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SITEWIDE EXCAVATION PLAN

RNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

VOLUME I
SECTIONS 1 through 7

JULY 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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JUL 30 1998

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Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL: FINAL SITEWIDE EXCAVATION PLAN, CHANGE PAGES TO AREA 1, PHASE I CERTIFICATION REPORT, FINAL AREA 2, PHASE I INTEGRATED REMEDIAL DESIGN PACKAGE, AND DRAFT CERTIFICATION REPORT FOR AREA 8, PHASE I

The purpose of this letter is to transmit, for your review and approval, the following Soils Remediation documents and reports:

- Final Sitewide Excavation Plan
- Change Pages finalizing the Area 1, Phase I Certification Report
- Final Area 2, Phase I Integrated Remedial Design Package including a draft comment response package addressing comments received on the characterization addendum (final construction drawings will be submitted by August 14, 1998).
- Draft Certification Report for Area 8, Phase I

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If you should have any questions or comments, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

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SITEWIDE EXCAVATION PLAN

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INFORMATION ONLY

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000004

FINAL

TABLE OF CONTENTS

List of Tables . . . viii
List of Figures . . . viii
List of Acronyms . . . x
Executive Summary . . . ES-1

1.0 Introduction . . . 1-1
1.1 Objectives and Scope of the Sitewide Excavation Plan . . . 1-1
1.2 Background . . . 1-5
1.2.1 Transition from the Operable Unit Concept . . . 1-5
1.2.2 Integrated Implementation Approach . . . 1-7
1.3 Factors Driving Remediation . . . 1-11
1.3.1 Regulatory Drivers . . . 1-11
1.3.1.1 Applicable or Relevant and Appropriate Requirements and to Be Considered Criteria . . . 1-11
1.3.1.2 Permits . . . 1-12
1.3.1.3 Agreements . . . 1-13
1.3.1.4 Natural Resources Trusteeship . . . 1-14
1.3.2 Components of the Sitewide Selected Remedy . . . 1-15
1.3.2.1 Soil and Sediment . . . 1-15
1.3.2.2 Perched Water . . . 1-17
1.3.2.3 Storm Water/Wastewater . . . 1-17
1.3.2.4 Remediation Debris . . . 1-18
1.3.2.5 Waste from Operable Unit 2 Subunits . . . 1-18
1.3.2.6 Corrective Action Management Unit Rule . . . 1-18
1.3.2.7 RCRA Characteristic Waste Disposal . . . 1-20
1.3.2.8 Measures to Minimize Environmental Impacts . . . 1-21
1.3.2.9 Sitewide Environmental Monitoring . . . 1-22
1.3.2.10 Institutional Controls/monitoring . . . 1-22
1.3.2.11 Community Involvement . . . 1-23
1.3.3 Final Land Use . . . 1-24
1.4 Organization of the Sitewide Excavation Plan . . . 1-24
1.4.1 Contents of the Sitewide Excavation Plan . . . 1-24
1.4.2 Related Documents . . . 1-26
1.5 Schedule for Agency Submittals . . . 1-28

2.0 Remediation Issues and General Strategies . . . 2-1
2.1 Remediation Drivers . . . 2-1
2.1.1 Resource Conservation and Recovery Act . . . 2-2
2.1.1.1 Hazardous Waste Management Units . . . 2-2
2.1.1.2 Underground Storage Tanks . . . 2-3
2.1.1.3 Toxicity Characteristic Hazardous Wastes . . . 2-4
2.1.2 Waste Acceptance Criteria . . . 2-5
2.1.2.1 Waste Acceptance Criteria for Off-Site Disposal Facilities . . . 2-6
2.1.2.2 Waste Acceptance Criteria for the On-Site Disposal Facility . . . 2-6

TABLE OF CONTENTS
(Continued)

2.1.3 Final Remediation Levels 2-10
2.1.3.1 Primary and Secondary Constituents of Concern 2-12
2.1.3.2 Area-Specific Constituents of Concern 2-12
2.1.4 Ecological Constituents of Concern 2-13
2.1.5 Department of Energy Orders 2-14
2.1.5.1 General Guidelines for the Size of Certification Units 2-14
2.1.5.2 Radiological Hot Spots 2-15
2.1.5.3 As Low As Reasonably Achievable Requirements 2-15
2.2 Attainment of Remediation Goals 2-16
2.2.1 Demonstrating On-Site Disposal Facility Waste Acceptance Criteria Attainment 2-16
2.2.2 Certifying Final Remediation Level Attainment 2-18
2.2.3 Detection of and Criteria for Hot Spots 2-19
2.2.4 RCRA Characteristic Waste Compliance 2-21
2.2.5 Hazardous Waste Management Unit Closure 2-22
2.2.6 Underground Storage Tank Closure 2-23
2.3 General Implementation Guidelines 2-24
2.3.1 Remediation Priorities 2-24
2.3.2 Implementation Procedures 2-25
2.3.3 Sequencing and Coordination 2-25
2.3.3.1 Sitewide Sequencing Approach 2-25
2.3.3.2 Sequencing Within a Remediation Area 2-26
2.3.4 Contingency Plans 2-27
2.3.5 Material Information Tracking 2-27
2.3.6 Quality Assurance 2-27
2.3.7 Reporting Requirements 2-28
2.3.8 Health and Safety 2-28
2.4 Measurement Approaches 2-29
2.4.1 Remedial Action Applications 2-29
2.4.2 Field Measurements 2-30
2.4.3 Discrete Sampling and Laboratory Analysis 2-30
2.4.4 Design Considerations for Area-Specific Measurement Approach 2-32
2.5 Logistics 2-33
2.5.1 Area-Specific Conditions 2-33
2.5.2 Sitewide Environmental Database 2-34
2.5.2.1 Subsets of the SED 2-34
2.5.2.2 Screening Approach for Waste Acceptance Criteria and Final Remediation Level Area-Specific Constituents of Concern 2-36
2.5.3 Data Gaps 2-37
2.5.4 Perched Water 2-37
2.5.5 Deep Pile Foundations 2-40
2.5.6 Subsurface Utility Lines 2-41
2.5.7 Cross-Contamination/Recontamination 2-41
2.5.8 Special Materials 2-43
2.5.9 Capacity 2-44

000006

TABLE OF CONTENTS
(Continued)

2.5.10 Off-Site Shipments 2-44
2.5.11 Weather 2-45
2.5.12 Access to Off-Property Areas 2-46
2.5.13 Grading and Restoration 2-47

3.0 General Implementation Approach 3-1
3.1 Predesign Investigation 3-2
3.1.1 Types of Potential Excavation Areas 3-3
3.1.1.1 Overall Excavation Extent 3-3
3.1.1.2 Excavation/Segregation Phases 3-4
3.1.2 Predesign Sampling and Analysis 3-5
3.1.2.1 Material Contaminated by Technetium-99 3-6
3.1.2.2 RCRA Waste 3-6
3.1.2.3 Material Containing COCs Above WAC 3-6
3.1.2.4 Other Considerations 3-7
3.1.3 Establish Extent of Excavation 3-8
3.2 Remedial Design and the IRDP 3-10
3.3 Remedial Action 3-11
3.3.1 Implementation of Construction, Excavation, and Material-Handling Activities 3-11
3.3.1.1 Site Preparation 3-11
3.3.1.2 Excavation Hierarchy 3-12
3.3.1.3 Treatment, Special Handling, and Disposal Options 3-14
3.3.1.4 ALARA Implementation 3-15
3.3.1.5 Reuse of Soil During Remedial Actions 3-15
3.3.2 Impacted Materials Handling and Tracking 3-15
3.3.2.1 Disposition Categories 3-16
3.3.2.2 Special Materials 3-17
3.3.3 Precertification Activities 3-17
3.3.3.1 Field Survey to Evaluate Residual Radionuclide Distributions 3-18
3.3.3.2 Determination of CU Size, Area-Wide CU Delineation, and CU-Specific COCs 3-18
3.3.3.3 Final Field Measurements and Excavation, as Needed 3-21
3.3.4 Attainment of Remediation Goals 3-22
3.4 Certification 3-22
3.4.1 Classification and Delineation of CUs 3-23
3.4.2 Sampling Design 3-23
3.4.2.1 Soil Sampling Locations 3-23
3.4.2.2 In Situ Soil Measurements for Gamma Emitters 3-25
3.4.2.3 Laboratory Analysis 3-25
3.4.2.4 Special Considerations for Off-Property Certification 3-26
3.4.3 Statistical Analysis 3-27
3.4.4 Criteria for Attainment of Certification 3-28
3.4.5 Procedures for Nonattainment Scenarios 3-28
3.4.6 Implementation Strategy for the Hot Spot Criteria 3-30

TABLE OF CONTENTS
(Continued)

3.4.7 Certification Report 3-31
3.5 Postremediation Action 3-32
3.5.1 Interim Actions 3-32
3.5.1.1 Access Controls 3-32
3.5.1.2 Surface Stabilization After Certification 3-32
3.5.1.3 Interim Monitoring 3-33
3.5.1.4 Runoff Control 3-33
3.5.2 Final Land Use Development 3-33
3.5.2.1 Final Grading 3-33
3.5.2.2 Access Controls 3-33
3.5.3 Final Land Use 3-33
3.5.3.1 Wetlands 3-34
3.5.3.2 Open Water Areas 3-34
3.5.3.3 Woodlands 3-34
3.5.3.4 Riparian Areas 3-34
3.5.3.5 Grasslands 3-34
3.5.3.6 Postremediation/Postclosure Care and Inspection 3-34
3.6 Record Keeping and Information Management 3-35
3.6.1 Information Management Objectives 3-35
3.6.2 Integrated Information Management System 3-36
3.6.3 Operational Documents 3-36
3.6.3.1 Construction Drawings and Associated Field Logs 3-37
3.6.3.2 Analytical Data and Associated Field Logs 3-37
3.6.3.3 Miscellaneous Field Logs 3-37
3.6.3.4 Manifest-type Documents 3-37
3.6.3.5 Specialized Waste Handling Documents 3-37
3.6.4 Field Documentation and Information Management Activities 3-38
3.6.4.1 Tracking System for Waste Stream Categories 3-38
3.6.4.2 Other Field Data 3-39

4.0 Location-Specific Excavation Approaches 4-1
4.1 Excavation Approach A-Shallow Excavation of Impacted On-Property Area Outside the Former Production Area and Other Waste Storage/Management Areas 4-3
4.1.1 General Description 4-3
4.1.2 Special Considerations 4-4
4.1.2.1 Nature and Extent of Contamination 4-4
4.1.2.2 Radiological Scanning and Field Measurements 4-5
4.1.2.3 Attainment of Waste Acceptance Criteria 4-5
4.1.3 Excavation Details 4-6
4.2 Excavation Approach B - Excavation in Waste Storage/Management Areas Outside the Former Production Area 4-13
4.2.1 General Description 4-13
4.2.2 Special Considerations 4-14
4.2.2.1 Nature and Extent of Contamination 4-15
4.2.2.2 Radiological Scanning and Field Measurements 4-15

