate collection/removal operation, groundwater monitoring, inspections/surveillance, drainage system maintenance, surveyed benchmark maintenance), are to be submitted along with the design information. The post-closure care period is to extend for a minimum of 30 years and is not to be relied upon for more than 100 years. 40 CFR 264 Subpart G, 264.197 & 264.310(b), & 10 CFR 61.59(b) The final cover must (1) minimize infiltration, (2) require minimal maintenance, (3) be sloped to promote drainage, minimize ponding, and minimize erosion/abrasion, (4) accommodate settling/subsidence, (5) have a permeability ≤ the bottom liner system, (6) provide long-term isolation, and resist degradation by geological processes and biotic activity. For radioactive Class C waste disposal, the final cover system is to be either: (1) ≥5 meters thick or (2) have an intruder barrier with a 500 year operating life. 40 CFR 264.310(a) [OAC 3745-11] & 10 CFR 61.42, 61.51(a)(1) & 61.52(a)(2) Upon completion of the post-closure period, the radiation limits specified in 10 CFR 20.105 shall not be exceeded at the surface of the final cover. 10 CFR 61.52(a)(6)	Closure of the storage area requires that all waste and residues must be removed. If any waste or residues are to remain, the site is to closed as a disposal facility.
Operational - Discharges	The maximum radioactive release to the environment shall comply with ALARA principles and shall not expose any member of the public to an annual dose exceeding an equivalent of 25 mrem/yr to the whole body, 75 mrem/yr to the thyroid, and 25 mrem/yr to any other organ. 10 CFR 61.41	Same as the disposal facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Discharges (Air)	The off-site public exposure (ambient air) to radionuclide emissions (excluding Radon-220 and 222) shall be limited to 10 mrem/yr (above background). This limit is for an effective dose equivalent as calculated per the International Commission on Radiological Protection's Publication No. 26. Modelling and sampling procedures are specified in 40 CFR 61.93. 40 CFR 61.92 & 61.93 An annual report must be submitted to EPA headquarters and regional offices by June 30. This report includes the monitoring results as recorded in DOE's Effluent Information System and the effective dose equivalent calculations, as required by 40 CFR 61.93, for the previous year. Records as specified under 40 CFR 61.95 must be maintained for at least 5 years. 40 CFR 61.94 & 61.95 [OAC 3745-54-94 & 95]	Same as the disposal facility.
Operational - Discharges (Air)	As required by 40 CFR 61.192, no more than 20 ρCi/m^2-sec of Radon-222 (as an average for the entire source) shall be emitted into the air from the disposal facility. The provisions of 40 CFR 192.02 requires that the radon controls shall be designed to be effective for at least 200 years and up to 1000 years. The radon control design is to provide reasonable assurance that releases of Radon-222 to the atmosphere will not exceed an average (for the entire disposal site surface and for at least a one year period) release rate of 20 ρCi/m^2-sec. Guidance regarding the design and implementation of this radon control standard is provided in 40 CFR 192 Subpart C. 40 CFR 61.192 & 40 CFR 192 Subpart A & C	Only the provision of 40 CFR 61.192 is applicable [no more than 20 ρCi/m^2-sec of Radon-222 (as an average for the entire source) shall be emitted into the air from the disposal facility]. The provisions of 40 CFR 192.02 do not apply to the storage facility.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Discharges (Air)	As specified in OAC 3745-15-07, the emission or escape into open air from any source whatsoever in such a manner or in such amounts as to endanger the health, safety, or welfare of the public or to cause unreasonable injury or damage to property shall be declared a public nuisance and is prohibited. The significant and avoidable deterioration of air quality shall be prohibited as required by OAC 3745-17-05. As required by OAC 3745-17-08, the visible emissions of fugitive dust generated during grading, loading, or construction operations, and other practices which emit fugitive dust are to minimized or eliminated. OAC 3745-15-07, OAC 3745-17-05 & OAC 3745-17-08	Same as the disposal facility.
Operational - Discharges (Air)	No visible emissions are allowed during the disposal of asbestos waste unless the provisions of OAC 3745-20-06(B) are meet [includes waste handling and operational restrictions, and the posting of warning signs]. The regulatory requirements of 40 CFR 763 Subpart G (Asbestos Abatement Projects) may also be relevant and appropriate for the disposal to asbestos material at the disposal facility. OAC 3745-20-06 [40 CFR 61.154]	Same as the disposal facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Discharges (Wastewater)	Any wastewater discharge from the disposal facility to a surface water body must comply with all the requirements of the NPDES program, including monitoring and record keeping. Also applicable are technology-based effluent limitations and standards based under Section 301 of the CWA and technology-based controls for toxic pollutants. 40 CFR 122.41 [OAC 3745-33-05] & 40 CFR 122.44 [OAC 3745-33-04] Design must ensure that the construction/operation of the disposal facility does not violate the minimum water quality requirements for the Great Miami River. The disposal facility shall not be a source of floating debris, materials producing odor, and/or color change, and substances in toxic concentrations. The specific water use designation for the Great Miami River and Paddy's Run is identified in OAC 3745-1-21. The corresponding water quality criteria is listed in OAC 3745-1-07. "Mixing Zones" may be established for each discharge pursuant to OAC 3745-1-06. OAC 3745-01 The test procedures listed in 40 CFR 136 are required to be followed for monitoring any wastewater effluent discharged from the disposal facility. The specific monitoring parameters are determined pursuant to the NPDES permitting process. Test procedures exist for biological, inorganic, non-pesticide organic, pesticide, and radiological constituents. The required containers, preservation techniques, and holding times are also specified under 40 CFR 136. The use of alternate test procedures can be granted by the EPA. 40 CFR 136.1 to 40 CFR 136.4	Same as the disposal facility.
Operational - Discharges (Air & Wastewater)	The radionuclide concentrations in air and wastewater effluents are to be limited to the levels specified in Appendix B, Table II or 10 CFR 20.303 (wastewater effluent discharges to a sanitary sewerage system). 10 CFR 20.105 & 20.106 [10 CFR 61.43]	Same as the disposal facility.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Emergency Planning	The disposal facility must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment. 40 CFR 264.31 [OAC 3745-54-31] Unless demonstrated otherwise, the following equipment must be provided: 1) an internal communications or alarm system, 2) telephone or two-way radio to summon emergency assistance, 3) portable fire extinguishers, spill control equipment, and decontamination equipment, and 4) water at adequate volume and pressure. 40 CFR 264.32 [OAC 3745-54-32] Arrangements must be made with the local authorities to ensure proper emergency planning procedures. Procedures need to be consistent with existing arrangements. 40 CFR 264.37 [OAC 3745-54-37] A Contingency Plan and Emergency Procedures are to be developed for the disposal facility in accordance with 40 CFR 264 Subpart D. The emergency procedures will include procedures for notifying off-site officials as required by 40 CFR 264.56(d) in the event of a situation which could threaten human health or the environment. 40 CFR 264 Subpart D	Same as the disposal facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Groundwater Monitoring	A detection groundwater monitoring program must be developed to ensure that the specified groundwater protection standard is not exceeded. The monitoring program is to consist of a list of monitoring parameters and associated limits, monitoring frequency, sampling and analytical procedures, and statistical evaluation procedures. Baseline monitoring data (including ecological, meteorological, climatical, hydrological, geological, geochemical, and seismological) shall be established prior to disposal operations. 40 CFR 264.92, 264.93, 264.94, 264.96, 264.97, 264.98 & 264 Appendix IX [OAC 3745-54-92, 93, 94, 96, 97 & 98], & 10 CFR 61.53 Groundwater monitoring wells are to be provided at the point of compliance in sufficient numbers and locations to allow detection of contaminant migration from the disposal facility into the upper most aquifer. 40 CFR 264.95 [OAC 3745-54-95] & 264.97 [OAC 3745-54-97] Upon completion of testing, test holes must be filled with grout or other material to prevent contaminants from entering groundwater, or converted into a well. Wells which are neither use for supplying groundwater nor use for monitoring (i.e., quality, quantity, or water level measures) must be filled with grout or other material to prevent contaminants from entering groundwater, or maintained in accordance with OAC 3745-9-09. OAC 3745-09-10.	Same as the Disposal Facility; however, the EPA is more likely to grant a groundwater monitoring wavier or require a less stringent program.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Inspections	**FOR HAZARDOUS WASTE DISPOSAL:** The disposal facility must be inspected to prevent an event which may cause the release of hazardous waste constituents to the environment or pose a threat to human health. The inspection items and frequencies are to be specified in an Inspection Plan. All inspections are to be recorded and maintained in an inspection log. Inspection items are to included: (1) testing and maintenance of emergency equipment (including facility communications, alarms, and decontamination equipment), (2) tank overfill control, (3) the aboveground tank portions of the tank system and secondary containment for corrosion, erosion and spills/leaks each operating day, (4) the functionality of tank monitoring and leak detection equipment each operating day, (5) the proper operation of the cathodic protection after six months of installation and annually thereafter, (6) impressed current sources at least bimonthly, (7) drainage systems, wind dispersal controls, and leachate collection/removal system accumulation/function each week and after storms. 40 CFR 264.15, 264.33, 264.195, & 264.303(b) [OAC 3745-54-15 & 33]	**FOR HAZARDOUS WASTE STORAGE:** The storage facility must be inspected to prevent an event which may cause the release of hazardous waste constituents to the environment or pose a threat to human health. The inspection items and frequencies are to be specified in an Inspection Plan. All inspections are to be recorded and maintained in an inspection log. Inspection items are to included: (1) testing and maintenance of emergency equipment (including facility communications, alarms, and decontamination equipment), (2) weekly inspections of the containers and containment system for leaks and deterioration. If tank systems are used for the storage facility, the tank inspection items are also applicable (tank overfill control, aboveground tank portions of the tank system and secondary containment for corrosion, erosion and spills/leaks each operating day, functionality of tank monitoring and leak detection equipment each operating day, the proper operation of the cathodic protection after six months of installation and annually thereafter, and impressed current sources at least bimonthly). 40 CFR 264.15, 264.33, 264.174 & 264.195
Operational - Miscellenous	The run-on and run-off control systems are to emptied and managed expeditiously after storm events to maintain design capacities. The wind dispersal of any particulate matter is to be controlled. Void space between waste packages is to be minimized during disposal operations and filled to reduce future subsidence within the disposal facility. Partial closure activities (closure of individual disposal units) are to be initiated upon reaching capacity. On-going operations are not to impact any areas which have been closed. 40 CFR 264.301(h) & (i) [OAC 3745-66-01], 10 CFR 61.52(a)(4), (5), (9) & (10)	These requirements are appliable to the storage facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Records	**FOR HAZARDOUS WASTE DISPOSAL:** The operating record is to include the following reports: (1) as-built drawings of the location, dimension, and depth of each disposal cell with respect to permanently surveyed benchmarks, (2) disposal records (type, quantity, location, and manifest number) for each waste shipment, (3) waste analysis, (4) contingency plan incidents, (5) groundwater monitoring results, (6) annual waste minimization certification, (7) LDR treatment/generator certifications, (9) inspection reports, and (10) training records. The operating record is to be available for on-site inspection by EPA/OEPA. A biennial report is to be submitted to EPA/OEPA in accordance with 40 CFR 264.75. 40 CFR 264.73, 264.74, 264.75, 264.77, 264.195(d), 264.309 & 264 Appendix I [OAC 3745-54-73, 74, 75 & 77]	**FOR HAZARDOUS WASTE STORAGE:** The operating record is to include the following reports: (1) waste analysis, (2) contingency plan incidents, (3) groundwater monitoring results, (4) annual waste minimization certification, (5) LDR treatment/generator certifications, (6) inspection reports, and (7) training records. The operating record is to be available for on-site inspection by EPA/OEPA. A biennial report is to be submitted to EPA/OEPA in accordance with 40 CFR 264.75. 40 CFR 264.73, 264.74, 264.75, 264.77
Operational - Records	**FOR RADIOACTIVE WASTE DISPOSAL:** The operating record is to include the following reports: (1) disposal records (location, quantity, date, waste package condition and radiation levels, any required repacking, and manifest discrepancies), and (2) radiation monitoring results. 10 CFR 61 Subpart G	These requirements are not applicable to the storage facility.
Operational - Spill	The disposal facility shall be operated under Best Management Practices (BMP) for toxic pollutant effluents as defined under 40 CFR 125. The toxicity of the pollutants, quantity of the pollutants used/produced/discharged, history of NPDES violations, history of significant leaks or spills of hazardous pollutants, potential for adverse impact of public health, and other relevant factors shall be considered when developing the BMP plan. 40 CFR 125.100 & 40 CFR 125.104	Same as the disposal facility.
Operational - Tank Systems	Operating procedures and spill/leak response procedures need to be specified. 40 CFR 264.194 & 40 CFR 264.196 [OAC 3745-55-90]	No requirement for a tank system identified at this time. If a tank system is required, the requirements as presented for the disposal facility would be applicable.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Training	All disposal facility personnel must be trained within six months from their date of hire or reassignment, and participate in annual reviews. The training requirements are to be specified in a Training Plan. Employees hired after April 15, 1981 are not to work unsupervised unless the requirements of OAC 3745-54-16(A) are fulfilled. 40 CFR 264.16 [OAC 3745-54-16]	Same as the disposal facility.
Operational - Waste Management	**FOR ASBESTOS WASTE DISPOSAL:** All friable asbestos-containing waste material shall be sealed into durable leak-tight disposal containers or use an approved alternative disposal system as specified in OAC 3745-20-05(C). OAC 3745-20-05 [40 CFR 61.150]	Same as the disposal facility.
Operational - Waste Management	The State of Ohio manifest system is to be utilized for any off-site shipment of hazardous wastes from the disposal facility. The manifest procedures and reports (including manifest discrepancies and unmanifested acceptance) specified under 40 CFR 264.71, 264.72 and 264.76 are to be followed. 40 CFR 264.71, 264.72 & 264.76 [OAC 3745-54-71, 72 & 76]	Same as the disposal facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Waste Management	**FOR RADIOACTIVE WASTE DISPOSAL:** Wastes are classified as either Class A, B, C, or greater than Class C in accordance with 10 CFR 61.55. Class A wastes are to be segregated unless they meet the stability requirements listed in 10 CFR 61.56(b). Greater than Class C cannot be placed into the disposal facility, 10 CFR 61.55 requires that these wastes be placed in a geologic repository. Class A, B and C wastes disposal criteria are as follows: 1) cardboard or fiberboard packages are not allowed for disposal, 2) liquid waste shall be solidified or packed with twice the amount of absorbent required, 3) solid wastes shall contain ≤1% (volume) free liquids, 4) explosive waste are prohibited, 5) waste which generate gases, vapors, or fumes in quantities resulting in an occupational exposure above the 10 CFR 20 limits is prohibited, 6) pyrophoric wastes must be rendered (treated or packaged) nonflammable, 7) gases are to be packaged so that pressure ≤1.5 atm @ 20°C and activity ≤100 Ci/container, 8) hazardous, biological, pathogenic, and infectious wastes are to be treated to minimize their hazards, and 9) waste packages are to be labelled (Class A, B, or C). Additional disposal criteria for Class B and C are as follows: 1) the waste shall be treated or packaged to maintain structural stability (physical dimensions and form) under disposal conditions (overburden weight, equipment loads, moisture, microbial attack, and radiation and chemical exposure), 2) stabilized waste are to contain ≤0.5% (volume) free liquids, and 3) maximize waste density and minimize the void space within the waste container. Only waste containing or contaminated with radioactive materials is to be placed into the EWMF. 10 CFR 61.55, 61.56, & 61.52(a)(11)	These regulatory requirements do not apply to the storage facility; however, these requirements would need to be met at the time the waste is to be disposed.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Waste Management	**FOR HAZARDOUS WASTE DISPOSAL:** Detailed chemical and physical analysis of a representative sample must be obtained prior to disposal of any waste. A Waste Analysis Plan (WAP), specifying the sampling and analytical procedures, and rationale and frequency for analysis, must be prepared in accordance with 40 CFR 264.13. Reactive wastes can not be placed into the disposal facility. Ignitable waste may be placed into the disposal facility provided that the ignitable wastes are placed in non-leaking containers, safely handled, covered daily with soil or other non-combustible materials, and isolated from potential sources of ignition. Precautions shall be taken to ensure that incompatible waste are not mixed together which could cause any of the conditions identified in 40 CFR 264.17(b). Bulk liquids or bulk waste containing free liquids, regardless of adding an absorbent, cannot be placed into the disposal facility. Lab packs (40 CFR 264.316) and specially designed containers can be disposed of with free liquids. Absorbents or other methods can be used by the generator to eliminate free liquids in a container prior to disposal. Waste containers must either be 90% full or their volume minimized (shredding, crushing or other means) prior to being placed into the EWMF (40 CFR 264.315). The disposal of hazardous wastes F020, F021, F022, F023, F026, and F027 requires an EPA approved management plan (40 CFR 264.317). 40 CFR 264.13, 264.17, 264.198, 264.199, 264.312, 264.313, 264.314, 264.315, 264.316 & 264 Appendix V [OAC 3745-54-13 & 17]	**FOR HAZARDOUS WASTE STORAGE:** Detailed chemical and physical analysis of a representative sample must be obtained prior to disposal of any waste. A Waste Analysis Plan (WAP), specifying the sampling and analytical procedures, and rationale and frequency for analysis, must be prepared in accordance with 40 CFR 264.13. Precautions shall be taken to ensure that incompatible waste are not mixed together which could cause any of the conditions identified in 40 CFR 264.17(b). Containers which hold incompatiable materials must be separated from each other by distance, or a dike, berm, wall or other device. Containers with ignitable or reactive waste must be located at least 50 feet from the FMPC property boundary. The container must always be closed unless it is being filled or emptied. Waste containers must be managed to prevent rupture. 40 CFR 264.13, 264.17, 264.173, 264.176 & 264.177 The other regulatory requirements do not apply to the storage facility; however, these requirements would need to be met at the time the waste is to be disposed.