000005

TABLE OF CONTENTS
(Continued)

4.2.2.3 Attainment of Waste Acceptance Criteria 4-16
4.2.2.4 Logistics 4-16
4.2.3 Excavation Details 4-17
4.3 Excavation Approach C - Excavation of Existing Soil Stockpiles and Management of Containerized Soil in the Former Production Area and Remediation Area 1, Phase I 4-23
4.3.1 General Description 4-24
4.3.2 Special Considerations 4-25
4.3.2.1 Nature and Extent of Contamination 4-26
4.3.2.2 Radiological Scanning and Field Measurements 4-26
4.3.2.3 Attainment of Waste Acceptance Criteria 4-26
4.3.3 Excavation Details 4-26
4.4 Excavation Approach D - Excavation Following D&d in the Former Production Area, STP, and FTF 4-30
4.4.1 General Description 4-31
4.4.2 Special Considerations 4-32
4.4.2.2 Radiological Scanning and Field Measurements 4-33
4.4.2.3 Attainment of WAC 4-33
4.4.2.4 Logistics 4-34
4.4.3 Excavation Details 4-35
4.5 Excavation Approach E - Off-Property and Nonimpacted On-Property Area Certification 4-42
4.5.1 General Description 4-42
4.5.2 Special Considerations 4-43
4.5.2.1 Nature and Extent of Contamination 4-43
4.5.2.2 Radiological Scanning and Field Measurements 4-43
4.5.2.3 Attainment of WAC 4-43
4.5.3 Excavation Details 4-44
4.6 Excavation Approach F - Non-HPDE Pipeline Excavation Outside the Former Production Area 4-47
4.6.1 General Description 4-47
4.6.2 Special Considerations 4-48
4.6.2.1 Nature and Extent of Contamination 4-48
4.6.2.2 Radiological Scanning and Field Measurements 4-48
4.6.2.3 Attainment of WAC 4-49
4.6.2.4 Logistics 4-49
4.6.3 Excavation Details 4-50

5.0 Environmental Controls And Monitoring 5-1
5.1 Project-specific Control Mechanisms and Monitoring 5-2
5.1.1 Natural Resource Impacts 5-2
5.1.2 Air Pathway 5-3
5.1.2.1 Noise 5-4
5.1.2.2 Fugitive Emissions 5-5
5.1.2.3 Airborne Radiological Particulates 5-9

TABLE OF CONTENTS
(Continued)

5.1.2.4 Radon 5-11
5.1.2.5 Direct Radiation 5-11
5.1.3 Surface Water Pathway 5-12
5.1.4 Groundwater Pathway 5-20
5.2 Coordination with Sitewide Monitoring 5-23
5.2.1 Air Pathway 5-23
5.2.2 Surface Water Pathway 5-24
5.2.3 Groundwater Pathway 5-24
6.0 Project Health And Safety 6-1
6.1 Project-Specific Health And Safety Plans 6-1
6.2 Subcontractor Safe Work Plans 6-3
6.3 Emergency Preparedness 6-4
6.4 Occupational Air Monitoring (Employee Exposure) 6-5
6.4.1 Sampling Strategy 6-5
6.4.1.1 Activities to be Sampled 6-5
6.4.1.2 Contaminants of Concern 6-6
6.4.1.3 Available Historical Data 6-6
6.4.1.4 Monitoring for Unidentified Contaminants 6-6
6.4.2 Monitoring Methods and Frequency 6-7
6.4.2.1 Personal Air Sampling Planned During Project Work 6-7
6.4.2.2 General Area Air Sampling Planned During Project Work 6-8
6.4.3 Results and Action Levels 6-9
6.4.4 Data Reporting and Documentation 6-9
6.4.5 Quality Assurance 6-10
6.4.5.1 Calibration/Analysis Requirements 6-10
6.4.5.2 Sample Chain of Custody 6-10
6.4.5.3 Sample Blanks 6-10
6.4.5.4 Special Sample Storage/Handling Requirements 6-10

7.0 Soil Remediation Documents 7-1
7.1 Project-Specific Plans 7-2
7.1.1 Content of Project-Specific Plans 7-2
7.1.2 Content of Data Summary Reports 7-3
7.2 Integrated Remedial Design Package 7-4
7.2.1 Design Package Components 7-4
7.2.2 Model Outline 7-6
7.2.3 Schedule 7-8
7.2.4 Review and Finalization of Design Deliverables 7-8
7.3 Certification Design Letter 7-8
7.3.1 Contents 7-9
7.3.2 Schedule 7-9
7.4 Certification Report 7-10
7.4.1 Contents 7-10
7.4.2 Certification Report Outline 7-11
7.4.3 Schedule, Review and Finalization 7-13

000010

TABLE OF CONTENTS
(Continued)

7.5 Other Related Future Documents 7-14
7.5.1 Natural Resources Restoration Plan and Design Packages 7-14
7.5.2 Remedial Action Report 7-15
7.5.3 Site Closeout Report 7-16

APPENDICES

Appendix A Soil Remediation ARARs and TBCs
Appendix B Sitewide Sequencing Plan
Appendix C Selection of Ecological Constituents of Concern
Appendix D Wood Sampling Program
Appendix E SEP Quality Assurance Job Specific Plan (QajSP)
Appendix F Implementation of Construction
Appendix G Certification Design Rationale
Appendix H Summary of Field Measurement And Laboratory Analytical Technologies
Appendix I Sitewide Extent of Contamination by Constituent

LIST OF TABLES

Table 1-1 FEMP Operable Unit Remedies and Associated Project Responsibilities
Table 1-2 Cross-Reference Between Operable Unit Remedy Components and the Sitewide Excavation Plan
Table 1-3 Required Project Plans
Table 1-4 Summary of Contaminant Levels Pertinent to Soil Remediation at the FEMP
Table 1-5 Schedule of Remedial Design Deliverables
Table 2-1 Hazardous Waste Management Units to be Closed Under CERCLA
Table 2-2 Underground Storage Tanks to be Closed Under CERCLA
Table 2-3 Areas Potentially Containing RCRA Characteristic Waste in Soil
Table 2-4 Radiological and Chemical Waste Acceptance Criteria and Prohibited Items for OSDF
Table 2-5 Physical Waste Acceptance Criteria (WAC) and Prohibited Items for the On-Site Disposal Facility (OSDF)
Table 2-6 Summary of Sitewide Constituents of Concern (COCs)
Table 2-7 Preliminary Identification of Primary, Secondary, and Ecological COCs Assigned to Remediation Areas
Table 2-8 Measurements and Analysis
Table 3-1 Summary of Sampling Tasks and Analytes
Table 4-1 Excavation Approach Tied to Remediation Areas
Table 4-2 Remediation Areas Tied to Excavation Approach
Table 4-3 Cross-Contamination of Tasks Within the Excavation Approach
Table 5-1 Dust Control Requirements
Table 6-1 Occupational Monitoring and Action Levels
Table 7-1 Hierarchy and Content of Soil Remediation Documents
Table 7-2 Example of Statistical Information to be Included in the Certification Report
Table 7-3 Remedial Action Completion Reporting

LIST OF FIGURES

Figure ES-1 Sitewide Excavation Plan Organization
Figure 1-1 General Area-Specific Soil Remediation Process
Figure 1-2 Hierarchy of Soil Remediation Documents
Figure 1-3 Generalized Sitewide Remediation Areas
Figure 1-4 Potential Excavation Footprint, Based on Operable Unit 5 FS
Figure 1-5 Areas Requiring Further Characterization and Potential Treatment of RCRA Toxicity Characteristic Wastes
Figure 1-6 RCRA-Regulated Soil Treatment and Disposal Requirements
Figure 2-1 FEMP Areas with Total Uranium Concentrations Potentially Greater than WAC
Figure 2-2 FEMP Areas with Tc-99 Levels Potentially Greater than WAC/FRL
Figure 2-3 Areas with Lower Uranium FRL Due to High Leachability
Figure 3-1 General Soil Remediation Process
Figure 3-2 General Predesign Investigation Process
Figure 3-3 Establish Extent of Excavation
Figure 3-4 Conceptual Side Slope Configuration for Deep Excavation

LIST OF FIGURES
(Continued)

Figure 3-5 General Soil Segregation/Disposal Process
Figure 3-6 RCRA-Regulated Soils Treatment and Disposal Requirements
Figure 3-7 Proposed Trap Range Remediation Strategy
Figure 3-8 General Precertification Activities
Figure 3-9 General Certification Sampling Strategy
Figure 3-10 General Certification Procedure
Figure 3-11 Hot Spot Criteria and Implementation Strategy
Figure 3-12 Site Database Relationships
Figure 3-13 Operational Documents and SCEP Functional Organizations
Figure 3-14 Material Destination Decisions and Organizational Hand-Off
Figure 4-1 Proposed Excavation Approaches within Sitewide Remediation Areas
Figure 4-2 Anticipated Excavation Areas for Excavation Approach A (For Information Purposes Only)
Figure 4-3 Logical Flow for Excavation Approach A
Figure 4-4 Anticipated Excavation Areas for Excavation Approach B (For Information Purposes Only)
Figure 4-5 Logical Flow for Excavation Approach B
Figure 4-6 Anticipated Excavation Areas for Excavation Approach C (For Information Purposes Only)
Figure 4-7 Logical Flow for Excavation Approach C
Figure 4-8 Anticipated Excavation Areas for Excavation Approach D (For Information Purposes Only)
Figure 4-9 Logical Flow for Excavation Approach D
Figure 4-10 Anticipated Excavation Areas for Excavation Approach E (For Information Purposes Only)
Figure 4-11 Logical Flow for Excavation Approach E
Figure 4-12 Anticipated Excavation Areas for Excavation Approach F (For Information Purposes Only)
Figure 4-13 Logical Flow for Excavation Approach F
Figure 5-1 Sitewide and Project-Specific Environmental Monitoring and Controls
Figure 5-2 Priority Natural Resource Areas
Figure 5-3 IEMP Surface Water Sample Locations
Figure 7-1 General Area-Specific Soil Remediation Process
Figure 7-2 Phasing of the Sitewide Soil Remediation and Deliverables
Figure 7-3 Organizational Structure of the Major Remediation Documents

LIST OF ABBREVIATIONS AND ACRONYMS

ACA	Amended Consent Agreement
ACGIH	American Conference of Governmental and Industrial Hygienists
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ASCOC	area-specific constituent of concern
ASL	analytical support level
AWWT	Advanced Wastewater Treatment (Facility)
BAT	best available technology
BOD	biological oxygen demand
BTV	benchmark toxicity value
CAMU	Corrective Action Management Unit
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMD	construction management data
COC	constituent of concern
COD	chemical oxygen demand
COEC	constituent of ecological concern
CRP	Community Relations Plan
CU	certification unit
DAC	derived air concentration
dBA	decibels on the A-weighted scale
D&D	decontamination and dismantlement
DF&O	Director's Findings and Orders
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ESH&TRM	Environment, Safety, Health, and Training Requirements Matrix
FC&DP	Facilities Closure & Demolition Project
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FFAPR	full-face air purifying respirator
FFCA	Federal Facilities Compliance Act
FFPARR	full-face powdered air purifying respirator
FRL	final remediation level
FS	feasibility study
FTF	Fire Training Facility
FTL	Field Tracking Log
GC/MS	gas chromatography/mass spectroscopy
GIS	Geographic Information System
GMA	Great Miami Aquifer
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air (filter)
HPGe	high-purity germanium

LIST OF ABBREVIATIONS AND ACRONYMS
(Continued)

HSO	Health & Safety Officer
HWMU	hazardous waste management unit
ICP	inductively coupled plasma emission spectroscopy
IEMP	Integrated Environmental Monitoring Plan
IIMS	Integrated Information Management System
IMPP	Impacted Materials Placement Plan
IRDP	integrated remedial design package
LDR	land disposal restriction
LTRA	long-term response action
MDA	minimum detectable activity
mg/m^3	milligram per cubic meter
MM	mask mounted
mph	mile per hour
MSDS	Material Safety Data Sheet
MTL	material tracking location
MTR	minimum technology requirement
NaI	sodium iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NRRDP	Natural Resource Restoration Design Package
NRRP	Natural Resource Restoration Plan
O&M	operations and maintenance
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OSHA	Occupational Safety and Health Act
pCi/g	picocurie per gram
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
PQL	practical quantitation limit
PSHASP	Project-Specific Health and Safety Plan
PSHSRM	Project-Specific Health and Safety Requirements Matrix
PSP	project specific plan
PWID	Project Waste Identification Document
QA	quality assurance
QAjSP	Quality Assurance Job Specific Plan
QC	quality control
RA	remedial action
RAR	Remedial Action Report

LIST OF ABBREVIATIONS AND ACRONYMS
(Continued)

RCRA	Resource Conservation and Recovery Act
RD	remedial design
REM	Radiological Environmental Monitoring
RI	remedial investigation
ROD	Record of Decision
RTRAK	Real Time Radiation Tracking System
SARA	Superfund Amendment and Reauthorization Act
SCEP	Soil Characterization and Excavation Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SCR	Site Closeout Report
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SERA	Sitewide Ecological Risk Assessment
S/RID	Standards/Requirements Identification Document
STP	Sewage Treatment Plant
SWIFTS	Sitewide Waste Information Forecasting and Tracking System
SWPPP	Storm Water Pollution Prevention Program
SWRB	Storm Water Retention Basin
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
TSS	total suspended solids
TWA	time-weighted average
UCL	upper confidence limit
U.S.C.	United States Code
UST	underground storage tank
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Operations
WL	working level
WMP	Waste Management Programs
XRF	x-ray fluorescence

EXECUTIVE SUMMARY

The Sitewide Excavation Plan (SEP) for the Fernald Environmental Management Project (FEMP), Fernald, Ohio, addresses sitewide planning for remediation of soil and at- and below-grade structures and debris at the FEMP. The SEP is identified in the Operable Unit 5 Remedial Design Work Plan as the document that will provide the management strategy and technical guidelines necessary to govern sitewide soil remediation. A Sitewide Sequencing Plan for remediation (Appendix B) is provided to guide the long-term planning and phasing of soil remediation and to facilitate sitewide coordination with the other activities at the FEMP. Other information included in the SEP consists of remediation drivers, restoration goals, methods/protocols, and related requirements (e.g., health and safety, environmental controls and monitoring, recordkeeping, and data management) that are applicable to each remediation project. The general steps of each remediation project are described in the SEP and include: predesign investigation, remedial design, remedial action (including material handling and disposal), precertification, certification, and postremediation activities. Figure E-1 provides an overview of the SEP organization.

Area-specific conditions may limit the applicability of available measurement, monitoring, and construction technologies to be used during remediation. Examples of such conditions include depth and extent of excavation, types and levels of contamination, and existence of above-grade structures. To accommodate the area-specific conditions, the SEP also defines representative conditions expected to be encountered throughout the FEMP and provides conceptual implementation approaches for efficiently complying with the general remedial requirements. These area-specific conditions will be addressed as work elements during the design process for each remediation project.

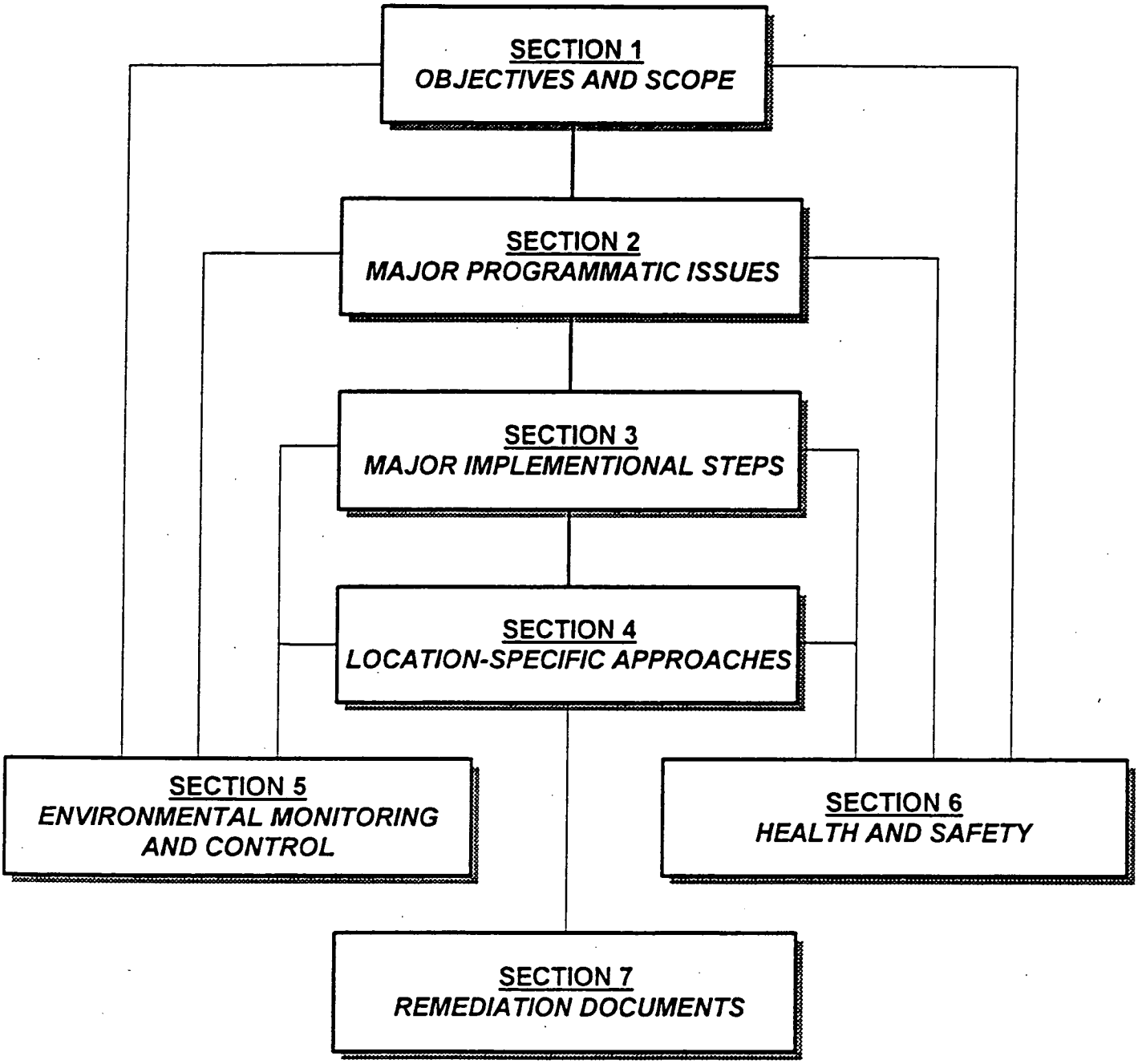
A remediation document hierarchy is also proposed in the SEP. Area-specific remediation documents that will be required for each remediation project include: Project-Specific Plans (PSPs), the Integrated Remedial Design Package (IRDP), the Certification Design Letter (CDL) and the Certification Report. Development of PSPs for sampling and analysis purposes will occur throughout the remediation cycle as characterization and sampling activities are needed. The IRDPs will present area-specific contamination data, a detailed design of the area-specific remediation elements, and the lessons learned during previous phases of the sitewide remediation process. After completion of the soil remedial actions, an area-specific CDL and a Certification Report will be prepared according to specifications

provided in the SEP. The letter and the relevant standard procedures described in the SEP will be used to guide the certification sampling and statistical analysis processes necessary to demonstrate attainment of all the applicable remedial requirements summarized in the SEP. The Certification Report will document activities and results of the certification.

After completion of all the individual remediation projects, final grading and restoration of the site will be guided by the Natural Resource Restoration Plan, which will be submitted separately from the SEP. Additionally, a Remedial Action Report will be prepared for each of the five FEMP operable units to document the completion of all the remedial actions within the scope of the specific operable unit. After completion of sitewide remediation and restoration, a Site Closeout Report will be submitted to summarize all the activities conducted and the final conditions at the site.

By defining the general sitewide management strategy, major technical guidelines, representative area-specific implementation approaches, and hierarchy of all the remediation documents, the SEP will facilitate the development and review/approval of all future deliverables required during remediation. Specifically, the SEP will achieve this objective by providing accepted resolutions to any outstanding and expected global issues and by providing a template/guide for future documents and procedures.