0425

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY
REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Operational - Worker Protection	The occupational radiation dose per calendar quarter in restricted areas is as follows: 1) Whole body (i.e., head and trunk, active blood forming organs, eyes, or gonads) - 1¼ rems, 2) Hands, forearms, feet and ankles - 18¾ rems, 3) Skin - 7½ rems. To the extent practicable, process or engineering controls shall be utilized in airborne radioactivity areas to limit the concentration of radionuclides to acceptable levels (i.e., an individual is not to be exposed (inhalation and skin absorption) to radioactive materials which would exceed the limits specified in Appendix B, Table I for any 13 week 40 hours/week period); otherwise, other controls are required. The occupational radiation dose limits for unrestricted areas is as follows: 1) Whole body - 0.5 rem for any period of one calendar year, 2 mrem for any one hour period, or 100 mrem for any consecutive 7 day period. [NOTE: The exposure levels for persons under 18 years old are 10% of the above 10 CFR 20.101, 20.103(a), 20.103(b) & 20.104 [10 CFR 61.43] levels for occupational radiation dose and the limits specified in Appendix B, Table II for inhalation and skin absorption.] If required and practicable, engineering controls will be provided to maintain exposure below specified limits; otherwise, recommendations for a control program will be provided.	Same as the disposal facility.
Operational - Worker Protection	An individual in a restricted area may receive a total occupational dose (whole body) up to 3 rems during any calendar quarter provided that the individual's accumulative whole body dose is less than 5(N-18), where N is the age of the individual. The exposure levels for persons under 18 years old are 10% of the above levels for occupational radiation dose and the limits specified in Appendix B, Table II for inhalation and skin absorption. Precautionary procedures (i.e. increased surveillance, limitation of working times, respiratory protection) can be used to limit intake of airborne radioactive materials. [Note: Special requirements are specified for respiratory programs. Radiation exposure records are to be maintained. Medical surveillance and monitoring are to be used to assess radiation exposures. Warning signs are to be posted and administrative controls are to be implemented for restricted areas. 10 CFR 20.101(b), 20.102, 20.103(c) to (f), 20.104, 20.107, 20.108, 20.201, 20.202, 20.203, & 20.204 [10 CFR 61.43]	Same as the disposal facility.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Siting	The disposal facility must be capable of being characterized, modeled, analyzed and monitored. The impacts of future development (including existing nearby facilities and activities) and population growth will have on the disposal facility should be considered. NRC regulatory guidance, NUREG-1199, will be reviewed to assist with interpreting the implementation of this requirement. 10 CFR 61.50(a)(2), (3) & (11) Areas that contain known natural resources which, if exploited, cause a failure of the disposal facility such that the performance objectives would not be meet, are to be avoided. If such resources are present, the performance objective impacts will be considered. 10 CFR 61.50(a)(4) Radioactive waste disposal is not to occur within the water table fluctuation zone. The disposal facility is to be designed to prevent the discharge of groundwater from the hydrogeologic unit into the disposal cell. 10 CFR 61.50(a)(7) & (8) For radioactive waste disposal, areas subject to surface geological processes (i.e., mass wasting, erosion, slumping, landslides, and weathering) which significantly affect the ability of the disposal facility to meet the performance objectives shall be avoided. If present, additional design requirements may need to be specified. 10 CFR 61.50(a)(10)	These provisions are not appliable to the storage facility.

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TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Siting	For hazardous waste disposal, the disposal facility shall not be located in a 100-year floodplain unless the disposal facility is designed, constructed, operated, and maintained to prevent washout of any hazardous waste. For radioactive waste disposal, the disposal facility can not be located in a 100-year floodplain, coastal high-hazard area, or wetland. The disposal facility shall be located outside of a floodplain or wetland if possible. Under 10 CFR 1022, adverse impacts to floodplains and wetlands are to be avoided. If it is necessary to locate the disposal facility within a floodplain or wetland, the effect from the disposal facility must be minimized. A floodplain or wetland assessment must be published in the Federal Register prior to taking any action within the floodplain/wetland to allow time for public review and comment. Under Executive Order 11988, the potential effects of any Federal action that will occur in a floodplain must be evaluated. The DOE must consider alternatives to 40 CFR 264.18(b) [OAC 3745-54-18], 10 CFR 61.50(a)(5), 10 CFR 1022, & Executive Orders 11988 & 11990 avoid adverse effects and incompatible development in floodplains. If the DOE decides that the only practicable alternative requires siting in a floodplain, the action must be designed to minimize potential harm to the floodplain and a public notice (with prescribed contents) and opportunity for public comment provided. Under Executive Order 11990, Federal agencies are to avoid construction within a wetlands unless there are no practicable alternatives and all practicable measures are included in the construction project to minimize any impacts to the wetland. Early review of the proposed action is to be provided to the public. Areas which are within a 100-year floodplain or wetland will be avoided. The evaluation criteria identified in Executive Orders 11988 and 11990, 10 CFR 1022, and NEPA guidance documents will be utilized to evaluate and demonstrate compliance for any activities which may be within a floodplain or wetland.	Same as the disposal facility.
Siting	A buffer zone shall be established around the disposal facility to allow detection of radionuclides (environmental monitoring) and, if needed, to permit mitigation prior to release beyond the FMPC boundary. 10 CFR 61.52(a)(8) & 61.53(d)	This provision is not appliable to the storage facility.

TABLE 2

ENGINEERED WASTE MANAGEMENT FACILITY REGULATORY REQUIREMENTS

CATEGORY	DISPOSAL REQUIREMENTS	LONG-TERM STORAGE REQUIREMENTS
Siting	For hazardous waste disposal, the disposal facility shall not be located within 200 feet of a fault which has had displacement in the Holocene time. For radioactive waste disposal, areas subject to tectonic processes (i.e., faulting, folding, seismic activity, and vulcanism) which significantly affect the ability of the disposal facility to meet the performance objectives shall be avoided. If present, additional design requirements may need to be specified. 40 CFR 264.18(a) [OAC 3745-54-18] & 10 CFR 61.50(a)(9)	Same as the disposal facility.

0429

6420

Preliminary Operable Unit Waste Volume Estimates

MEMORANDUM

To: J. Craig, DOE
From: T. H. Tank - IT Cincinnati THT
Date: March 12, 1991
Subject: Preliminary Operable Unit (OU) Waste Volume Calculation Back-up Sheets

---

Per the March 6, 1991 request by J. Kreiger, WMCO, I am providing the subject backup calculation sheets. However, please note, they are very preliminary, do not appear in IT Corporation's mandated format for calculations, and have not been reviewed by anyone other than myself. In addition, some OU information may require updating.

If you need any additional information or clarification, please contact me at 738-3100.

TT2065.TO4

Attachments

cc: John Wood
Project File

MEMORANDUM

To: Jack Craig, DOE
From: T.H. Tank, IT Cincinnati
Date: October 23, 1990
Subject: Preliminary Operable Unit Waste Volumes

The following waste volumes have been supplied by the ASI/IT RI/FS Task managers for Operable Units 1, 2, 3, 4, and 5. The volumes should be considered a very preliminary quantities estimate due to insufficient site data. As the results of proposed sampling and analysis programs and treatability studies become available, the final disposal volumes can be more accurately defined (exclusive of ARAR defined remediation goals and allowable contaminant levels).

PRELIMINARY
OPERABLE UNIT WASTE VOLUMES*

OPERABLE UNIT	WASTE VOLUMES (CY) LLRW	LLMW	OTHER**	TOTAL (CY)
1	1,800,000	120,000	—	1,920,000
2	300,000	—	—	300,000
3	121,750	34,190	—	155,940
4	2,430	24,970	9,860	37,260
5	37,060	—	—	37,060
			GRAND TOTAL	2,450,260

(including 30% bulking + ~5% WASTE FACTOR) (66,157,020 CF)

*Volumes are based on total waste removal and subsequent stabilization with cement and fly-ash.

**LL waste with half-life greater than 20 years and activity greater than 100 nCi/g (α)

TT1354.kg3

cc: M. Higgins, OU1/IT
D. Smith, OU2/ASI
S.H. Wolinsky, OU3/ASI
D. Harmer, OU4/IT
R. Smith, OU5/IT
M. Khan, Site-Wide Trt'mt/IT
D. Carr, WMCO
J. Krieger, WMCO
M. Neal, Lee Wan
S.Y. Latham, Parsons

0432

OU-1 -EDF
Waste Summary Volumes - Preliminary

- Pit 4 - 53,000 CY
  Adj Soils - 47,000 CY

  100,000 CY

- Pits 1-3 & Soils
  Burn Pit & Clean Well - &
  w/ Adj Soils - 1,296,000 — 1,296 000 CY

  Sub Total (1,396,000 CY)

- Process system waste including HP waste } 5% (1,396,000) — 69,800 CY

- WWTP estimated waste
  spent resins, membranes
  and waste cakes
  (From OU-5 : 2000 gpm for 30 years ⇒ 606,000 CF)
  (OU-1 : 250 gpm for 4 years prorated against OU-5)

  $2000\ gpm = \frac{606{,}000\ CF}{30\ yr.} \Rightarrow 20{,}200\ \frac{CF}{yr.} \Rightarrow \frac{10.1\ CF}{yr}$ per gpm

  $(250\ gpm)(4\ yr)(10.1\ \frac{CF}{yr.}) = 10{,}100\ \frac{CF}{yr}$

  BULKING
  $(10{,}100)(1.30) = 13{,}130\ CY$

  10,100 CY

OU-1/EDF

SUBTOTAL =	1,475,900
(30% BULK'G)	442,800
	1,918,700

TOTAL VOLUME USE 1,920,000 CY
(120,000 CY/RCRA-LL + 1,800,000 CY/LLRW

0434

INTERNATIONAL TECHNOLOGY CORPORATION

6420

Memorandum

To: Distribution

Date: January 11, 1991

From: Barry Brown and Ken Stier

Subject: **Definition of Fernald Operable Unit 1 surface areas.**

There have been several questions concerning the proper usage of surface area numbers associated with Fernald's Operable Unit 1 (OU1). In an attempt to mitigate the confusion, we are providing the following definition of applicable surface area numbers for OU1.

- **Approximate area of the OU1 site = 23 acres**
- **Approximate surface area of waste pits (including Pits 1 through 6, the Clearwell, and Burn Pit) within OU1 = 16 acres**
- **Approximate area of a OU1 site wide multi-layer cap (if installed over OU1) = 37 acres**

These areas have been derived from historic data which include surveys and waste pit plans. Therefore, these numbers are considered approximations and should be reflected as such in all calculations and reports that they are used.

For a summary of OU1 pit information, the attached table is being provided.

For additional information please call either Ken Stier or Barry Brown at ext. 2683 or 2377, respectively.

0435

11-8-85

0436

TABLE 1-1.
SUMMARY OF FMPC PIT INFORMATION

Pit No.	Average Pit Design Depth (ft)	Waste (cu. yd.)	Percent Total Waste	Water (cu. yd.)	Cap (cu. yd.)	Soils[b] (cu. yd.)	Total (cu. yd.)	Percent Total Material	Cap Thickness Range (ft)	Estimated Liner Thickness (ft)
1	14.3	33,676	7.2	---	3,063	98,341	135,080	9.6	0.5 - 1.0	4.5' clay lined
2	13.8	18,478	4.0	---	1,247	57,430	77,156	5.5	0.5 - 1.5	4' clay lined
3	27	237,053	50.7	---	71,518	150,738	459,309	32.8	7.0 - 9.0	1' clay lined
4	24	53,706	11.5	---	17,070	159,887	230,663	16.5	5.0 - 6.0	2' clay lined
5	30	98,841	21.1	3,704 (748,060 gal)	---	229,336	331,881	23.7	No Cap	60 mil EPDM elastomeric membrane
6	24	11,556	2.5	Unknown	---	79,467	91,023	6.5	No Cap	60 mil EPDM elastomeric membrane
Burn Pit	20	9,074	1.9	---	805	17,477	27,356	2.0	0.0 - 2.0	no liner
Clear Well	27	5,008	1.1	7,656 (1,546,265 gal)	---	37,047	49,711	3.5	No Cap	1' clay lined
TOTALS	N/A	467,392	100 %	11,360	93,703	829,723	1,402,179	100 %	N/A	N/A

a - Calculations obtained from recent and historical data as supplied by WMCO, Weston, and Dames & Moore.

b - Soil volumes have been calculated as those soils outside the pit liner surrounding the respective pit.
Soil volume calculations include those soils which extend in depth to the Great Miami Aquifer (approximate elevation is 548 ft).

Note: All volumes have been calculated as in situ.

6420

Manager: M. HIGGINS
Date: 10-9-90

Operable Unit: 1
Prepared by: S. McComb

Suboperable Unit: 1

Alternative #: 4

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
LLMW (PIT 4)	13,500,000 (2) 100,000 cy	PACKAGED, CEMENT STABILIZED OR VITRIFIED	URANIUM AND OTHER RCRA WASTES
LLRW (BALANCE OF OU1)	13,500,000 (1)(2) 0.85 [illegible]	PACKAGED, CEMENT STABILIZED OR VITRIFIED	URANIUM
LLRW (J08 CONTROL WASTE)	2,700,000 (3) [illegible] 250 ppm [illegible] 4 [illegible]	PACKAGED IN LSA OR SIMILAR BOXES	

Assumptions

(1) THIS ASSUMES 5 FOOT AND 10 FOOT BUFFER AS DESCRIBED IN OU1 TASK 12 REPORT (OCTOBER) SECTION 1.2.

(2) FOR CEMENT STABILIZATION THIS NUMBER SHOULD BE MULTIPLIED BY (1.3) FOR VITRIFICATION MULTIPLY BY (.8)

(3) ASSUMED TO BE 10% OF UNTREATED WASTE.

[illegible] 1,915,000 CYD

PIT 4 = 130,000 CYD

BALANCE OF OU1 = 1,685,000 CYD.

J08 CONTROL WASTE [illegible]

2,000,000 CY (TOTAL)

0437

REC'D

OCT - 9 1990

ASI
FERNALD

MEMORANDUM

TO: Tom Tank, EDF Project Manager, IT/Fernald

FROM: D.R. Smith, Operable Unit 2 Manager

DATE: Site-Wide Waste Questionnaire

SUBJECT: October 3, 1990

The purpose of this memo is to revise some of the information that were previously supplied to you concerning the Site-Wide EDF. For question Number 1 under "Form", the lime sludge will be solidified and placed in 4'x4'x7' steel containers. We are considering bulk storage (disposal) for all the other waste types. The waste types are considered to be LLRW. These changes are shown on the attachment.

Attachment

File 602.15.2.1.1 ASI Oak Ridge W/Att
File 15.2.1.1 ASI Fernald Project File W/Att

0438

QUESTIONNAIRE

Operable Unit: 2 Manager: D.R. SMITH

Prepared by: D R Smith Date: 9/25

Operable Unit 2

Alternative (Number - Title)
4 - ON site disposal

1. Waste to be placed in EDF

Type[a]	Volume[b] (CY)	Form[c]	Contaminants of Concern [d]
SANITARY LANDFILL	18,000	BULK DISPOSAL	SEE BASELINE RISK ASSESSMENT FOR OU2
LIME SLUDGE (SOLIDIFIED)	33,000	CONCRETE PLACED INSIDE STEEL CONTAINERS	
FLY ASH (INACTIVE)	59,000	BULK DISPOSAL	
FLY ASH (ACTIVE)	21,500	BULK DISPOSAL	
MYTH FIELD	125,000	BULK DISPOSAL	

≈ 250,000 + 50,000 (CONTAMINATED SOIL) = 300,000 TOTAL CY

(a) Specify: LLRW, RCRA, LLMW, ETC.
(b) After treatment
(c) Specify: waste-crete (grout), vitrified, concrete or steel box with dimensions
(d) After treatment, specify: minimum/maximum/average

2. Results of Treatability Studies N/A

Note Briefly summarize the results of the study (eg; waste compressive strength, leach test results, etc.)

3. Waste Placement Schedule (Referenced to months after ROD.)

Start: 18 - 24 This is Aguess

Complete: 36 - 48

OU-3/EDF

UNIT A

BULKING MISC WASTE

LLRW: (596,820 CF)(1/27)(1.30)(1.05) = 30,17[illegible] C

LLMW: (174,210)(1/27)(1.30)(1.05) = 8807 CY

A TOTAL: 38,980 CY

UNIT B

LLRW: (460,485)(1/27)(1.30)(1.05) = 23,280 CY

LLMW: (294,645)(1/27)(1.30)(1.05) = 14,896 CY

B TOTAL = 38,180 CY

UNIT C

LLRW: (359,130)(1/27)(1.30)(1.05) = 18,160 CY

TOTAL

UNIT D Alt 13

LLRW: (630,435)(1/27)(1.30)(1.05) = 31,870 CY

TOTAL

LLMW: (10,097 T)(2000 lb/T)(100 lb/cf)$^{-1}$ = 201,940 CF / 27 = 7,48[illegible] C

TOTAL = 39,350 CY

0440

OU-3/EDF

UNIT E

BULKING MISC WASTE

LLRW : $(308,250)(1/27)(1.30)(1.05) =$ 15,580 CY

LLRW : $[7500(T)][2000 \frac{\#}{T}](490 \frac{\#}{CF})^{-1}(\frac{1.30}{27})(1.05) =$ 1550 CY

LLRW TOTAL = 17,130 CY

UNIT F

Assume ~~[illegible]~~ LLMW = 3,000 CY
From WWTP

UNIT G

LLRW : $(22,500)(1/27)(1.3)(1.05) =$ ~~[illegible]~~ 1140 C

TOTAL OU-3/EDF VOLUMES

UNIT	LLRW (CY)	LLWM (CY)	SUBTOTAL
A	30,170	8,810	38,980
B	23,200	14,900	38,180
C	18,160	—	18,160
D	31,870	~~39,350~~ 7,480	38,350
E	1,550 / 15,580	—	17,130
F	—	3000	3,000
G	1140	—	1140
TOTAL	121,750	~~66,550~~ 34,190	155,940 CY

0441

MEMORANDUM

TO: Tom Tank

FROM: John Throckmorton

DATE: October 3, 1990

SUBJECT: Operable Unit 3; Response to Site-Wide EDF Waste Questionnaire

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Enclosed are responses to the memo and questionnaire dated September 18, 1990. The estimates in the enclosure are based upon information available at this time. Once more information becomes available, modifications can be made to these estimates. Note that the locations of RCRA contamination are unknown and may cause the modification of low level radioactive waste versus low level mixed waste volumes.

JDT/jt

cc: S. Wolinsky
David Smith
L. Meyers-Schöne
F. Grigsby

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: A

Alternative #: 5 & 6

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	2,570,100 Total Pretreatment*		
LLRW	596,820 +130%	Packaged, Cement Stabilized or Vitrified	Uranium
LLMW	174,210 + [illegible] + 10% [illegible]	Packaged, Cement Stabilized or Vitrified	Uranium and other RCRA waste

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation states that the potential volume reduction for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: B

Alternative #: 5 & 6

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	2,517,100 Total Pretreatment*		
LLRW	460,485	Packaged, Cement Stabilized or Vitrified	Uranium
LLMW	294,645	Packaged, Cement Stabilized or Vitrified	Uranium and other RCRA waste

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

0444

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: C

Alternative #: 5, 6, 7, & 8

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	1,197,100 Total Pretreatment*		
LLRW	359,130	Packaged, Cement Stabilized or Vitrified	Uranium

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: D

Alternative #: 5, 6, 7, & 8

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	2,101,450 Total Pretreatment*		
LLRW	630,435	Packaged, Cement Stabilized or Vitrified	Uranium

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

0446

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: D

Alternative #: 13 & 14

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	2,101,450 Total Pretreatment*		
LLRW	630,435	Packaged, Cement Stabilized or Vitrified	Uranium
LLMW	10,097 Tons	Packaged	Uranium, Asbestos, and other RCRA waste

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: E

Alternative #: 5 & 6

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	1,027,500 Total Pretreatment (Soils)* 10,000 Tons (Aboveground Waste)*		
LLRW	308,250 (Soils)	Packaged, Cement Stabilized or Vitrified	Uranium
LLRW	7500 Tons (Aboveground Waste)	Packaged	Uranium

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

5) Decontamination of the aboveground wastes will reduce the quantity of waste for disposal by 25%. WMCO presently believes that 50% of the on site aboveground waste is recoverable.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

0448

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: F

Alternative #: ___

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
LLMW	Waste is expected from the Water Treatment Facility, but quantities are unknown at this time.	Packaged	Uranium and RCRA waste

Assumptions:

1) Packaging of the waste is unknown at this time, but will be LSA or Type B.

2) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

3) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

Operable Unit: 3
Prepared by: John Throckmorton

Manager: Sam Wolinsky
Date: 10/2/90

Suboperable Unit: G

Alternative #: 5 & 6

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
	75,000 Total Pretreatment (Total is not completely known)*		
LLRW	22,500	Packaged, Cement Stabilized or Vitrified	Uranium

Assumptions:

1) Soil washing of the soil may volume reduce the soils by 70%. Westinghouse documentation state that the potential for heavy metal washing is approximately between 80% and 90%.

2) Packaging of the waste is unknown at this time, but will be LSA or Type B.

3) Stabilization techniques post treatment will be Cement-based Stabilization, Thermoplastic Stabilization, or Vitrification.

4) RCRA contaminants of concern are not completely known at this time nor are all of the locations known. See page 9 for listing.

* These totals are for information only and represent the total excavation prior to treatment of the wastes. The totals representing the LLRW and LLMW are after treatment of the waste.

0450

CONTAMINANTS OF CONCERN

Inorganics

Arsenic
Barium
Cadmium
Chromium
Cobalt
Copper
Lead
Manganese
Silver
Zinc
Molybdenum
Magnesium
Iron
Mercury
Nickel

Organics

Acenapthene
Acetone
Anthracene
Aroclor-1254
Aroclor-1260
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoroanthene
Benzo(ghi)perylene
Benzo(k)fluoroanthene
Bis(2-ethylhexyl)phthalate

Organics (Cont.)

Benzyl alcohol
2-Butanone
Chrysene
Dibenzofuran
Beta-BHC
1,1-Dichloroethene
Benzene
Chlorobenzene
1,1-Dichloroethane
Di-n-butylphthalate
Ethylbenzene
Fluoroanthene
Fluorene
Indeno(1,2,3-ad)pyrene
2-Methylnaphthalene
Naphthalene
Phenanthrene
Phenol
Pyrene
Tetrachloroethene
4-Methyl-2-pentanone (methyl isobutyl ketone)
Dibenzo(a,h)anthracene
N-nitrosodiphenylamine
Toluene
Tricloroethene
1,1,1-Trichloroethane
Xylenes (Total)
Tributyiphosphate
Cis-1,2-dichloroethene
Trans-1,2-dichloroethene

Radionuclides

Cs-137
Pu-238
Pu-239
Pu-240
Ra-226
Ra-228
Sr-90

Radionuclides (Cont.)