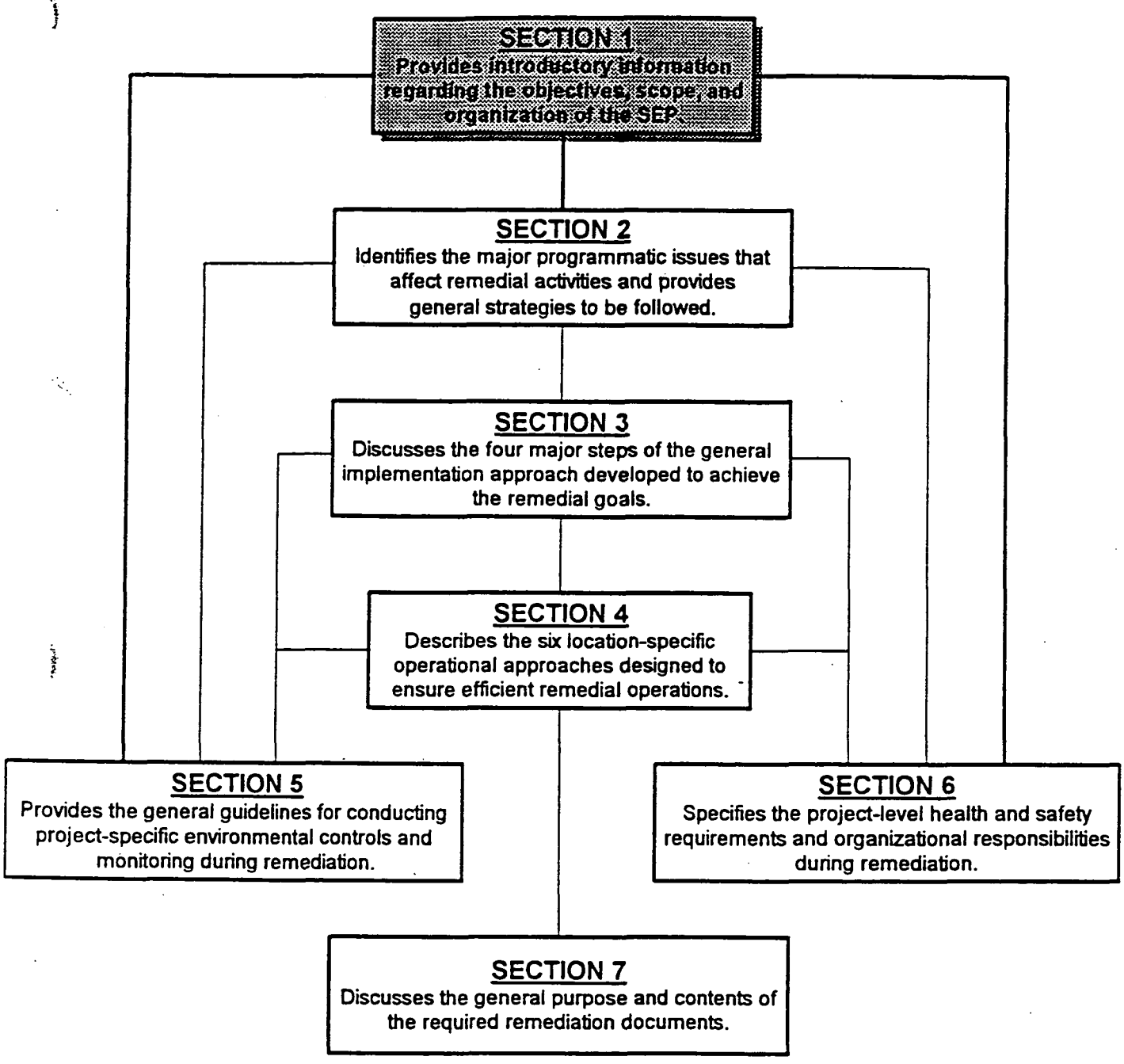
SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent of Contamination by Constituent

FIGURE ES-1 SITEWIDE EXCAVATION PLAN ORGANIZATION

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
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1.0 INTRODUCTION

This Sitewide Excavation Plan (SEP) provides technical guidance for activities related to the excavation and disposition of soil and at- and below-grade structures and debris at the Fernald Environmental Management Project (FEMP).

The SEP was prepared in accordance with Section XI of the 1991 Amended Consent Agreement (EPA 1991) between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA). It was also prepared, where feasible, using Superfund Remedial Design and Remedial Action Guidance (EPA 1986), Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties (EPA 1990a), and the Remedial Design/Remedial Action Handbook (EPA 1995). These guidance documents and agreements identify the requirements for the FEMP remedial design/remedial action phase of remediation, as regulated by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (40 CFR 300).

Because of its general complexity and various area-specific conditions, soil remediation at the FEMP will require a "learn as you go" approach throughout the implementation period. Lessons learned from previous soil remediation conducted at the FEMP (i.e., Remediation Area 1, Phase I Project) that are applicable to future projects have also been incorporated in the SEP. Necessary modifications to the technical approaches and/or project schedules presented in the SEP will be developed with regulatory concurrence and documented in future change pages to the SEP, area-specific design packages or other appropriate official correspondences.

1.1 OBJECTIVES AND SCOPE OF THE SITEWIDE EXCAVATION PLAN

The remediation of soil and at- and below-grade structures and debris at the FEMP will be organized into ten remediation areas, as listed in Section 1.2.2. The SEP is the mechanism for promoting integration and consistency for site excavation activities, including project-specific planning and documentation and ensuring that project goals, procedures and activities address commitments and regulations. The overall objectives of the SEP are to provide guidance for:

- All planning, design, and remedial activities related to the excavation and disposition of soil and at- and below-grade debris, including the decontamination and demolition (D&D) of at- and below-grade structures and utilities

- Integration of soil excavation activities at the FEMP.

The following activities must be completed for area-specific excavation projects as part of the remedial design/remedial action process:

- Predesign investigations
- Remedial design
- Remedial action
- Precertification and certification
- Postremediation activities.

The relationships among these activities are shown on Figure 1-1 and discussed in detail in Section 3.0. The SEP provides programmatic guidance for completion of these activities. This programmatic guidance also provides a model for the development of Project-Specific Plans (PSPs), Integrated Remedial Design Packages (IRDPs), Certification Design Letters (CDLs), and Certification Reports for individual excavation documents which are described in Section 7.0. PSPs will detail the additional sampling and analysis activities needed to provide information for the IRDPs. The IRDPs will provide details on remediation activities, issues, and conditions in construction drawings, specifications, and Implementation Plans. CDLs will describe the sampling and design process to demonstrate compliance with remediation goals. The Certification Reports will document attainment of these goals.

The SEP also defines the sequencing of all remediation projects (Appendix B). Major sitewide and operable unit-specific documents and reports to be developed during and after remediation are identified on Figure 1-2.

Specifically, as described in the Operable Unit 5 Remedial Design Work Plan (DOE 1996a), the SEP addresses the following:

- **Decision Criteria.** The overall logic for remediation decisions, including identifying the extent of excavation due to contamination (Section 3.1.3), establishing sitewide constituent of concern (COC) screening criteria, and area-specific COCs (ASCOCs) (Section 2.5.2.2), addressing waste acceptance criteria (WAC) for the On-Site Disposal

000022

Facility (OSDF) (Section 2.2.1), and identifying methods for certifying attainment of final remediation levels (FRLs) (Section 2.2.2).

- **Excavation of At- and Below-Grade Structures.** Integration between Operable Unit 3 and Operable Unit 5 for excavation of at- and below-grade slabs, foundations, piping, and other structures (Sections 2.3.3 and 4.4).

- **Contingency Plan.** The strategy for implementing a contingency plan (Section 2.3.4 and Appendix F).

- **Closeout Requirements.** The documentation, or procedures, that will be necessary during remedial action to successfully complete the goals of the selected remedy for soil (Section 2.3.7 and 7.0).

- **Impacted/Excavated Materials Management.** General protocol for soil segregation, stockpiling, staging, maintenance, and disposition (Section 3.3.2 and Appendix F).

- **Sampling and Analysis Methods and Requirements.** Data quality objectives, analytical requirements, sampling methods, representative sampling, sampling rationale (Section 2.4 and Appendices E, G and H).

- **Excavation Control.** Monitoring of excavation areas to achieve WAC (Section 2.2.1), and protocols for perched water dewatering (Section 2.5.4), slope stability (Sections 3.1.3 and 4.4.2), dust control (Section 5.1.2.2 and Appendix F), and soil management and staging requirements (Section 3.3.2 and Appendix F).

- **Site Health and Safety Matrix.** Health and Safety Protocols that remain the same for all IRDPs (Section 2.3.8 and 6.0).

- **Quality Assurance/Quality Control.** Outline of requirements for roles and responsibilities, standard operating procedures, document control, change notices, and sampling and analysis (Appendix E).

- **Access Controls.** Appropriate access controls to support soil remediation (Section 3.5.1.1).

- **Operation and Maintenance.** Guidelines for performing operations and maintenance for managing equipment and storage/staging areas, performing dust suppression (Section 5.1.2.2), and implementing erosion and storm water controls (Section 5.1.3 and Appendix F).

- **Excavation Monitoring.** General project-specific monitoring requirements for air, noise, and surface water to meet environmental (Section 5.0) and occupational (Section 6.0) regulatory standards.

- **Regulatory Considerations.** The compliance strategy for applicable, relevant, and appropriate requirements (ARARs), site agreements, and other regulatory criteria that may affect procedures for conducting remediation (Section 1.3.1.1 and Appendix A).

- **Baseline Grading.** The guidelines for site grading to control surface run-off after remediation, as a basis for developing final land use options, wetland mitigation, and associated institutional controls (Section 3.5.1 and Appendix F).

- **Technology Studies.** Potential use of technology studies (Section 1.4.2).

- **Measures to Minimize Impacts.** Identification of potential measures to ensure protection of threatened and endangered species, and protocol for ensuring protection of archeological and cultural finds during remediation (Sections 1.3.2.8 and 5.0).

In addition, the SEP addresses the following:

- Achievement and demonstration of the closure of hazardous waste management units (HWMUs) and underground storage tanks (Sections 2.1.1.1 and 2.1.1.2, respectively)

- Identification of toxicity characteristic hazardous waste (Section 2.1.1.3)

- Implementation of environmental and occupational "as low as reasonably achievable" (ALARA) strategy (Section 2.1.5.3)

- Demonstration of WAC attainment (Section 2.2.1)

- Demonstration of FRL attainment (Section 2.2.2).

It is important to note that several remediation and remediation-related activities are excluded from the SEP because other projects are responsible for completing them. These activities include:

- Excavation associated with nonremedial activities, such as minor maintenance-related excavation

- Design, construction, and placement of materials into the OSDF

- Design, construction, and operation of groundwater restoration and wastewater treatment facilities

- D&D of above-grade structures and utilities

- Removal, treatment, and disposition of materials stored in the Operable Unit 1 Waste Pits

000024

- Removal, treatment, and disposition of the Operable Unit 4 silos and their content
- Monitoring during postremediation.

The following subsections provide background information on remediation activities at the FEMP, the factors that are driving remediation, and a description of the remainder of the contents of the SEP.

1.2 BACKGROUND

The FEMP is a DOE-owned, contractor-managed facility located in southwestern Ohio. It is located north of the small community of Fernald, Ohio, approximately 20 miles northwest of Cincinnati, Ohio. Formerly known as the Feed Materials Production Center, the facility was in operation from 1951 through 1989 to produce metallic uranium fuel elements, target cores, and other uranium products for use in weapons, production reactors, and other DOE programs.

The DOE began to focus resources on environmental issues at the site in 1986 and halted production in 1989. At this point, available resources were devoted to environmental restoration initiatives. One of the first initiatives was the CERCLA remedial investigation and feasibility study (RI/FS) process. As work progressed from the investigation/planning phases to the implementation phase, a more integrated approach to remediation activities was adopted. The following paragraphs of this subsection discuss the transition from the operable unit concept to the integrated approach.

1.2.1 Transition from the Operable Unit Concept

For the purposes of investigation and study, remedial issues and concerns that were similar in location, history, type/level of contamination, and inherent characteristics were grouped into operable units. This management approach was seen as the most efficient way to gather information about the condition of the site. The site was divided into five operable units, which are defined in the Amended Consent Agreement (EPA 1991) as follows:

- Operable Unit 1: Waste Pit Area. Waste Pits 1 through 6, Clearwell, Burn Pit, berms, liners, and soil within the operable unit boundary.
- Operable Unit 2: Other Waste Units. Flyash Piles, other South Field disposal areas, Lime Sludge Ponds, Solid Waste Landfill, berms, liners, and soil within the operable unit boundary.

- Operable Unit 3: Former Production Area. Former Production Area and production-associated facilities and equipment (including all above- and below-grade improvements), including, but not limited to, all structures, equipment, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, a portion of the K-65 transfer line, wastewater treatment facilities, fire training facilities, scrap metal piles, feedstocks, and coal pile.

- Operable Unit 4: Silos 1 through 4. Silos 1, 2, 3, and 4, berms, decant sump tank system, and soil within the operable unit boundary.

- Operable Unit 5: Environmental Media. Groundwater, surface water, soil not included in the definitions of Operable Units 1 through 4, sediment, flora, and fauna.

During the RI/FS process, human health and environmental concerns were identified and remedial alternatives were evaluated for each of these operable units. A Record of Decision (ROD) was produced for each operable unit after the RI/FS process was completed. Each ROD reviewed the results of the RI/FS documentation and identified the selected remedy. The remedy selected for soil remediation consists of excavation and disposition of contaminated soil and associated debris.

As the RODs were issued, it became apparent that successful and efficient remediation of the site depended upon developing sitewide remediation plans that reintegrated the operable units. For instance:

- Remediation of Operable Units 2, 3, and 5 at the FEMP involves the excavation of soil, at- and below-grade debris, and disposal of this material in the OSDF

- Excavation within the OSDF footprint has to be completed and areas certified before the OSDF can be constructed

- The sequencing of construction, building D&D and final soil and groundwater remediation must be closely coordinated among all operable units through remedial design and remedial action

- The Operable Unit 5 scope includes excavation of all contaminated soils left after the remediation of the other operable units.

Therefore, integration with activities in other projects is essential to the successful excavation of contaminated soil and FRL certification of remaining site soil. The operable unit concept did not provide the required level of integration.

An integrated site remediation strategy was developed and discussed with the Ohio Environmental Protection Agency (OEPA) and EPA in September 1995; DOE then proceeded with implementation of the agency-approved integrated approach. This approach integrates former operable units into remediation projects. For example, contaminated soil from Operable Units 2 and 5 was integrated into the Soil Characterization and Excavation Project (SCEP). The integrated implementation process refocused remedial activities planned under the operable unit concept into primary projects based on the selected remedy.

Organizing remediation in recognition of "the way the work will be performed" fosters improved project integration. The remediation responsibilities of the project and the relationship between the project and the operable unit concept are shown in Table 1-1. The projects are as follows:

1) Waste Pits Remedial Action Project (Operable Unit 1, for waste pit residue)
2) OSDF Project (Operable Units 2, 3, and 5)
3) Facilities Closure and Demolition Project (Operable Unit 3)
4) Silos Project (Operable Unit 4)
5) Aquifer Restoration Project (Operable Unit 5)
6) SCEP (Operable Units 2, 3, and 5)
7) Wastewater Treatment Project (Operable Unit 5).

These projects were then placed into three remedial action divisions within the FEMP organization:

- Facilities Closure and Demolition Projects Division (Project 3)
- Soil and Water Projects Division (Projects 1, 2, 5, 6, and 7)
- Waste Management Technology and Silo Projects Division (Project 4).

1.2.2 Integrated Implementation Approach

The SCEP is included in the Soil and Water Projects Division and has responsibility for the characterization and excavation of soil, which includes:

- Further characterization/confirmation of the nature and extent of contamination (predesign investigation beyond RI/FS activities)
- Remedial design
- Construction

- Procurement
- Operations
- Maintenance of response activities and material stockpiles
- Excavation, segregation, and treatment of materials
- Disposition of material based on WAC and FRLs
- Treatment and disposition of toxicity characteristic hazardous wastes
- Management of remediation wastewaters generated during soil excavation activities including contaminated perched water
- Certification of FRL attainment
- Demonstration of WAC attainment
- Control and monitoring of project-specific environmental conditions
- Management of cultural resources
- Maintenance and enhancement of natural resources
- Coordination with stakeholders.

The SCEP is also responsible for producing documentation for planning and controlling these activities. The associated documentation includes:

- the SEP (this document)
- PSPs to support IRDP development (Section 7.1)
- IRDPs for each remediation area and phase (Section 7.2)
- CDLs and Certification Reports (Sections 7.3 and 7.4)
- Remedial activity completion documents (Section 7.5).

Figure 1-2 shows the relationship and hierarchy of these documents.

The responsibilities of the SCEP have been categorized according to the following components, based on specific remediation activities as they relate to soil, water and debris:

000028

- Soil and sediment
- Perched water

- Storm water/wastewater
- Remediation debris
- Impacted materials from Operable Unit 2 subunits.

The general strategy for remediation of each component is presented in Section 1.3.2. Table 1-2 identifies each remedy component, the operable unit(s) associated with that component, and cross-references the section of the SEP (or other relevant documentation) that discusses the component in detail.

The remediation work has been organized into ten remediation areas that correlate to the sequence in which work will be performed. Nine of the ten soil remediation areas are shown on Figure 1-3 (Remediation Area 10 corresponds to utility and road corridors and has not been shown for clarity). When remediation area boundaries are significantly modified from Figure 1-3, DOE will justify the changes and submit the revised area map for regulatory review and approval. A summary of the ten remediation areas is provided below:

- **Remediation Area 1, North and East Regions of the FEMP (three phases).** This area includes the footprint of the OSDF, the North Entrance Road, the Trap Range, soil and at- and below-grade debris that will remain after D&D of the Sewage Treatment Plant (STP) and on-property portion of the old outfall line, and limited shallow excavation of the wetlands just north of the northern boundary line of Remediation Area 6.

- **Remediation Area 2, Southwestern Region of the FEMP (three phases).** Remediation Area 2 consists of the southern Operable Unit 2 waste units and material under these that exceeds the FRLs. The waste units consist of the South Field and the Active and Inactive Flyash Piles, as well as suspect areas of contamination within Remediation Area 2 but outside the boundaries of the Inactive Flyash Pile, South Field, and Active Flyash Pile.

- **Remediation Area 3, North Portion of the Former Production Area.** Remediation Area 3 requires removal of soil and at- and below-grade debris exceeding FRLs following D&D of Operable Unit 3 above-grade structures within the northern portion of the Former Production Area. Deep excavation is expected in portions of Remediation Area 3. The Operable Unit 2 Lime Sludge Ponds are also included in Area 3. Remediation of the Lime Sludge Ponds will involve removal of all sludges and soil exceeding FRLs.

- **Remediation Area 4 (A and B), Central Portion of the Former Production Area.** Remediation Area 4 (A and B) includes impacted soil and at- and below-grade debris remaining after D&D of the middle portion of the Former Production Area (Operable Unit 3).

- **Remediation Area 5, Southern Portion of the Former Production Area.** The scope of work in Remediation Area 5 includes residual soil and at- and below-grade debris subsequent to D&D of the southern portion of the Former Production Area (Operable Unit 3), and potential remediation of the storm water retention basin.

- **Remediation Area 6, Waste Pits and Vicinity.** The scope of work for Remediation Area 6 consists of remediating soil and at- and below-grade debris in the vicinity of the waste pits, including rail lines, after removal of the Operable Unit 1 waste pit material. Remediation activities also include removal of above-grade structures associated with remedial treatment facilities and the Operable Unit 2 Solid Waste Landfill. Remediation of the SWL will involve removal of all landfill material and soil exceeding FRLs. Remediation of the Fire Training Facility (FTF), which is also included in Area 6, will involve removal of soil and at- and below-grade debris exceeding FRLs, which may involve deep excavation.

- **Remediation Area 7, Silos and Vicinity.** Remediation Area 7 consists of the soil and at- and below-grade debris remaining after removal of the Operable Unit 4 materials and silos, the above-grade structures associated with remedial treatment facilities, the Advanced Wastewater Treatment (AWWT) facility, and miscellaneous corridors.

- **Remediation Area 8 (three phases), West Bank of Paddys Run.** The west side of Paddys Run (including sediment in Paddys Run) has been separated from other FEMP remediation areas to emphasize the facts that contamination has not been detected and that process knowledge does not indicate the potential for contamination. Although this area must be certified, only a minimal amount of spot excavation is expected.

- **Remediation Area 9 (two phases), Off-Property Areas.** Off-property areas that may require remediation include the following:

  - Potentially impacted land adjacent to the northeast corner of the site
  - Land adjacent to the eastern fenceline north of the STP
  - Abandoned outfall line
  - Abandoned outfall structure
  - Great Miami River sediment.

- **Area 10, Corridors and Utilities.** When all other remediation areas have been certified, corridors such as access roads, utility lines, and underground piping will remain. These features will be excavated and certified after other excavations are complete. The electrical substation located within the boundaries of Area 5 will also be excavated as part of Area 10.

As presented on Figure 1-3, the Former Production Area is divided into four general remediation areas (i.e., A3, A4A, A4B, and A5) according to the D&D sequence. Remediation areas in the production area will be designed and remediated in sequence from northeast toward southwest to prevent

recontamination of remediated areas. Each remediation area may be further divided into phases and/or sectors that will be remediated in sequential construction seasons. The exact boundaries between remediation areas, phases/sectors, and any specific deep excavation sites will be finalized in the area-specific IRDPs. These detailed boundaries will be delineated to simplify potential dewatering needs and to prevent recontamination of an excavated area by inflow of perched water from adjacent unexcavated areas. Additional detail on each remediation area and the excavation sequence is provided in Appendix B (Sitewide Sequencing Plan).

1.3 FACTORS DRIVING REMEDIATION

Three primary factors are driving remediation at the FEMP and dictating its direction:

- Regulatory drivers
- The components of selected remedies identified in the RODs for each operable unit
- Final land use plans, which will be described in the Natural Resource Restoration Plan (NRRP) (Section 1.4.2).

The following paragraphs of this subsection summarize the issues associated with each of these factors that affect remediation.

1.3.1 Regulatory Drivers

Several regulatory criteria and legal obligations provide the basis for remediation activities at the FEMP. These include:

- ARARs and To Be Considered criteria (TBCs)
- Permits
- Agreements
- Natural Resources Trusteeship.