Tc-99
Th-228
Th-230
Th-232
U-234
U-235
U-238

OU-4/EDF VOLUMES

K-65 — *191 Type Waste

Silo 1 & 2

*Residuum (LLMW) $(195{,}000)(\frac{1}{27})(1.30)(1.05)$ = 9860 CY

Non-Residuum (LLMW) – Silo 1 & 2 Structure

$2(48{,}000)(\frac{1}{27})(1.30)(1.05)$ = 4850 CY

Non-Residuum (LLWM) – Adjacent Soils

$[(494{,}000) - (195{,}000) - 2(48{,}000)](\frac{1}{27})(1.30)(1.05)$ = 10,260 CY

Silo 3 (LLMW)

Waste + Structure

$(195{,}00)(\frac{1}{27})(1.30)(1.05)$ = 9860 CY

Silo 4 (LLRW)

$(48{,}000)(1/27)(1.30)(1.05)$ = 2430 CY

SUMMARY TOTAL

LLMW	LLRW	TOTAL
9860 (191 TYPE)	2430	
4850		37,260 CY
10,260		
9860		
34,830 CY	2430 CY	

0452

6420

Manager: DR. HARMER
Date: 10-12-90

Operable Unit: 4
Prepared by: S. McComb

Suboperable Unit: ____

Alternative #: DEMOUAL, STABILIZATION, ON PROPERTY DISPOSAL

TYPES	VOLUME (CF)	FORM	CONTAMINANTS OF CONCERN
K-65 MATERIAL (SILOS 1 & 2)	494,000 - 9 INCLUDES MATL + STRUCTURE + SOILS	WASTE-CRETE IN STEEL LSA BOXES	SEE ATTACHED.
LLRW (Silo 4)	48,000	DEBRIS OF SILOS IN CONCRETE BOXES.	~~[illegible]~~
LLMW (SILO 3)	195,000 INCL. STRUCTURES	WASTE-CRETE IN STEEL BOXES	SEE ATTACHED
LLPW ~5% LCW + P.W.	30,000	PROCESS WASTE IN CONCRETE BOXES	

Assumptions:

195,000 cf. Residues, Silo 1 & 2

137,800 cf. Waste, Silo 3

TABLE 2-1

CHEMICALS OF CONCERN FOR OPERABLE UNIT 4 BY MEDIA

Medium	Current and Future Chemical(s) of Concern
Direct radiation	Direct penetrating radiation
Air	Radon Radon progeny
Soil[a]	Uranium Radium Thorium Radon progeny
Sediment/surface water[a]	Uranium Radium Thorium Radon progeny
Groundwater[a]	Uranium Radium Thorium Actinium Protactinium Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead Manganese Mercury Nickel Selenium Silver Thallium Vanadium Zinc

[a]All silo constituents are chemicals of potential future concern if the silos begin to leak

0454

OU-5/EDF VOLUMES

LLRW

BULKING MISC WASTE

$(605{,}550)(\frac{1}{27})(1.30)(1.05) =$ 30,610 CY

$(5400)(\frac{1}{27})(1.30)(1.05) =$ 270 CY

30,880 CY

+ EST TOTAL + 20% FOR MISC PROCESS SYSTEM WASTE $(30{,}880)(1.2) =$

TOTAL 37,060 CY

On-Site Disposal

QUESTIONNAIRE

Operable Unit: 5

Manager: Robin Smith

Prepared by: MRO

Date: 10-8-90

Operable Unit 5

Alternative (Number - Title)

1. Waste to be placed in EDF

Type[a]	Volume[b](CF)	Form[c]	Contaminants of Concern [d]
1)* LLRW (worst case)	605,550 ft³ (after 30 yrs)	Dry Sludge	Uranium
2)**	5,400 ft³	Excavated Soil	

* Groundwater alternatives : 3, 5, 7 & 9

** Sediments/Soil alternatives : 2 & 3

(a) Specify: LLRW, RCRA, LLMW, ETC.
(b) After treatment
(c) Specify: waste-crete (grout), vitrified, concrete or steel box with dimensions
(d) After treatment, specify: minimum/maximum/average

2. Results of Treatability Studies

Note Briefly summarize the results of the study (eg; waste compressive strength, leach test results, etc.)

3. Waste Placement Schedule (Referenced to months after ROD.)

Start:

Complete:

USG

INCLUDES BULKING FACTOR AND PROCESS SYSTEM WASTES

0456

ATTACHMENT A

B-25 BOX DROP FROM A HEIGHT

PARSONS
ERA PROJECT

CALCULATION SHEET

6420

REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]	B-25 Box Drop From A Height, P06-1	COST CENTER
				AUTHOR Zimmerman SHEET 11 OF 11	OU EWMF

3) "AIRDOS-EPA: A Computerized Methodolog for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides, EPA/520/1-79-009, December, 1979.

4) "Dose Associated with Tornado/High Wind Accident Scenario," Calculation No. 1 P.O. 23, Parsons 1991.

5) "Material Handling Study For The Engineered Treatment, Packaging & Staging Facility, DRAFT", PARSONS, 1991.

6) "A Manual For Implementing Residual Radioactive Material Guidelines", DOE/CH/8901, Argonne National Laboratory, June, 1989.

ENG.021(03/91)

Consequences Of B-25 Box Drop From A Height

The Airborne Concentration of Contaminants from a B-25 Box Drop from a height							
			Concentration in Air		DCF (CEDE)	DOSE CEDE (mrem)	
Contaminant	Concentration	Airborne Release (pCi)	On-Site (pCi/m^3)	Off-Site (pCi/m^3)	(mrem/pCi)	On-Site	Off-Site
Ra-226 (pCi/g)	6.23E+01	2.18E+05	3.82E+03	2.29E+02	7.90E-03	1.11E-01	6.64E-03
U-238 (pCi/g)	2.50E+02	8.75E+05	1.53E+04	9.19E+02	1.20E-01	6.74E+00	4.04E-01
Th-230 (pCi/g)	3.67E+03	1.28E+07	2.25E+05	1.35E+04	3.20E-01	2.64E+02	1.58E+01
VOC (mg)	2.72E+01	9.51E+01	1.66E+00	9.98E-02			
SVOC (mg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
RCRA Metals (mg)	2.71E+03	9.49E+03	1.66E+02	9.97E+00			
PCB (mg)	1.43E+00	5.02E+00	8.78E-02	5.27E-03			
						2.71E+02	1.62E+01
Assumes Atmospheric Stability Class F per SP-A-01-013							
CEDE - Committed Effective Dose Equivalent (Inhalation)							
15 second exposure to the plume							
100% Respirable Airborne Contaminants							
Only major radionuclides of concern are presented							
Nearest On-Site Receptor at 100 m							
Nearest Off-Site Receptor at 500 m							
DCFs from Ref. 6							
Waste Concentrations from Ref. 5							

5.0 Summary

The fractional airborne release due to a drop of a B-25 box from a 13 foot height is 0.078%. This results in an airborne release of 3.5 kg. of solidified waste.

The consequences of this accident are 270 mrem CEDE on-site dose and 16 mrem CEDE off-site dose.

6.0 Recommendations

None.

7.0 References

1) NUREG-1320 "Nuclear Fuel Cycle Facility Accident Analysis Handbook," Nuclear Regulatory Commission, 1988.

2) SP-A-01-013 "SOP- Guidelines for the Preparation of Safety Assessments," Westinghouse Materials Company of OHIO, 1990.

REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]	B-25 Box Drop From A Height, PO6-1	COST CENTER
				AUTHOR Zimmerman SHEET 7 OF 11	OU EWMF

500DIS.XLS

	A	B
1	Stability Class Designator	Stability Class Conversion
2	6	A=1
3	Distance X	B=2
4	500.00	C=3
5	Q (Release Rate)	D=4
6	1.00E+00	E=5
7	Wind Speed (M/S)	F=6
8	2.00	
9	H (effective stack height)	
10	0.00	Dilution Factor
11	Sigma - y	1.05E-03
12	17.99	
13	Sigma - Z	
14	8.41	
15	Centerline (Y=0,Z=0) Max. Concentration	
16	Distance From Centerline	
17	0.00	
18	Z Distance	
19	0.00	

PARSONS
ERA PROJECT

CALCULATION SHEET

REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	JT	HB	B-25 Box Drop From A Height, P06-1	COST CENTER
				AUTHOR Zimmerman SHEET 8 OF 11	OU EWMF

100DIS.XLS

	A	B
1	Stability Class Designator	Stability Class Conversion
2	6	A=1
3	Distance X	B=2
4	100.00	C=3
5	Q (Release Rate)	D=4
6	1.00E+00	E=5
7	Wind Speed (M/S)	F=6
8	2.00	
9	H (effective stack height)	
10	0.00	Dilution Factor
11	Sigma - y	1.75E-02
12	4.06	
13	Sigma - Z	
14	2.23	
15	Centerline (Y=0,Z=0) Max. Concentration	
16	Distance From Centerline	
17	0.00	
18	Z Distance	
19	0.00	

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REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]	B-25 Box Drop From A Height, P06-1	COST CENTER
				AUTHOR Zimmerman SHEET 5 OF 11	OU EMMF

4.0 Calculation

Fraction Airborne = $1 \times 10^{-8} \frac{H^2}{\rho}$ (Eqn. 4.55 Nuregs 1320)

H = height

ρ = density

H = 13 ft = 396 cm

$\rho = 2.0\ g/cm^3$

Fraction Airborne = $\frac{1 \times 10^{-8} (396)^2}{2.0} = 7.8 \times 10^{-4} = 0.078\%$

Total airborne release = 10,000 lbs · 7.8×10^{-4} = 7.8 lbs

7.8 lbs = 3.5 kg

The dilution factor was determined using the spreadsheet verified in calculation PO 23-1 (Ref. 4)

The dilution factors are shown in 500DIS.XLS and 100DIS.XLS. These show the dilution factor for off-site (500m) and on-site (100m). The input atmospheric dispersion parameters are shown and are consistent with WMCO procedure SP-A-01-013.

PARSONS
ERA PROJECT

CALCULATION SHEET

REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]	B-25 Box Drop From A Height, POb-1	COST CENTER
				AUTHOR Zimmerman SHEET 6 OF 11	OU EWMF

The CEDE is determined using the spreadsheet shown "Consequences of B-25 Box Drop From A Height". The results were verified by simple hand calculator. The dose is determined by Equation 1.

$$Dose = B \cdot ED \cdot C \cdot DCF \cdot F$$

Dose = Committed Effective Dose Equivalent (mrem)

B = Breathing rate (m^3/hr)

ED = Exposure Duration (hr)

C = Airborne Concentration (pCi/m^3)

DCF = Dose Conversion Factor (mrem/pCi)

F = Respirable fraction (unitless)

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ENG.021(03/91)

REV	DATE	BY	CK	TITLE	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]	B-25 Box Drop From A Height, P06-1	COST CENTER
				AUTHOR Zimmerman SHEET 3 OF 11	OU EWMF

1.0 Objective

The objective of this calculation is to determine an estimate of the amount of material released as a result of dropping a full B-25 box from the boom forklift truck. In addition, the consequences of this release are to be assessed using the a spreadsheet for atmospheric dispersion and consequence estimate.

2.0 Background and Approach

B-25 boxes containing treated waste are to be placed in the Engineered Waste Management Facility (EWMF) by boom forklift trucks. The boom forklift is approximately 13 feet (maximum) above the ground. The consequences of dropping and rupturing a box is to be assessed.

The WEMCO procedure SP-A-01-013 and methodology of NUREG-1320 and AIRDOS are to be used.

PARSONS ERA PROJECT

CALCULATION SHEET

REV	DATE	BY	CK	TITLE B-25 Box Drop From A Height, P06-1	PAGE NUMBER
0	10/1/91	[illegible]	[illegible]		COST CENTER
				AUTHOR Zimmerman SHEET 4 OF 11	OU EWMF

3.0 Assumptions

B-25 box will be used for waste emplacement

10,000 pounds waste mass per B-25 box.

B-25 Box will fall from 13 foot height

The correlation for free fall spill of powders per NUREG-1320 will be applicable although very conservative.

No credit for the B-25 box structure is taken.

Density is equal to 2.0 g/cm3.

Due to solidification/grouting the waste concentration will be reduced by a factor of 3.

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ENG.021(03/91)

ENGINEERING CALCULATIONS
TITLE AND SUMMARY SHEET

Date 10/1-/91

Revision No. 0

Project No. 6 Calculation No. 1 Sheet 1 of 11

Project Title Engineered Waste Management Facility

Calculation Subject B-25 Box Drop From A Height

STATUS: PRELIMINARY _____ FINAL ✓ SUPERSEDED _____ VOID _____

STATEMENT OF PROBLEM
The consequences of a B-25 drop from a height of 13 feet is to be assessed.

SUMMARY OF CONCLUSIONS	Originator's Signature and Date
The dose on-site (100m) is 270 mrem (CEDE) and the off-site dose (500m) is 16 mrem. These consequences fall within the low hazard class per SP-A-01-013.	John R. Jennings 10/1/91
CHECKING METHOD	**Checker's Signature and Date**
	Dean Gross 10/01/91

Rev. No.	Sheet No.	Description	Reviser's Signature/Date	Checker's Signature/Date	Approved by Signature/Date

ENGINEERING CALCULATIONS
BASIS SHEET

Revision No. 0
Sheet 2 of 11

Project No. 6 Calculation No. 1

Project Title Engineered Waste Management Facility

Calculation Subject B-25 Box Drop From.. Date Checked 10/9/91

Performed by: John P. Zimmerman Checked By: [illegible]

Date 10/1/91

SUMMARY OF DATA SOURCES - CODES - ASSUMPTIONS

1) NUREG-1320 "Nuclear Fuel Cycle Facility Accident Analysis Handbook," Nuclear Regulatory Commission, 1988

2) SP-A-01-013 "SOP - Guidelines for the Preparation of Safety Assessments," Westinghouse Material Company of Ohio, 1990.

3) "ATRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides," EPA/520/1-79-009, December, 1979

4) "Dose Associated with Tornado/High Wind Accident Scenario," Calculation No. 1, P.O. 23, Parsons, 1991

5) "Material Handling Study for the Engineered Treatment, Packaging & Staging Facility, DRAFT," PARSONS, 1991

6) "A Manual For Implementing Residual Radioactive Material Guidelines," DOE/CH/8901, Argonne National Laboratory, June, 1989.