The following paragraphs summarize the requirements of each of these.

1.3.1.1 Applicable or Relevant and Appropriate Requirements and To Be Considered Criteria

The ARARs and TBCs pertinent to the excavation of soil and at- and below-grade debris are included in Appendix A. ARARs and TBCs from the Operable Units 2 and 5 RODs will be used as the basis for conducting soil remediation within Operable Unit 5 and beneath Operable Units 1, 2, 3, and 4;

those from the Operable Unit 3 ROD will be used as the basis for conducting excavation of at- and below-grade structures and debris.

Area-specific IRDPs (Section 7.2) will identify the subset of ARARs and TBCs that are pertinent to each remediation area. Implementation of soil remediation will comply with these ARARs. Procedures are provided in Section 2.1 for addressing the significant ARARs and TBCs at the FEMP.

1.3.1.2 Permits

The remedial actions to be performed at the FEMP are regulated under CERCLA. Section 121(e)(1) of CERCLA states that no federal, state, or local permit shall be required for the portion of any removal or remedial response action conducted entirely on site, where such response action is selected and carried out in compliance with Section 121. Although on-site response actions are exempt from the administrative requirements associated with a permit (e.g., administrative reviews, reporting and record-keeping requirements, etc.), such actions are not exempt from the substantive requirements that would have been imposed by each permit.

To determine if a permit is required for a remedial action, an evaluation must be made as to whether the action is conducted entirely on site, as stated in Section 121(e)(1) of CERCLA. Discussions with the EPA and OEPA have established a consensual strategy for permitting activities at the FEMP (Craig 1995). This consensual strategy determined that air releases, fill/dredging of wetlands, excavation of soil and associated debris, and remediation management (through either disposal in the OSDF or transportation for off-site disposal) are considered on-site activities and are not subject to the administrative requirements of a permit. It was decided that wastewater and storm water discharges to the Great Miami River and Paddys Run are considered off-site activities and are subject to both the administrative and substantive requirements of the National Pollutant Discharge Elimination System (NPDES) Permit for the FEMP.

The Amended Consent Agreement (EPA 1991) for the FEMP requires that the compliance strategy for addressing the substantive requirements of permits, as well as other ARARs, be initiated at the start of remedial action. The Amended Consent Agreement requires the following specific information:

000032

- Identification of each permit that would have been required in the absence of the CERCLA 121(e)(1) permitting exemption
- Identification of the standards, requirements, criteria, or limitations that would normally have to be met to obtain the permits
- Explanation of how the remedial action will meet the substantive requirements, criteria, or limitations identified above.

The Amended Consent Agreement further states that a permitting plan containing the above items should be submitted as a design deliverable. However, to address these requirements, DOE provided a letter to EPA and OEPA on June 12, 1995, which described the FEMP's strategy for compliance with substantive permit-related regulatory requirements for remedial actions at the site (Craig 1995). EPA and OEPA concurred with the strategy DOE outlined in the letter and agreed to the development of a compliance cross-reference (including substantive permitting requirements) as a substitute for a formal permitting plan. These compliance cross-references are to be supplied along with the ARARs in the remedial design submittals. Approval of the design documents by EPA and OEPA will constitute approval that the compliance strategy meets the intentions of the Amended Consent Agreement and fulfills the FEMP's obligation to address ARARs and TBCs in the remedial design process.

1.3.1.3 Agreements

In addition to the pertinent ARARs and TBCs, there are other legal agreements between DOE, EPA, and OEPA. These agreements, as discussed below, introduce additional requirements for soil remediation.

The Consent Agreement for the FEMP was originally signed in 1990 (EPA 1990b) and was amended in 1991 (EPA 1991). In addition to defining the schedule and documentation for remedial design and remedial action, the consent agreement also requires that a five-year review process be initiated, in accordance with Section 121 of CERCLA. The first five-year review will be conducted in the third quarter of fiscal year 2002, which is five years from the initiation of remedial action in Area 1 Phase I. Subsequent reviews by EPA will occur in at least five-year increments to ensure that human health and the environment are being protected by the remedial actions being implemented.

The Amended Consent Agreement requires that certain project plans be included in the remedial design or remedial action work plan. Table 1-3 outlines these requirements and identifies where the requested information will be documented.

On June 4, 1996, the OEPA and DOE agreed to an OEPA Director's Findings and Orders (DF&O) regarding Resource Conservation and Recovery Act (RCRA)/CERCLA Integrated Closure (OEPA 1996). This agreement covered requirements for closure of HWMUs at the FEMP that had not already been closed under RCRA. The DF&O allows closure to be deferred until CERCLA remediation for HWMUs, and allows RCRA closure performance standards for these HWMUs to be addressed as part of CERCLA remediation and documentation. Several active and inactive HWMUs were deferred to the D&D process under CERCLA because they cannot be reasonably removed/closed independent of the D&D process. Other inactive HWMUs were deferred to closure under CERCLA because of their potential for soil contamination due to a release of hazardous waste. Many units that will be closed under the D&D process also have the potential for soil contamination. Section 2.1.1.1 discusses the HWMU closure process under CERCLA in greater detail.

1.3.1.4 Natural Resources Trusteeship

Two mechanisms drive protection of natural resources during remediation. These include the Natural Resource Trusteeship process and compliance with pertinent federal and state regulations. Both of these mechanisms will be incorporated into Operable Unit 5 soil remediation planning and implementation.

CERCLA, Executive Order 12580, and the National Contingency Plan collectively require certain federal and state officials to act on behalf of the public as trustees for natural resources. The Natural Resource Trustees for the Fernald site are the Secretary of the DOE, the Secretary of the U.S. Department of the Interior, and officials of OEPA, appointed by the governor of Ohio.

Aspects of natural resource management and monitoring are mandated through the incorporation of National Environmental Policy Act (NEPA) values into remedial action planning. In June 1994, a revised secretarial policy on NEPA compliance was issued by DOE. This policy called for the integration of NEPA values into the CERCLA decision-making process. Therefore, values such as the protection of threatened and endangered species and cultural resources are to be considered throughout

000034

remedial activities to be consistent with the Operable Unit 5 ARARs, the Amended Consent Agreement, and agreements made with EPA, OEPA, and Natural Resource Trustees.

The Trustees act as guardians for natural resources at or near the Fernald site. The Trustees are responsible for determining whether natural resources have been injured as a result of a release of a hazardous substance or oil from the site and, if so, how to restore, replace, or acquire the equivalent natural resources to compensate for the injury. DOE is responsible for costs related to natural resource injury, in addition to costs associated with remediation of the site. The Fernald Natural Resource Trustees are responsible for resolving the FEMP's compensatory restoration requirements on behalf of the public.

The Fernald Site Natural Resource Trustees Council has been meeting since June 1994 to evaluate and determine the feasibility of integrating the Trustees' concerns with future remedial design activities. The Trustees have identified their desire to fulfill their obligations by integrating their concerns with remedial design and restoration activities.

1.3.2 Components of the Sitewide Selected Remedy

Project implementation under the SCEP will be conducted through specific remediation activities as they relate to affected media (soil and sediment, debris, waste, perched water, storm water, and wastewater). Measures will be taken to minimize the environmental impacts of remediation for each medium. This section summarizes the 11 components of the selected remedy for soil and debris, as presented in the RODs for Operable Units 1, 2, 3, 4, and 5. Implementation will be focused to meet the FRLs specified in the Operable Units 2 and 5 RODs for soil, and the Operable Unit 3 ROD for excavation of debris. In addition, soil FRLs within Operable Unit 1 will be applied when they are more stringent. Table 1-2 identifies each remedy component and the operable unit(s) associated with each component, and cross-references the section of the SEP (or other relevant documentation) that discusses the component.

1.3.2.1 Soil and Sediment

Soil and sediment exceeding WAC for the OSDF, including material from the seven areas described in Section 1.3.2.7 that exhibits the hazardous waste toxicity characteristic (40 CFR 261), will be excavated and dispositioned according to one of the following methods: 1) transported to an off-site

disposal facility for treatment and disposal, as required to meet WAC for the off-site facility; 2) treated on site, as required to meet WAC for the off-site facility, and transported off site for disposal; or 3) treated on site for organic and/or inorganic contaminants, as required to meet the WAC for the OSDF, and dispositioned in the OSDF. However, method 3 is not an option for toxicity characteristic hazardous soil from the South Field Firing Range. This soil was specifically excluded for disposal into the OSDF by the Operable Unit 2 ROD. Additionally, as stated in the Operable Unit 5 ROD, on-site treatment/disposal will not be considered for soil that exceeds radiological WAC for the OSDF. Off-site disposal will be conducted in accordance with the terms of the Amended Consent Agreement (EPA 1991) and EPA's Off-Site Rule.

Following removal of material exceeding the OSDF WAC, soil and sediment exceeding FRLs will be excavated and placed in the OSDF. Table 1-4 presents the WAC for the OSDF and FRLs for soil and sediment at the FEMP. Figure 1-4 provides a planning-level estimate of the projected footprint of soil and sediment requiring excavation as part of the remedy for Operable Unit 5. Details regarding the completion of WAC- and FRL-driven excavation activities are included in Sections 3.0 and 4.0.

Remediation of soil and sediment will require deep excavations (i.e., greater than 6 feet) in the Former Production Area. Where deep excavations are planned, the preferred excavation approach will be to construct multiple benches in the side slope. When access to an area is limited and the development of benches is not possible, driven vertical barriers (e.g., sheet pilings) or other means of maintaining the open excavation will be used. Additional discussion of deep excavations is provided in Sections 3.1.3 and 4.4, while scanning and sampling of the excavations are discussed in Section 2.4.2.

Appropriate mitigative measures will be used during excavation activities to minimize the resuspension of dust particles (Section 5.0). Worker health and safety monitoring will be provided during excavation activities as part of the health and safety program described in Section 6.0.

Some facilities at the FEMP, including the AWWT facility, service roads, and other long-term remedial action facilities (e.g., silos and groundwater restoration facilities), will not be decommissioned before the OSDF is closed. The remediation of soil beneath these facilities will be included in an IRDP that addresses long-term remedial actions.

1.3.2.2 Perched Water

Perched water zones in the Former Production Area and the STP that present an "unacceptable" threat to the underlying aquifer will be extracted and/or excavated with contaminated soil. An unacceptable threat is defined as one having a cross-media impact to the underlying Great Miami Aquifer that would produce concentrations of contaminants in groundwater exceeding the FRL. In this area, perched water will be removed during the dewatering operation necessary for deep excavation and during excavation of contaminated soil and soil necessary for foundation removal. When necessary for deep excavations, a sump with a cut-off drainage ditch will be installed along the toe of the side slope tied to the appropriate bench level. The collection of perched water and rain water at each bench perimeter ditch will reduce the amount of water in the bottom of the excavation. This approach to controlling perched water will reduce the potential impact to the Great Miami Aquifer during deep excavations. Perched water extracted from the Former Production Area that contains organic contamination will require treatment at the AWWT facility before it can be discharged to the Great Miami River.