BASIS.057

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Safety Assessment

6420

Safety Assessment for the Engineered Waste Management Facility

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio

Document Control No. 06SA12209101
DOE Contract No. DE-AC05-90OR21951
December 1991
Revision No. 0

PARSONS

Fairfield Executive Center
6120 South Gilmore Road
Fairfield, Ohio 45014

0470

Safety Assessment
for the
Engineered Waste Management Facility
Fernald Environmental Management Project
Fernald, Ohio

APPROVED FOR ISSUE

Approved By:

D.L. Gross, Nuclear and Systems Safety Manager, PARSONS — Date 12/20/91

S.D. Young, Project Manager, EWMF, PARSONS — Date 12/20/91

J. Click, Nuclear, Fire, and System Safety Manager, WEMCO — Date 1/9/92

G.J. Krieger, Project Manager, EWMF, WEMCO — Date 1-9-92

R. Allen, Project Manager, EWMF, DOE — Date 1-9-92

Safety Assessment for EWMF

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ATTACHMENTS

A B-25 Box Drop From A Height

SECTION 1

FACILITY AND LOCATION

The purpose of the project is to develop a waste disposal facility for low-level radioactive, hazardous, and mixed waste that is generated as a result of the Fernald Environmental Management Project (FEMP) remediation and possibly from the RMI Titanium Company Extrusion Plant (RMI) which has yet to be determined. The Engineered Waste Management Facility (EWMF) is not intended to receive waste from any other sites. The EWMF is to be located within the FEMP boundary; see Drawing 96X-5900-G-00001 for the proposed location. Due to the size requirements of the EWMF, there is only one assumed location on the FEMP that can accommodate the EWMF.

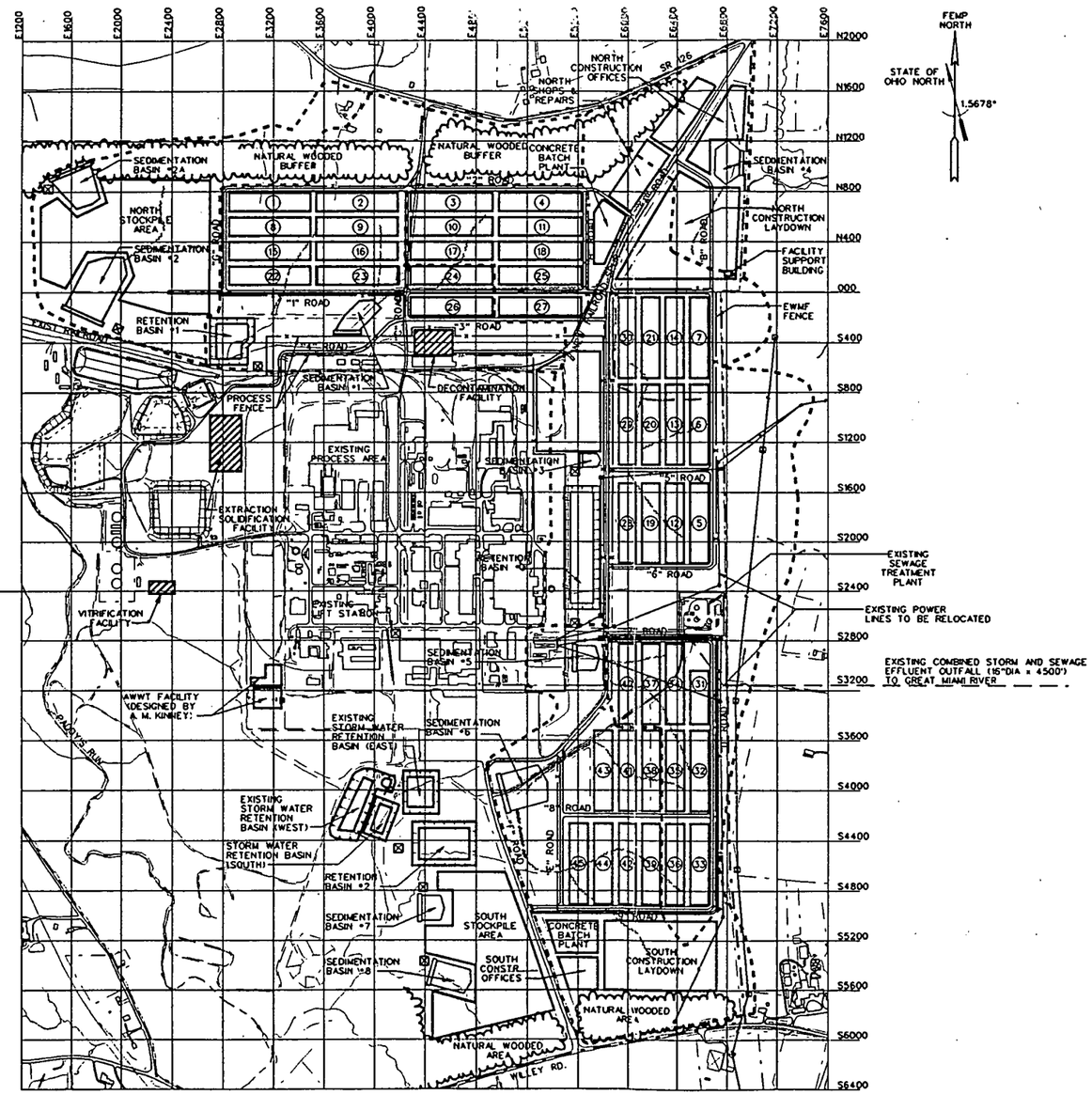
This Safety Assessment (SA) is limited to the EWMF during the operational period (see Section 3.2.5) only and does not include any on-site transportation or treatment facilities required. The hazards associated with the transportation of the waste to the EWMF and the long term performance of the EWMF are outside the scope of this project.

SECTION 2

SEGMENT LOCATIONS WITHIN FACILITY

There is only one segment identified at this time. All portions of the EWMF shall be classified according to the results of the most hazardous potential vault within the EWMF. This will ensure the hazards are adequately bounded, using one vault design. If additional segments are identified later in the project, this SA may need to be revised.

Any administrative support building and services for operations support of the EWMF are not included in this SA. The support building will contain the office areas, records storage areas, remote monitoring, and security areas. The support building is assumed to be a general-use facility since no expected wastes or other hazardous materials are to be stored in this general-use support facility.



NOTES

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DRAWING SCHEDULE:

SHEET NO.	TITLE
G0001	MASTER PLAN
G0002	SITE PLAN - SHEET 1
G0003	SITE PLAN - SHEET 2
G0004	CLOSURE PLAN - SHEET 1
G0005	CLOSURE PLAN - SHEET 2
G0006	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 1
G0007	CONSTRUCTION STRATEGY (YEAR 8) - SHEET 2
G0008	SITE CROSS SECTIONS - SHEET 1
G0009	SITE CROSS SECTIONS - SHEET 2
G0010	LEACHATE COLLECTION SYSTEM SECTION AND DETAILS
S0001	EWMF VAULTS PLAN AND SECTIONS
S0002	STORAGE LAYOUT
A0001	PLANS, ELEVATIONS, AND SECTIONS FACILITY SUPPORT BUILDING

LEGEND:

- PROPERTY LINE
- NATURAL DRAINAGE
- OPEN DITCH
- STORM DRAIN PIPE
- EXISTING FENCE
- NEW FENCE
- STORM WATER LIFT STATION
- (12) SEQUENTIAL NUMBER OF VAULT
- TRANSMISSION TOWER
- OVERHEAD POWER LINE
- DRAINAGE BOUNDARY
- PROPOSED NEW FACILITIES FOR PO #8

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. · CHAS. T. MAIN, INC. · ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /PO6

DRAWING TITLE
MASTER PLAN
EWMF VAULTS

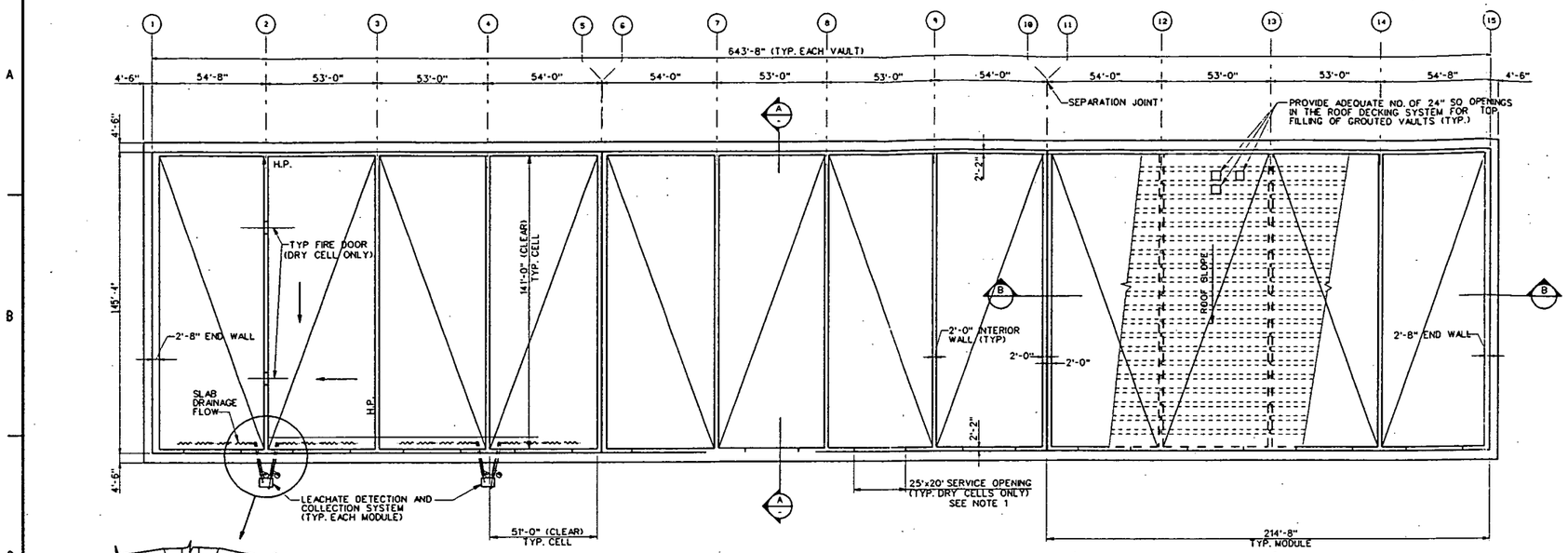
DRAWN BY	DATE	DESIGNED BY	DATE	CHECKED BY	DATE
D. THOMPSON	4-11-91			T. PICKERING	7-16-91

PERMIT NO.	FEMP	SCALE	SHEET
		1"=400'-0"	

SUBMITTED FOR APPROVAL	APPROVED RECOMMENDED	DRAWING APPROVED
A-E DATE	CONTRACTOR/SUBCONTRACTOR DATE	DOE DATE

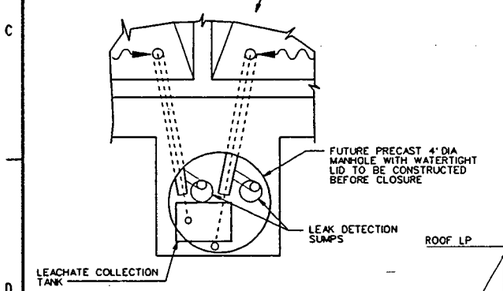
DOE PROJECT NO.	FEMP CONTRACT PROJ NO.	OPERATOR NO.	SHEET NO.	REV. NO.
BY D.O.E. LATER	WBS 1.2.1.8.1.1.3 00-90701	96X-5900-G-00001	G0001	-

0476

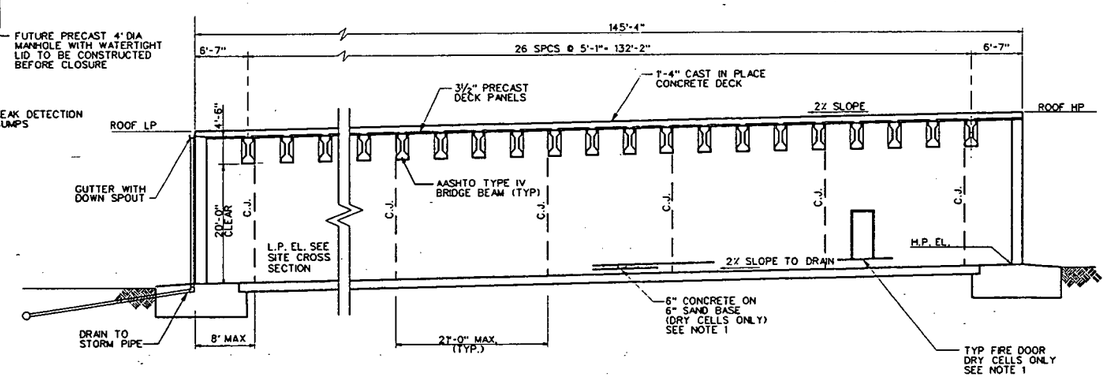


TYPICAL FOUNDATION AND FLOOR SLAB PLAN

NO SCALE



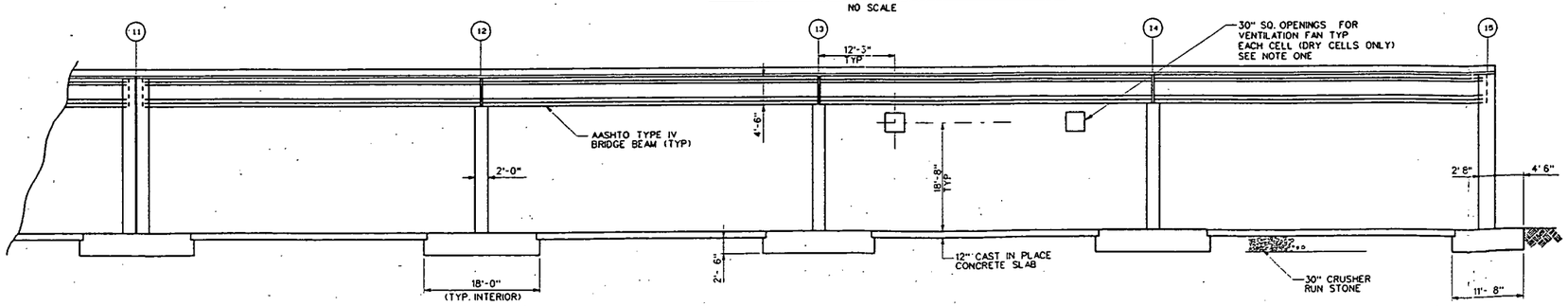
DETAIL



CJ: CONTROL JOINT

SECTION A-A (TYP INTERIOR WALL ELEVATION)

NO SCALE



SECTION B-B

NO SCALE

C477

NOTES

1. THE FOLLOWING INTERIM PROVISIONS ARE INCLUDED ONLY FOR THE DRY CELL TYPE VAULTS.
   A) 25' X 20' SERVICE OPENINGS AND OTHER OPENINGS TO BE FILLED IN WITH CONCRETE AT INTERIM CLOSURE.
   B) ADDITIONAL 6" CONCRETE FLOATING SLAB ON 6" SAND LAYER DESIGNED TO PROTECT LINER FROM FORKLIFT TRAFFIC.
   C) FIRE DOORS IN THE INTERIOR WALLS TO BE REMOVED AND FILLED IN WITH CONCRETE AT INTERIM CLOSURE.