Perched water zones that can be excavated with the contaminated soil will be represented on diagrams submitted with area-specific IRDPs (Section 7.2). Additional details regarding perched water control are provided in Section 2.5.4.

1.3.2.3 Storm Water/Wastewater

The FEMP maintains a storm water collection system that includes conveyance systems and retention basins. This system is designed for a 10-year, 24-hour storm event. This system can prevent most storm water from entering the Storm Sewer Outfall Ditch and Paddys Run. As remediation of the site progresses, the storm water collection system will be decommissioned in stages to ensure continued storm water collection from the portions of the site not yet remediated. Run-on and run-off controls are addressed in Section 5.0 and Appendix F, and storm water collection systems are included with the Sitewide Sequencing Plan (Appendix B).

Sanitary and process wastewater continues to be generated at the FEMP because of the occupancy of the site by the work force and ongoing cleanup activities, such as building decontamination. Additionally, process wastewater is expected to be generated as a consequence of the implementation of remedial actions for all operable units. The FEMP will continue to collect and direct this wastewater for treatment, as necessary, as part of the selected remedy.

For the deep excavations anticipated in the Former Production Area, dewatering is likely to be required after large storm events. This water will be treated, as necessary, through the AWWT facility prior to discharge.

1.3.2.4 Remediation Debris

Debris is expected to be generated throughout remediation by the Facilities D&D Project (above-grade) and SCEP (at- and below-grade). Initial planning has identified that debris will be generated from D&D of the STP, FTF, structures in the Former Production Area, Operable Unit 5 groundwater extraction system, service roads, and AWWT facility. Additionally, any PPE or spill material generated during remediation activities will be managed and dispositioned as discussed in Section 3.3.1 and Appendix F. The Operable Unit 3 ROD has identified specific debris from the Former Production Area that is designated for off-site disposal. This includes acid brick, because of potentially elevated concentrations of several RCRA constituents, and several areas of surface concrete containing elevated levels of technetium-99. Excavation, management, and disposal of at- and below-grade debris from the site are addressed in Sections 2.5.8, 3.3.2, and 3.6.4.

1.3.2.5 Waste from Operable Unit 2 Subunits

The Operable Unit 2 subunits (Solid Waste Landfill, Lime Sludge Ponds, Inactive Flyash Pile, South Field, and Active Flyash Pile) will be remediated as described in the "Remedial Design Work Plan for Remedial Actions at Operable Unit 2" (DOE 1995a). Sampling and analysis will be performed in the excavated area to confirm removal of material with contamination above the FRLs established in Table 1-4. If the results of the certification sampling and analysis indicate that contamination above FRLs remains, then additional excavation will be performed. All waste material that meets the on-site WAC will then be transported to the OSDF for final disposition. Material exceeding the on-site WAC will be transported off-site for disposal. Excavation, management, and disposal of these wastes are addressed in Sections 2.1.2, 2.5.8, 3.3.2, and 3.6.4.

1.3.2.6 Corrective Action Management Unit Rule

The Corrective Action Management Unit (CAMU) and Temporary Unit Final Rule (58 CFR 865829) was promulgated to meet the objectives of a cleanup program under RCRA, as amended. Management of remediation (and investigation) waste within a CAMU is not subject to the strict land disposal restrictions and minimum technology requirements contained in Subtitle C of RCRA.

The CAMU rule permits the on-property disposal of both RCRA listed and characteristic waste provided a protective, implementable remedy is identified through the following three decision steps, cited in 40 CFR 264.552.

1. The remedy must be protective of human health and the environment.

2. The remedy must minimize the potential for future release.

3. The remedy must enhance long-term effectiveness through the application, as appropriate, of treatment technologies that reduce toxicity, mobility or volume of wastes that will remain in place following closure of the CAMU.

The Operable Units 2, 3, and 5 RODs acknowledged that EPA's CAMU rule is an ARAR for the FEMP's on-property disposal remedy that provides the regulatory framework for determining the treatment and on-property disposal requirements for RCRA-regulated constituents in the materials destined for on-property disposal. While only limited portions of the FEMP site are intended for long-term waste management and disposal (i.e., the OSDF), the entire FEMP property is designated a CAMU under the Operable Unit 5 ROD. Consolidation or management of on-site remediation wastes into or within the CAMU will not constitute creation of a unit subject to minimum technology requirements and will not invoke land disposal restrictions. Additionally, the TU concept may be used during remedy implementation to further facilitate the remediation process. Temporary units, such as tanks and container storage areas, may be used for short-term management of wastes generated during remediation. Alternative requirements which are protective of human health and the environment may be used in lieu of the design, operating or closure requirements that would otherwise apply to such units under RCRA.

RCRA characteristic soils identified and excavated to meet the OU2 and OU5 ROD requirements will be containerized and placed on an approved RCRA storage facility (Plant 1 Pad). The RCRA characteristic soils will not be placed in stockpiles designated for above-WAC materials. The need for a new temporary RCRA storage facility will be evaluated as part of the Area 3 remedial design process to replace the Plant 1 Pad after its removal. The new temporary RCRA storage facility may be designed for bulk storage of RCRA characteristic soils if the volume of the waste exceeds available storage capacity using containers.

000039

1.3.2.7 RCRA Characteristic Waste Disposal

Based on a review of the FEMP's site characterization data and historical process knowledge, DOE, EPA, and OEPA collectively agreed that several of the FEMP's potentially identified RCRA toxicity-characteristic waste streams may be suitable for additional cost-effective treatment prior to on-property disposal. These waste streams and their geographic areas were designated in the RODs as:

- The estimated several hundred cubic yards of lead-contaminated soil located at the FEMP's firing range (Figure 1-5). (Under the terms of the Operable Unit 2 ROD, this material is designated for off-site disposal.)
- RCRA toxicity characteristic soil from six geographic areas within Operable Unit 5 (Figure 1-5): the abandoned sump west of the pilot plant; the area between the KC-2 warehouse and railroad tracks; the FEMP's trap range; the fill material west of the silos along Paddys Run stream bank; the scrap metal pile area; and the area north of the maintenance building.
- Operable Unit 3 lead sheeting (formed as flashing, window sills, and door moldings) and acid brick. In accordance with the Operable Unit 3 ROD, the acid brick will be sent off site for disposal because of possible technetium-99 contamination.

As stated in the Operable Unit 5 ROD, DOE, EPA, and OEPA agree that sufficient existing data and historical process knowledge are available to identify the boundaries of the above geographic areas as those that represent a reasonable opportunity for cost-effective soil treatment. Outside of these geographic areas, DOE, EPA, and OEPA all concur that there is no reasonable basis to conclude that the presence of RCRA toxicity characteristic waste exists to an extent that would allow additional opportunity for cost-effective soil treatment. Therefore, outside the boundaries of the designated geographic areas, no additional analytical data will be required to screen for the presence of toxicity characteristic waste before placement in the OSDF. Only the site-specific WAC developed for the OSDF, as listed in Table 1-4, will be applied to excavated soil outside the six areas identified in the Operable Unit 5 ROD. The Operable Unit 5 ROD states that the EPA's toxicity characteristic leaching procedure is the mechanism to guide the identification of soil requiring treatment within the boundaries of the designated geographic areas.

Viable technologies for treating the FEMP's RCRA toxicity characteristic soil were specified in the Operable Unit 5 ROD. The technologies cited include EPA-approved stabilization technologies (for inorganic constituents) and low temperature thermal desorption techniques (for organic

000040

constituents). Stabilization technologies are also contemplated for treatment of the Operable Unit 3 RCRA toxicity characteristic waste streams prior to their disposal. The decision to treat the FEMP's RCRA toxicity characteristic materials on site (and dispose of them in the OSDF) versus sending them off site for treatment and disposal will be a case-by-case, cost/benefit decision that will be made as part of the detailed remedial design processes for both soil and debris. These decisions will be communicated in the IRDPs for soil and at-and below-grade structures and in the D&D Implementation Plans for debris.

The FEMP is committed to identifying, segregating, and treating, as needed, the contaminated soil from within the six designated geographic areas (i.e., Operable Unit 5 areas in Figure 1-5) that exhibits the RCRA toxicity characteristic, as well as the lead sheeting and acid brick from the Operable Unit 3 D&D waste stream. Lead shot and associated soil from the Operable Unit 2 firing range that exhibits the toxicity characteristic will be dispositioned off site. This commitment satisfies the requirements of the Operable Units 2, 3, and 5 RODs regarding the disposal of RCRA toxicity characteristic waste in the OSDF.

Figure 1-6 summarizes the treatment and disposition requirements for RCRA toxicity characteristic waste to be identified and segregated from the six Operable Unit 5 areas. Decisions regarding on-site versus off-site treatment for the toxicity characteristic waste from these areas will be made during the area-specific design process when considering the availability of any on-site treatment facility and the results of cost-benefit evaluation. When treatment of the toxicity characteristic waste for on-site disposal is the preferred remedial option, the temporary unit concept will be used to facilitate the construction/permitting process for the on-site treatment facility. The characterization, treatment, and disposition of soil from these areas are described in greater detail in Section 2.1.1.3.

1.3.2.8 Measures to Minimize Environmental Impacts

DOE has factored environmental impacts into the plans for excavation. Measures to minimize environmental impacts to on-property natural resources (e.g., wildlife and wildlife habitat, wetlands, floodplains, surface water, groundwater) have been identified in the Operable Unit 5 Feasibility Study Report and Proposed Plan (DOE 1995b, 1995c). Impacts to on-property vegetation and wildlife habitat will result from the removal and movement of contaminated soil and sediment and from construction of support facilities. Measures taken to minimize impact are discussed in Sections 3.0

and 5.0 but will ultimately be decided on a project- and/or area-specific basis and addressed in the IRDPs.

1.3.2.9 Sitewide Environmental Monitoring

Sitewide environmental monitoring of air, sediment, surface water, and groundwater will be conducted during all sitewide remedial actions. Monitoring will be designed to detect and quantify releases from the site attributable to the implementation of all the remedial actions at the FEMP. Monitoring will also be conducted following the completion of remedial actions to assess the continued performance of the remedy. Sitewide environmental monitoring activities will be implemented by the sitewide monitoring program discussed in the Integrated Environmental Monitoring Plan (IEMP). Section 1.4.2 contains a summary of this plan and other parallel programs that tie in with the SEP. The IEMP describes the sitewide monitoring strategy and will be revised every two years (DOE 1997a). SCEP project-specific monitoring activities will supplement the site-wide environmental monitoring program and are discussed in greater detail in Section 5.0.