6420

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
		INITIALS AND DATE		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN, INC. - ENGINEERING-SCIENCE, INC.
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PROJECT NAME
FEMP ERA
ENGINEERED WASTE MANAGEMENT FACILITY /P06

DRAWING TITLE
EWMF VAULTS PLAN AND SECTIONS
EWMF VAULTS

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SECTION 3

DESCRIPTION OF OPERATION

3.1 Existing Conditions

The FEMP is engaged in a site-wide remediation program pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments Reauthorization Act (SARA). The FEMP is a Federal facility operated by Westinghouse Environmental Management Company (WEMCO) for the United States Department of Energy (DOE). The FEMP is located on 1,050 acres approximately 26 miles northwest of Cincinnati, Ohio. The villages of New Baltimore, Ross, New Haven, and Shandon are all located within a few miles of the FEMP.

A variety of chemical and metallurgical processes were used at the FEMP for the manufacture of uranium metal products. The basic uranium compound necessary for metal production was uranium tetraflouride (UF_4), also known as green salt. UF_4 was produced from uranium hexaflouride (UF_6) in the Pilot Plant (Building 54) by the reduction with hydrogen (H_2) gas. UF_4 was also produced by the reduction of uranium oxides (UO_2-Orange Oxide, UO_3-Brown Oxide, and U_3O_8-Black Oxide) in the Green Salt Plant (Plant 4). The Nitric Acid Recovery Plant (Plant 3), and the Scrap Recovery Plant (Plant 8) recovered uranium above the Economic Discard Limit (EDL) from residues and produced oxides for production of UF_4 in the Green Salt Plant. The Scrap Recovery Plant is currently used for uranium recovery in the environmental remediation effort.

Small amounts of thorium were processed at the FEMP at various times between 1954 and 1975 to produce thorium metal products. Thorium operations were performed in the metals fabrication plant, the recovery plant, the special projects plant, and the pilot plant. The FEMP currently serves as the thorium repository for the DOE and has thorium storage facilities for a variety of thorium metals.

Large quantities of liquid and solid waste were generated by the various operations at the FEMP. Before 1984, solid and slurried waste were disposed in the on-property waste storage area. This waste storage area includes six low-level radioactive waste storage pits; two earth-mounded concrete silos containing radium-bearing residues (K-65 residue); one concrete silo containing metal oxides; two lime sludge ponds; and a sanitary landfill.

Solid waste materials associated with uranium metal production are presently stored on the property in steel drums awaiting disposal. This waste includes oils, sludges, contaminated combustibles, filter cake, off-spec UF_4, and reject UO_3. Other waste materials stored in drums include spent degreasing solvents and polychlorinated biphenyl (PCB) contaminated material.

As a result of the activities and processes at the FEMP, the surrounding environment became contaminated with hazardous materials. The bulk volume of these materials is low-level radioactive materials. The soils and debris containing the contaminants are also considered wastes requiring remediation.

There are no acceptable disposal facilities for radioactive or hazardous waste currently in existence at the FEMP. There are considerable volumes of waste currently on site at the FEMP. These wastes are currently undergoing a characterization process as a part of CERCLA. As a part of the final remediation of the site, these wastes must be isolated from the environment.

3.2 Proposed Project Operation

The purpose of the project is to develop a waste disposal facility for low level radioactive, hazardous, and mixed waste that is generated as a result of the FEMP remediation and possibly from the RMI which has yet to be determined. The EWMF is not intended to receive waste from any other sites.

Waste materials that will be accepted at the EWMF are defined as follows:

Low-Level Radioactive Waste (LLRW) - LLRW is waste that contains radioactivity and is not classified as high-level waste, transuranic waste, byproduct material, or spent nuclear fuel, as defined by DOE Order 5280.2A. To accommodate LLRW, the EWMF will be designed in accordance with Nuclear Regulatory Commission (NRC) regulations (10 CFR 61) for Class C waste, DOE Order 6430.1A Division 13, and DOE Order 5820.2A, Chapter III. This design will also allow the disposal of stabilized Class A and Class B waste.

Byproduct Material and Naturally Occurring and Accelerator Produced Radioactive Materials - Byproduct materials are defined under 10 CFR 40.4 and DOE Order 5820.2A as consisting of:

1) Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident or to the process of producing or utilizing special nuclear material. For purposes of determining the applicability of the Resource Conservation and Recovery Act (RCRA) to any radioactive waste, the term "any radioactive material" refers only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous waste components of the waste substance will be subject to regulation under the RCRA.

2) The tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction operations and which remain underground do not constitute "byproduct material."

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DOE Order 5820.2A defines naturally occurring and accelerator produced radioactive materials as any radioactive material that can be considered naturally occurring and is not source, special nuclear, or byproduct material or that is produced in a charged particle accelerator.

DOE Order 5820:2A, Chapter IV allows small volumes of these wastes to be managed as low-level waste in accordance with DOE Order 5820.2A, Chapter III. Pursuant to the list of ARARs developed for the EWMF, these waste streams are to be managed in accordance with 40 CFR 192.

Hazardous Waste (HW) - HW is defined in Subpart D of 40 CFR 261 or is a waste that exhibits any of the hazardous waste characteristics identified in Subpart C of 40 CFR 261. Specific limitations of the type of HW acceptable for disposal will be described in a more detailed waste acceptance criteria section contained within the Conceptual Design Report (CDR). To accommodate HW, the EWMF will be designed in accordance with US EPA regulations (40 CFR 264, Subpart N) or more stringent Ohio EPA regulations for landfills and DOE Order 6430.1A, Division 13.

Mixed Waste (MW) - MW is defined in DOE Order 5820.2A as waste that satisfies the definition of radioactive waste subject to the Atomic Energy Act (AEA) that also contains hazardous waste subject to the RCRA. The EWMF will be designed to handle any MW which contains a radioactive waste from either the LLRW or byproduct material categories and a hazardous waste. To accommodate the disposal of MW, the EWMF will be designed in accordance with US EPA regulations (40 CFR 264, Subpart N) for landfills; NRC regulations (10 CFR 61) for Class C waste; 40 CFR 192 for byproduct materials; DOE Order 6430.1A, Chapter 13; and DOE Order 5820.2A, Chapters III and IV. This design will also allow the disposal of stabilized Class A mixed waste and Class B mixed waste.

The EWMF conceptual design consists of earth-mounded aboveground containment vaults with internal leachate collection and leak detection systems. The EWMF vault design contains several major systems as discussed in the following sections. The functional requirements for the EWMF are based on FEMP requirements, DOE Orders, and Federal and State of Ohio regulatory requirements identified as Applicable or Relevant and Appropriate Requirements (ARARs) (PARSONS 1991a).

3.2.1 Waste Form

The waste that will be placed in the vaults will be generated as a result of the remediation and remedial actions at the FEMP. Based on the Remedial Investigation/Feasibility Study (RI/FS) Reports, the sources of waste and contaminant concentrations are summarized in Table 7-1.

The waste will be treated as required to meet the waste acceptance criteria specified in the EWMF design documents. The form in which the waste will be placed in the vault has not yet been determined. The options for placement are dedicated vaults of individual containers that will be stacked inside of the vault or a grout slurry that will solidify as a monolith within the vault.

3.2.2 Containment Structure

The containment structure will consist of 45 above-grade vaults, each capable of storing approximately 53,000 cubic yards. The size and number of the vaults is based on the currently estimated waste volume of 2.4 million cubic yards. Each vault is divided into 12 cells of equal size. The cell provides the primary containment structure for the waste (see Drawing 96X-5900-S-00017). Each vault has nominal dimensions of 644 feet by 145 feet by 26 feet high.

During the waste emplacement period, precipitation is prevented from entering the vault by the reinforced concrete roof and drainage system.

3.2.3 Liner System/Leachate Collection/Leak Detection System

The EWMF will contain a double liner system with a leachate collection and a leak detection system. The double liner system will consist of a top and bottom liner. The liners are to be constructed from materials that prevent the migration of the waste constituents into the top liner and through the bottom liner for at least a period of time equal to the waste emplacement and institutional period. The liners will be chemically resistant to physical contact with the waste and leachate as well as exposure to weather. The liner will be designed to comply with 40 CFR 264.301, as follows:

1) The liners will have sufficient thickness and strength to prevent failure due to pressure gradients (internal static head and external hydraulic forces), climatic conditions, installation stresses, and daily operational stresses.

2) The liners are to be placed on a suitable foundation which will adequately support the liner system and not fail due to pressure gradients or settlement.

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3) Each cell will be equipped with a leachate collection/leak detection system (LCLDS). The LCLDS consists of a double liner system at the bottom of each cell, a base for protecting the double liner system, leachate collection system for containing leachate, and a leak detection system for monitoring performance of the waste containment.

To allow accumulation and detection of leachate within the LCLDS, a sump tank shall be provided. The storage capacity has not been determined but it will be sized to achieve efficient operation of the leachate detection and removal systems. There is also a requirement that no more than 1 foot of leachate is allowed over the lowest point of the bottom liner.

3.2.4 Final Cover

Upon completion of the waste emplacement in the vaults, a multi-layer, low permeability final cover will be placed over the vault with appropriate drainage controls. The cover will consist of compacted backfill over and around the vaults, a clay layer with permeability equal to or less than the bottom liner system, a drainage layer, and a topsoil cover.

3.2.5 Periods of the EWMF Lifecycle

There are several periods identified during the life of the EWMF. These periods are as follows:

1) The operational period which includes:

   (1) The construction and filling phase is the time required to construct and fill the vaults. This period is estimated to be approximately 16 years.

   (2) The closure phase is the time required to install the final cover. The closure period starts upon receipt of the final waste volume and is to be completed within 180 days per 40 CFR 264.113(b), unless an alternate period is approved by the US EPA.

   (3) The stabilization phase is the time after completion of closure during which the disposal site is to be stabilized (i.e., vegetative cover, repair of erosion and subsidence, etc.). The stabilization period is to last for a minimum of 5 years after closure, per 10 CFR 61.29 (invoked as an ARAR).

2) The institutional period is the time during which institutional controls continue to function on the EWMF. During this time, the vaults and cover are maintained as needed, and the LCLDS and environmental monitoring systems are operated. Institutional controls cannot be relied on for more than 100 years per 10 CFR 61.54.

3) The performance period is the time after the end of the institutional period when all controls are assumed to be nonfunctional. This period is to be at least 200 years following closure.

These operation periods during the life of the EWMF have some hazards unique to each period. This SA does not include the actual construction of the EWMF vaults. During construction, the hazards are assumed to be standard construction hazards. The construction hazards are to be assessed by the construction contractor with final approval by WEMCO Nuclear and System Safety. The nonstandard hazards encountered during the operational period are assessed in Section 9. The hazards during the institutional and performance periods are assessed during title design as a part of a performance assessment as required per DOE Order 5820.2A.

A Preliminary Safety Analysis Report (PSAR) must be generated during the Title I/II design phase and a Final Safety Analysis Report (FSAR) during Title III per DOE Orders 5820.2A, 5480.5, 4700.1, and 6430.1A. The Performance Assessment will be performed in accordance with DOE Order 5820.2A, and the results will be incorporated into the PSAR and the FSAR.

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SECTION 4

MAJOR EQUIPMENT FOR OPERATION

The major equipment necessary for the operation of the EWMF varies depending on the period. The equipment involved with the operational period is most extensive. During the other periods of operation, no additional major equipment is expected to be required.

The following equipment may be used during the operational period:

1) Portable pumps for removing the water from the sumps

2) Tanks for the collection and storage of any contaminated sump water

3) Cranes for the movement and placement of the waste within the vaults

4) Fork lifts for the movement and placement of waste containers within the vaults

5) Portable monitoring equipment for the sump water

6) Overhead crane for construction and/or waste container emplacement

7) Air monitors

SECTION 5

NUMBER AND CLASSIFICATION OF OPERATING PERSONNEL

The number and classification of operating personnel has not been determined at this time. The number of personnel will be greatest during the operational period of the EWMF. The other periods of operation will require fewer personnel. The performance period will require no personnel.

SECTION 6

INTERACTION WITH OTHER FACILITIES

It is anticipated that the EWMF will need to interface with other facilities at the FEMP. Some of these other facilities do not exist at this time. It is expected that the EWMF will interface with various waste treatment, waste processing facilities, and transportation on site. In addition, the EWMF will interface with Emergency Management in the event of an accident on site. The EWMF will programmatically interface with the site's Health and Safety, Environmental Monitoring, and Quality Assurance groups.

SECTION 7

NUCLEAR/RADIOACTIVE MATERIALS

The radioactive materials to be stored within the EWMF are those generated as a part of the FEMP remediation project. These materials will come directly from the soils, sludge ponds, waste pits, waste storage facilities, or other areas of the FEMP containing radioactive, hazardous, or mixed waste. These wastes may be treated prior to disposal within the EWMF to immobilize the material or reduce the volume by separating the nonradioactive constituents of the waste.

The estimated waste volumes are gross approximations at this time. The total quantity of radioactively contaminated materials and the final waste forms are not well defined at this time. The effectiveness of the waste processing and treatment facilities will affect the final volume and form of the waste.

An estimate of the volumes of the waste to be disposed of in the EWMF is provided in The Material Handling Study for the Engineered Treatment, Packaging, and Staging Facility (PARSONS 1991e). At the present time only order of magnitude estimates concerning the volumes and concentrations of the waste are available. The major radionuclides of concern are listed below:

1) Uranium 238 (U-238)

2) Thorium 230 (Th-230)

3) Radium 226 (Ra-226)

Other radionuclides will be present in the waste. These other radionuclides are not expected to impact the results of this safety assessment due to the smaller source term for those radionuclides. Uranium-235 will be present in the waste but it is not anticipated that U-235 will exist in sufficient enrichment or concentrations to present a credible condition for criticality.

The decay products of these radionuclides are expected to be present in varying degrees of equilibrium. The radionuclides listed are not the complete list of radionuclides on the site, but they are the most prevalent ones of concern. The estimated average concentrations of constituents are shown in Table 7-1. This table and the effects from any changes in the waste estimates must be addressed in the Preliminary Safety Analysis Report during Title II design.

The waste form and containerization of the waste reduces the possibility and magnitude of a release of these materials to the environment. The amount of material available for transport or dispersion in the

atmosphere depends significantly on the form of the waste, which will be a solid and therefore not easily dispersed.

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WASTE STREAM	WASTE STREAM MEDIA, DESCRIPTION AND SOURCE	U-238 (pCi/g)	Th-230 (pCi/g)	Ra-226 (pCi/g)	TOTAL VOC (ug/kg)	TOTAL SVOC (ug/kg)	TOTAL RCRA METALS (mg/kg)	TOTAL PCB / PEST. (ug/kg)
OU1-1	Soil caps from Pits 1,2,3 and Burn Pit							
OU1-2	Clay cap from Pit 4							
OU1-3	Sludge from Pits 5,6 and Clear Well	5,550	3,383	200	5,600	0	8,860	300
OU1-4	Sludge from Pit 3	750	11,008	187	0	0	8,130	
OU1-5	Sludge from Pits 1,2,4 and Burn Pit	5,280	838	54	3,902	739	4,330	2,778
OU1-6	Standing water from Pit 5 and Clear Well	0	0	0	0	0	0	0
OU1-7	Drums from Pits 1 and 2							
OU1-8	Concrete, steel and equipment from Pit 2							
OU1-9	Clay liners from Pits 1,2,3,4 and Clear Well							
OU1-10	Elastomeric liners from Pits 5 and 6							
OU1-11	Shallow soil from beneath OU1 pit area							
OU1-12	Deep soil from beneath OU1 pit area							
OU2-1	Lime sludge from the north and south lime ponds	4	0	1	0	800	0	600
OU2-2	Fly ash from the active and inactive fly ash piles	13	0	0	0	0	9	300
OU2-3	Waste from the Sanitary Landfill	25	25	0	300	50	0	150
OU2-4	Waste from the Sanitary Landfill	25	25	0	300	50	0	150
OU2-5	Cap soil from Southfield	18	4	3	0	1	1	1
OU2-6	Construction debris from Southfield	18	4	3	0	1	1	1
OU2-7	Asbestos from Sanitary Landfill							
OU3-1	Soil from subunit OU3A	4,005	145	276	5,130	9,850	845	230
OU3-2	Soil from subunit OU3B	35	3,950	1,475	81,500	5,065	1,050	4,300
OU3-3	Soil from subunit OU3C	78	0	0	175	500	690	180
OU3-4	Soil from subunit OU3D	505	10	2	30,550	39,250	2,120	1,110
OU3-5	Miscellenous and solids piles from subunit OU3E							
OU3-6	Miscellenous structures from subunit OU3E					0		
OU3-7	Soil beneath subunit OU3E							
OU3-8	Scrap metal piles from subunit OU3E							
OU3-9	Soil beneath scrap metal piles at subunit OU3E							
OU3-10	Construction rubble mound from subunit OU3E							
OU3-11	Soil beneath construction rubble mound at subunit OU3E							
OU3-12	Perched groundwater from subunit OU3F							
OU3-13	Concrete secondary containment trench for							
	K-65 slurry lines from subunit OU3G							
OU3-14	Soil fill inside containment trench from OU3G							
OU3-15	K-65 slurry lines from subunit OU3G							
OU3-16	Miscellanous equipment from OU3							
OU4-1	Bentonite layer from Silos 1 and 2							
OU4-2	Sludge from Silos 1 and 2	653	25,850	106,913	40,000	3,700	93,000	14,800
OU4-3	Sludge from Silo 3	1,160	46,000	32,750	25,700	20	20,600	0
OU4-4	Accumulated rainwater from Silo 4							
OU4-5	Silos 1, 2 and 3 reinforced concrete structures							
OU4-6	Silos 4 reinforced concrete structure							
OU4-7	Soil beneath Silo 4							
OU4-8	Berm soil adjacent to Silos 1 and 2							
OU4-9	Soil beneath Silos 1, 2 and 3							
OU5-1	Soil from site							
OU5-2	Sediment from site							
OU5-3	Dry sludge from site							
OU5-4	Groundwater from site							

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Table 7-1 - Summary of Average In Situ Constituent Concentrations

SECTION 8

TOXIC AND FLAMMABLE SUBSTANCES

The toxic chemical materials to be stored within the EWMF are generated in similar ways to the radioactive materials which will also be stored in the EWMF. These materials will come directly from the soils, sludge ponds, waste pits, waste storage facilities, or other areas of the FEMP containing toxic materials. These wastes will be treated prior to disposal within the EWMF to immobilize the material or to reduce the volume by separating the toxic constituents of the waste.

There are established waste acceptance criteria for the hazardous wastes disposed in the EWMF. The acceptance criteria are designed to minimize the potential of an explosion or fire due to waste incompatibility. There will be no reactive wastes, explosives, or containerized gases placed in the EWMF. All known pyrophoric or ignitable wastes will be treated or packaged such that they are rendered nonflammable.

The chemical and toxic wastes at the FEMP have not been completely characterized at this time. The best available estimates are order of magnitude estimates concerning the volume and concentrations of the waste to be treated and disposed. The list of chemical wastes most significant to the EWMF are listed below:

1) Volatile organic compounds (VOCs)

2) Semi-volatile organic compounds (SVOCs)

3) RCRA metals

4) PCB compounds and pesticides

The hazardous materials listed above are not intended to be the complete list and other hazardous constituents that may be found. However, these wastes are expected to be the most significant. The average concentrations of the expected wastes are shown in Table 7-1.

SECTION 9

UNIQUE/UNUSUAL SAFETY PROBLEMS

The purpose of this preliminary hazard analysis is to determine the credible accidents that could occur as a result of the operations of the EWMF. The only hazards considered are those unique to the EWMF that are not normally encountered in general industrial settings. The primary source of the unique hazards involved with the EWMF operations is radionuclides and hazardous materials present. The only other hazards present at the EWMF are common industrial hazards.

At this time, there is no performance assessment of the EWMF design nor of the FEMP, so the assumption is that the specified performance criteria will be met. The long-term performance of the EWMF will be determined as a part of a performance assessment per DOE Order 5820.2A. The long term performance criteria that the EWMF must meet are all well below the Moderate Hazard Guidelines listed in procedure SP-A-01-013. Thus, the safety assessment will only consider the hazards associated with potential credible accidents during the operational period. These hazards will bound the actual risks associated with the facility.

9.1 Description of Hazards

This section describes the possible hazards and the credibility of the hazards.

9.1.1 Electrical

The hazards associated with the electrical power supply are those normally encountered in industrial settings. No accidents were hypothesized that could cause a release of radioactive or hazardous materials from the EWMF or the waste packages.

9.1.2 Nuclear Criticality

The radioactive wastes to be disposed of in the EWMF contain depleted and natural uranium as the main constituent; however, there may be some slightly enriched uranium and the LCLDS may collect fissile U-235 along with any other leached wastes from the vault. It is not anticipated that U-235 will exist in sufficient enrichment, or concentrations to present a credible condition for criticality. The design of the EWMF and LCLDS is required to include the reduction in probability of a criticality so that it is an incredible event. A criticality occurring in the LCLDS during the operational period of the EWMF is taken to be incredible as a result of the waste treatment and stabilization reducing the leachability.

9.1.3 Drop of Container from Height

The falling of a container from an overhead crane or a fork lift truck has the potential to release the contents of the container to the atmosphere or environment. The consequences of dropping a container from a height are assessed in Section 9.5.2.

9.1.4 Storage of Compressed Gases

There will be no known compressed gases stored within the EWMF or disposed of as waste. A complete equipment list has not yet been developed for the EWMF operations, but there is no anticipated need for stored compressed gases. This accident will not be considered further at this stage.

9.1.5 Rotational Kinetic Energy

The only rotational kinetic energy expected to be encountered during EWMF operations are those associated with the rotating part of the crane, pulley, or fork lift components. These sources of rotational kinetic energy present common industrial hazards. No release of radioactive or hazardous materials is expected to occur as a result of an accident associated with the rotational kinetic energy. This accident scenario does not require further development.

9.1.6 Linear Kinetic Energy

There is the possibility that a fork lift or other material handling equipment could puncture a waste container as a result of improper operations or an accident. The punctured container could release radioactive or hazardous waste to the atmosphere or environment. This scenario is developed in Section 9.5.3.

9.1.7 Corrosive

Criteria for the acceptance of wastes containing bases and acids for disposal in the EWMF have not yet been determined. These acids and bases will be neutralized prior to waste emplacement. The only potential consequence hypothesized for the bases and acids in the EWMF is an accelerated leaching or degradation of the waste container and containment liner. The acceptability of this is limited by the performance criteria for a waste disposal facility as specified in DOE Order 5820.2A. The performance criteria for disposal facilities are stated in DOE Order 5820.2A. The performance requirements of DOE Order 5820.2A requires that the hazards associated with the long-term storage and disposal of the waste do not result in more than 25 mrem/yr off-site or 100 mrem/yr on-site to an inadvertent intruder. These criteria are all within the low hazard classification. The consequences of storing corrosive materials in the EWMF will be assessed as part of a performance assessment, and the consequences must lie within

the low hazard ranking per the maximum dose allowed in DOE Order 5820.2A. The concentrations of corrosive material within the waste following treatment is not expected to be of a concentration high enough to present an exposure problem. This scenario will not be developed further as a part of the safety assessment.

9.1.8 Explosive/Pyrophoric

The waste acceptance criteria of the EWMF require that any pyrophoric waste be treated or packaged so that it is rendered nonflammable prior to disposal. Because of this treatment, an accident directly involving pyrophoric material would require a double-failure accident scenario. Thus, the possibility such as a double failure is considered to be highly unlikely or incredible. The only potential accident involving the pyrophoric wastes would be an accident external to the waste package itself. This accident scenario is not explicitly modeled further.

The generation of hydrogen through radiolysis is possible. The quantity of hydrogen produced and the potential for an explosion must be assessed when more detailed information concerning the waste is available. It is believed that this event will be physically impossible (during the operational period) due to the small generation rate of the hydrogen and the waste form containing the majority of the hydrogen within its matrix.

Reactions of certain metals with water can produce hydrogen gas. The possibility of this reaction is reduced at the EWMF by treating and packaging all reactive metals so that they are rendered nonflammable.

9.1.9 Flammable Materials

There may be flammable wastes disposed of in the EWMF. There is also the potential to produce hydrogen gas which is flammable. However, the potential for a release to the atmosphere is not significant during and following a fire accident at the EWMF due to the solidified form of the waste. Wastes stored at the EWMF will be solidified and consolidated or will be a consolidated grout. The source term from this accident should be less than that assumed for the drop of a non-consolidated powder (conservative) from a height.

9.1.10 External Radiation Exposure

The dose rates from the majority of the waste forms are expected to be low (< 10 mrem/hr); however, the exposure to external radiation from the EWMF waste packages during the operational period is a concern. The preferred alternative for the K-65 residue material is vitrification. The dose rate from the

residue, if vitrified, is expected to be low relative to the dose rate from the present state of the K-65 residue.

Design considerations and administrative controls are used to limit the routine exposure of workers to levels that would classify the EWMF in the low hazard category. An accident involving the waste packages at the EWMF would not significantly increase the external dose rate to an individual. The hazards due to external radiation are primarily an operational concern and do not contribute significantly to the dose involved with an accident. During an accident, the primary concern is the internal exposure to radionuclides or hazardous materials. The internal effects of a material release is evaluated as a part of the accident analyses in Section 9.5.

9.1.11 Toxic/Pathogenic

Toxic or pathogenic waste may be disposed of in the EWMF but will be treated to minimize the hazards. There is no normal exposure path to these wastes as a part of the operational period of the EWMF. The only exposure to these materials would be as a result of an accident involving a waste container or vault used to store these materials. The consequences of these materials needs to be included in the accident scenarios developed when more detailed information concerning the specific types of hazardous materials becomes available.

9.1.12 External Hazards

The possible external hazards considered are shown in Table 9-1. The consequences of these events could release radioactive or hazardous material.

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Table 9-1 - External Events Affecting the EWMF

Natural Processes	Natural Events	Man-Caused Events
Climatic Fluctuations	Flood Erosion	Inadvertent Intrusion
Glaciation	Seismicity	Perturbation of Groundwater
Tectonic Forces	Tornado/High Winds	Improper Waste Emplacement
New or Undetected Fault Rupture	Meteor Strike	Improper Design
Aquifer Flux Variation	Lightning Strike	Aircraft Crash
Soil Erosion		Rail Car Explosion
Tree Roots		Adjacent Facility Accident
Burrowing Animals		

A natural process is a natural occurrence that takes place over a period of time and a natural event is a natural occurrence that takes place over a short period of time. None of the natural process listed in Table 9-1 are expected to occur during the operational period of the EWMF and are not considered further. These processes may occur during the performance period and need to be considered in the performance assessment.

The man-caused events are not likely to affect the EWMF during any period except the performance period and need further consideration as a part of the performance assessment. An airplane crash has been determined not to be a credible event for the FEMP during the operational period due to the time frame of consideration and the low probability of the event.

The probability of a meteor strike is an incredible event per DOE/OR-901 and is not considered further. The EWMF will be located above the 100-year flood plain; therefore, the flood erosion accident does not need further consideration for the operational period. The other natural events listed in Table 9-1 require further development as a part of the Preliminary Safety Analysis Report and Final Safety Analysis Report.

9.2 Source Terms

9.2.1 Radiological Source Terms

The radiological source terms were developed individually for each accident scenario assessed in detail. The various accidents are each capable of releasing materials in a quantity or method unique to the accident considered. The radiological source terms are presented in the subsections of Section 9.5 that describe the accident scenario.

9.2.2 Chemical Source Terms

The chemical source terms are presented in a similar manner as the radiological source terms. These source terms are presented under the appropriate accident scenario in Section 9.5.

9.3 Other Non-Standard Hazards

All of the nonstandard hazards associated with the operations of the EWMF involve the presence of radioactive or toxic chemical materials.

9.4 Non-Reactor Nuclear Facility Determination

The EWMF meets the definition of a nuclear facility as specified in DOE Order 5480.5 Section 5.f . The EWMF does handle/store radioactive materials that are in sufficient quantity to present a potential nuclear

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hazard to the employees or general public. The EWMF is a Radioactive Solid Waste Facility as defined in DOE Order 6430.1A, Division 13, because it is used for the disposal of radioactive solid waste generated by nuclear facilities and wastes resulting from past operations of nuclear facilities.

9.5 Accident Scenario Assessment

9.5.1 Nuclear Criticality

The average concentration of uranium in the untreated waste is expected to be about 5,000 pCi/g (based on the draft RI/FS data). While the final treatment and waste form have not been selected, the EWMF Conceptual Design Report assumes that the waste will be treated and transferred to the EWMF as a slurry. This waste processing will homogenize (making the use of the average uranium concentration realistic) and reduce the uranium concentration in the waste. In addition, this process is intended to immobilize the uranium resulting in a smaller fraction of uranium leaching from the waste, thus minimizing the amount of uranium collecting in a LCLDS sump.

The concentration of the uranium in the waste will make a criticality within the EWMF vault incredible; however, there is the possibility that the uranium may leach and be collected in the LCLDS. This leaching will alter the geometry and concentration of the uranium making a nuclear criticality a potential event. The leaching of the waste during the operational period will be negligible making a criticality during that period incredible. Criticality may be a concern during the performance period.

9.5.2 Drop of Container from Height

The use of a forklift in the transportation and placement of the waste containers leads to the possibility of dropping a container from a height sufficient to cause damage to the integrity of the container. This accident could result in the release of contaminated material (hazardous and/or radioactive materials). The source term for this accident scenario is assumed to be limited to the contents of one waste container. The container size is based on a standard B-25 box (see Figure 9-1). A Department of Transportation Type-A high-integrity container of similar size may be used to facilitate eventual retrieval and transport. The wastes in a container are to be liquid free solids and are assumed (for source term calculations) to be non-consolidated.

This event would be considered a low energy event. There is no energy source to cause a continued release. The fraction of airborne contamination is estimated based on the guidance provided in NUREG-1320 (NUREG 1988) for spills of powders. This methodology provides a conservative estimate of the fraction of airborne contaminants because the waste is containerized and not a free form during the fall. In addition, the waste will be in a grout form which would be less likely to be suspended in air because it would be semi-consolidated or consolidated.

The release fraction estimated to occur from a 13 foot fall is 0.00078 (0.078%) (PARSONS 1991b). This also conservatively assumes the grout had not solidified in the B-25 box and is in a dry non-consolidated powder form at the time of the accident. The waste is assumed to be contained in B-25 boxes (other containers are possible but were not evaluated). A B-25 box is shown in Figure 9-1. The maximum mass of material expected to be in a B-25 box is 10,000 lbs. The amount of material released into the air is approximately 7.8 pounds (PARSONS 1991b). The activity of the waste in the B-25 box is assumed to come from Sludge Pit 3 since it contains the highest concentration of The-230 which is the most hazardous radionuclide. The waste from the Operable Unit 4 (OU-4) Silos is higher in hazard than the Sludge Pit 3 wastes at this time; however, it is anticipated that the OU-4 Silos waste will be vitrified prior to disposal. The K-65 residue, if vitrified, will be a hard solid block of glass and not capable of creating a significant airborne hazard.

The maximum committed dose due to this scenario is expected to be 0.27 rem on-site at 100m from the accident and 0.016 rem off-site at 500m from the accident (PARSONS 1991b). The maximum chemical hazards will need further assessment when specific waste information is available. It is expected that the chemical hazards will be less severe than the radiological hazards due to the assumption that the waste involved in the accident has a high Thorium-230 concentration.

9.5.3 Linear Kinetic Energy Puncture of a B-25 Box

This accident scenario is not expected to result in a greater source term than the release associated with the dropping of a B-25 box from a forklift. This is due to the limited impact of the forklift and the puncture diameter of the hole potentially created. Since the release is less than the release associated with the dropping of a container, the resulting consequences of this event are less.

9.5.4 Explosive/Pyrophoric

The generation of hydrogen through radiolysis is possible and the quantity of hydrogen produced and the potential for an explosion must be assessed when more detailed information concerning the waste is available. However, it is believed that this event will be physically impossible due to the small generation rate of the hydrogen and the fact that the waste form will trap the majority of the hydrogen within its matrix.

9.5.5 Flammable Materials

The storage containers and vault design will minimize the possibility of a fire in the EWMF. However, a potential fire could be started by an ignition source external to the EWMF (i.e., lightning). The only flammable materials, in the EWMF susceptible to a fire, will be those used in the construction and operation of the EWMF. The wastes are not expected to be exposed directly to the fire due to the

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containerization of the flammable waste. Since the containerized flammable wastes are not exposed directly to the fire, the source term is limited and expected to be less than the source term from the B-25 container rupture due to a container drop.

9.5.6 Seismicity

The accidental releases as a result of an earthquake during the operational period are assumed to be less than that of the release associated with the drop of a free falling non-consolidated material. This is because there is no expected release mechanism as a result of an earthquake except for an increase in the leachability of the waste due to the cracking of the liners or the consolidated waste. This accident is not a concern during the operational period due to the low probability of an earthquake and the low consequences expected as a result of an earthquake.

9.5.7 Tornado/High Winds

The B-25 boxes are estimated to weigh approximately 10,000 pounds and are therefore, not susceptible to relocation or damage due to direct high winds. The potential susceptibility to tornadoes would be damage to a B-25 box as a result of a missile penetration. The source term for this accident is expected to be less than the source term from the B-25 container rupture due to a container drop. In addition, the dispersion of the material released would be much greater than that during calm atmospheric conditions, thus the consequences would be less severe due to the turbulent dispersion.

The vaults are to be designed to at least meet the design requirements of UCRL-15910 and DOE Order 6430.1A.

B-25 LSA WASTE CONTAINER

FOR THE STORAGE AND SHIPPING OF LSA MATERIALS

DIMENSIONS (INCHES)	INTERIOR	EXTERIOR
HEIGHT	47	52
WIDTH	46	47
LENGTH	72	73

DESCRIPTION

CLASSIFICATION	LSA WASTE CONTAINER
PACKAGE TYPE	CFR SPECIFICATION "STRONG-TIGHT"
CAPACITY	90 CUBIC FEET
MATERIAL	ASTM A-569 LOW CARBON HOT ROLLED STEEL
GROSS WEIGHT (EMPTY)	445 POUNDS TO 895 POUNDS
PAYLOAD	4,000 POUNDS TO 10,000 POUNDS
MAX. LOADED WEIGHT	4,445 POUNDS TO 10,895 POUNDS

ADDITIONAL INFORMATION

MEETS GENERAL CONTAINER REQUIREMENTS (49 CFR 173.24) FOR ASBESTOS, ORM AND HAZARDOUS WASTE MATERIALS.

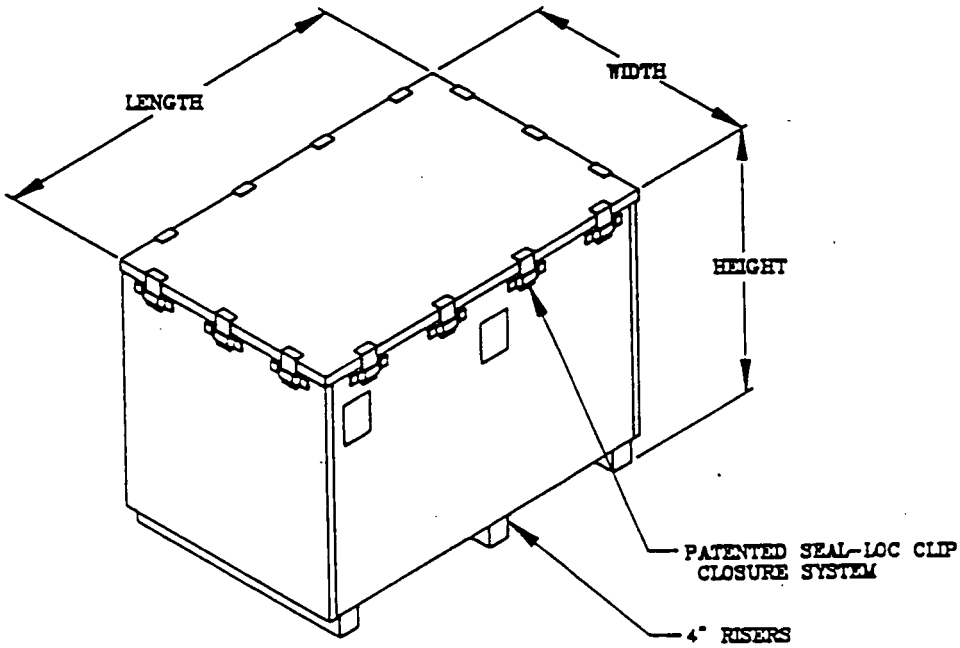
PATENTED, EXCLUSIVE "SEAL-LOC" POSITIVE CLOSURE SYSTEM TO PRECLUDE INADVERTENT OPENING.

OPTIONAL REMOVABLE RISERS

OPTIONAL ANTI-SPRINGBACK RETENTION SYSTEM FOR COMPACTOR APPLICATION

FINAL PROTECTIVE FINISH TO MEET CUSTOMER REQUIREMENTS

OPTIONAL SHIELDING AVAILABLE



U.S. PATENT NUMBERS 4371092 AND 4426927

ONTAINER
RODUCTS
ORPORATION

CONTAINER PRODUCTS CORPORATION
P.O. BOX 3767 112 NORTH COLLEGE ROAD
WILMINGTON, NORTH CAROLINA 28405
(919)392-6100 FAX (919)392-6778

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Figure 9-1 - B-25 Box (Source: Container Products Corporation)

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SECTION 10

EXISTING SAFETY DOCUMENTATION

There are no Preliminary or Final Safety Analysis Reports completed for the EWMF, so there is no comprehensive safety document to compare the facility's risks. A Preliminary Safety Analysis Report will be generated during the Title I/II design phases and a Final Safety Analysis Report during Title III prior to operation per DOE Orders 5820.2A, 5480.5, 4700.1 and 6430.1A.

SECTION 11

CONCLUSIONS

11.1 Facility Hazard Classification

Based on the data available, the EWMF will be within the Low Facility Hazard Classification as defined in SP-A-01-013 and DOE Order 5481.1B. The facility poses negligible threats to the general public and the environment during the operational periods of the facility. The performance requirements of DOE Order 5820.2A requires that the hazards associated with the long term storage and disposal of the waste not result in more than 25 mrem/yr off-site or 100 mrem/yr on-site to an inadvertent intruder. These levels of dose fall within the low hazard range per SP-A-01-013.

Although the facility presents low hazards, the facility is required to meet more stringent requirements for the long term storage or disposal of wastes. It is required that more stringent design criteria than those required per DOE Order 6430.1A and UCRL 15910 for a low hazard facility be used in order to meet the performance requirements of DOE Order 5820.2A and other pertinent ARARs.

11.2 Non-Reactor Nuclear Facility Determination

The EWMF was determined to be a non-reactor nuclear facility per the guidance provided in DOE Orders 5480.5 and 6430.1A.

11.3 Safety Documentation

There is no existing safety documentation for the EWMF. The facility hazard classification does not determine the extent of the safety documentation required for a long term storage or waste disposal facility because a PSAR must be generated during the Title I/II design phase and a FSAR during Title III per DOE Orders 5820.2A, 5480.5, 4700.1 and 6430.1A. The PSAR/FSAR will incorporate the results of the Performance Assessment performed in accordance with DOE Order 5820.2A.

11.4 Design Criteria

The EWMF must meet at a minimum the design criteria specified in DOE Order 6430.1A and UCRL 15910 for a low hazard facility. However, as stated in Section 11.1, the EWMF is required to meet more stringent design criteria than required per DOE Order 6430.1A and UCRL 15910 for a low hazard facility in order to meet the long term performance requirements of DOE Order 5820.2A and other pertinent ARARs. UCRL 15910 and DOE Order 6430.1A present design requirements based on hazard classification; however, a disposal facility must meet the more restrictive performance requirements of DOE Order 5820.2A for at least 200 years.

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SECTION 12

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