1.3.2.10 Institutional Controls/Monitoring

One element of the selected remedy that will be used to ensure protectiveness of human health and the environment is institutional controls. Institutional controls were identified as requirements in each of the operable unit RODs and include continued access controls at the site during the remediation period, continued federal ownership of the FEMP property including the OSDF and necessary buffer zones, and deed restrictions to preclude residential and agricultural uses of the remaining regions of the FEMP property. Additionally, proper notifications, as mandated by CERCLA, will be provided before the transfer of any federal property that is known to contain or has been used in the processing of hazardous substances. These measures will minimize the potential for human exposure to soil and groundwater contamination. These measures will also minimize exposure to the contaminated material contained in the OSDF following completion of remedial activities at the site (DOE 1997b). Specific institutional control measures to be implemented at the site will be established in the NRRP (Section 1.4.2).

1.3.2.11 Community Involvement

The DOE and EPA are committed to continuing the active community involvement program at the FEMP throughout the duration of remedial activities and post-remediation monitoring at the site. This program will include public meetings, public comment periods (as needed), newsletters, tours, and small focused group sessions assessing specific cleanup issues.

The Community Relations Plan (CRP) for DOE-Fernald (DOE 1995d) was revised in September/ October 1994 and approved by OEPA in December 1994 and by the EPA in January 1995. The CRP complies with the public participation requirements of all applicable laws and regulations, including CERCLA, Federal Facilities Compliance Act (FFCA), NEPA, and the National Contingency Plan (NCP), and also reflects EPA guidance in Community Relations in Superfund: A Handbook (EPA 1992a). Throughout the duration of FEMP remediation activities, the CRP may be revised to reflect changing community concerns, as well as changes in the law, regulations, or regulatory agreements.

The CRP describes how FEMP management will involve the public in decisions related to the site during the remedial action phase of CERCLA. Required activities are as follows:

Required Public Involvement Activities During Remedial Design

Upon completion of the final engineering design, prepare a fact sheet describing the remedial design (NCP 300.435).

Required Public Involvement Activities During Remedial Action

- Provide a public briefing upon completion of the engineering design and prior to the beginning of the remedial action (NCP 300.435).
- Publish in a local newspaper of general distribution a Notice of Availability of documents submitted to the EPA under the remedial action (DOE commitment/directive).

The DOE has surpassed regulatory requirements in offering public involvement opportunities at the FEMP and will continue to do so throughout the remedial action phase of site cleanup.

1.3.3 Final Land Use

The NRRP identifies the natural resource restoration strategy for the site and will serve as the final land use plan. The final land use currently planned for the FEMP is an undeveloped park. Therefore, it is not expected that extensive backfilling or regrading will be required following remediation activities. Some small, localized deep excavations will be backfilled and regraded to provide proper drainage or support to permanent facilities such as the OSDF. The current strategy is to leave larger areas where deep excavation is necessary as ponds (i.e., in the Former Production Area) or as a bench along Paddys Run (i.e., in the Silo, Waste Pit, and South Field areas). In addition, vegetation will be established on the remaining earthen areas of the site.

1.4 ORGANIZATION OF THE SITEWIDE EXCAVATION PLAN

This subsection describes the remaining contents of the SEP and other documents related to the SEP.

1.4.1 Contents of the Sitewide Excavation Plan

The remainder of the SEP consists of the following sections:

- **Section 2.0, Remediation Issues and General Strategies,** which presents the major programmatic issues that affect remediation activities (e.g., WAC attainment and certification requirements) and discusses the general approaches to address them.

- **Section 3.0, General Implementation Approach,** which discusses the steps for implementing remediation and describes how the issues in Section 2.0 will be addressed.

- **Section 4.0, Location-Specific Approaches,** which describes the location-specific guidelines for addressing excavation in the ten remediation areas.

- **Section 5.0, Environmental Controls and Monitoring,** which discusses the management strategy for implementing project-specific procedures to control and monitor environmental conditions during remediation of impacted soils.

- **Section 6.0, Project Health and Safety,** which discusses the health and safety requirements and procedures to meet these requirements on remediation projects.

- **Section 7.0, Soil Remediation Documents,** which discusses the general purpose and content of the PSPs, IRDPs, CDLs, and Certification Report. Three other documents required to complete the sitewide soil remediation and restoration are also described (Remedial Action Report, NRRP, and Site Closeout Report).

000044

Additional information used to support the materials in the SEP is included in the following appendices:

- **Appendix A, Soil Remediation ARARs and TBCs.** The regulatory requirements applicable to the SCEP, both ARARs and TBCs, are presented in this appendix in table form, with a crosswalk provided to the sections of the SEP where the requirements are met.

- **Appendix B, Sitewide Sequencing Plan.** This appendix presents the sequence of excavation activities for the major areas of the FEMP.

- **Appendix C, Selection of Ecological Constituents of Concern.** This appendix summarizes the results of the evaluation of ecological impacts presented in the Operable Unit 5 RI. It identifies the COCs that may have an adverse impact on ecological receptors if they are not monitored. In addition, the appendix evaluates potential constituents of ecological concern for source areas not considered in the Sitewide Ecological Risk Assessment (DOE 1995e).

- **Appendix D, Wood Sampling Program.** This appendix presents the results of the on-site tree tissue sampling program to support plans to manage plant material.

- **Appendix E, SEP Quality Assurance Job Specific Plan.** This appendix discusses those elements of the FEMP Quality Assurance Plan which are applicable to implementation of the SEP and contains the additional criteria needed to ensure that remediation subcontractors perform excavation activities properly.

- **Appendix F, Implementation of Construction.** This appendix presents the details of activities that will take place as part of the actual implementation of remediation tasks and the management of materials removed during excavation.

- **Appendix G, Certification Design Rationale.** This appendix presents the statistical background for determining the number of samples required in each certification unit to demonstrate compliance with FRLs.

- **Appendix H, Summary of Field Measurement and Laboratory Analytical Technologies.** This appendix presents available and commonly used field measurement and laboratory technologies to support selection decisions for specific applications at the FEMP during soil remediation.

- **Appendix I, Sitewide Extent of Contamination by Constituent.** This appendix includes maps which provide the basis for selection of area-specific constituents of concern.

1.4.2 Related Documents

The SEP is intended to provide overall guidance for excavation activities and will be applied throughout the remediation process. The SEP documents an approach to sitewide excavation to be agreed upon by DOE and the regulatory agencies. Area-specific requirements and conditions will be addressed in the IRDPs, and may vary slightly from those presented in the SEP based on new data or information. Some of the reference documents for the development of the SEP have already been submitted, are being submitted concurrently with it, or will be submitted at a later date. Changes to these documents or to sitewide strategies may necessitate changes to the SEP, and the subsequent submittal of changes pages to keep the SEP current with site documents and strategies. These documents and their relationship to the SEP are as follows:

Existing or In Preparation

- **Impacted Materials Placement Plan (IMPP) (DOE 1998a).** Describes the impacted materials acceptance, placement, compaction, and quality assurance/quality control activities associated with construction, waste placement, and closure of the OSDF.

- **WAC Attainment Plan for the On-Site Disposal Facility (DOE 1998b).** Provides the sitewide strategy for demonstrating OSDF WAC attainment and detail regarding material-type-specific requirements in one centralized document. For soil and at- and below-grade structure and debris, the WAC Attainment Plan provides the WAC attainment approaches summarized in the SEP.

- **Remedial Action Work Plan (the IRDP) for Area 1, Phase I (DOE 1996b).** Describes the implementation plan for remediation in the northernmost area of the OSDF. This document was submitted in December 1996 to allow construction of the OSDF to proceed on schedule. Because it was submitted prior to approval of the SEP, many of the concepts and procedures contained in it may be repeated in the SEP.

- **Certification Report for Area 1, Phase I (DOE 1997c).** Demonstrates that FRLs in Area 1, Phase I, have been attained. Area 1, Phase I was completed prior to development of the SEP.

- **Site Preparation Package for Area 2, Phase I (DOE 1997d).** Details site preparation activities to be completed in Area 2, Phase I, prior to excavation work.

- **Technology Reports.** Four separate project reports describing the potential application of physical separation to reduce soil volumes, vacuum extrusion/compaction of soil, phosphate soil stabilization, and geochemical barrier placement amendment, and recommending their application during remediation were submitted to EPA and OEPA on May 24, 1996. Additional technology reports on in situ gamma spectroscopy and

their addendums (DOE 1997e; 1997f) were submitted to EPA to demonstrate the capabilities of high-purity germanium (HPGe) and sodium iodide detector technologies. During remediation, additional technology reports to support area-specific and/or sitewide treatment and disposition decisions may be needed.

- **Integrated Environmental Monitoring Program (IEMP) (DOE 1997a).** Provides the central mechanism for ongoing groundwater, surface water, and air monitoring and reporting activities at the FEMP.

- **Storm Water Pollution Prevention Plan (DOE 1996c).** Identifies potential sources of storm water pollution and describes the practices that will be employed to control these, including engineering, construction, and inspection procedures (Section 5.0). NPDES permit requirements are also addressed.

- **Aquifer Restoration and Wastewater Treatment Project Operation and Maintenance Plan (DOE 1997g).** Specifies the capacity (hydraulic, chemical, and biological) of the AWWT, prioritizes streams for treatment (including remediation-related streams), and provides waste acceptance criteria for those streams. This plan was approved by the EPA in November 1997.

To Be Prepared for Each Remediation Area (Figure 1-1)

- **Project-Specific Plans (PSPs).** Project-specific plans will be prepared for each remediation area to collect the needed information and analytical data to support IRDP development and certification activities. The content of PSPs is discussed in Section 7.1.

- **Integrated Remedial Design Packages (IRDPs).** An IRDP will be prepared for each remediation area. Each IRDP will provide area-specific information and detail that is not fully addressed in the SEP. The IRDP will present important results of all the predesign investigation, including the estimated extents of excavation and certification information necessary for borrow material to be used during the construction. Each IRDP will include an area-specific implementation plan, design drawings, and specifications. The content of the IRDPs is discussed in greater detail in Section 7.2.

- **Natural Resource Restoration Design Package (NRRDP).** The area or zone-specific NRRDP will include the implementation plan for final restoration, design drawings, and specifications for remediated areas.

- **Certification Design Letters (CDLs).** Subsequent to completion of remediation and precertification survey activities (Section 3.0) in each area, in accordance with the IRDP, a Certification Design Letter will be issued. This letter will detail the certification survey design, including certification unit boundaries, number of samples to be collected and analyzed, and the analyses to be performed on each sample. This letter may become part of the complete Certification Report (Section 7.3).

- **Certification Reports.** Following completion of certification activities in each area, a Certification Report will be issued (Section 7.4). This report may incorporate the Certification Design Letter and demonstrate FRL attainment. In addition, the report will detail, as applicable, closure of HWMUs and USTs. The Certification Report will also include a section summarizing the WAC attainment procedures. Information will be provided to demonstrate that all material exceeding the WAC for the OSDF in each area has been removed, staged for shipment to an off-site disposal facility, or disposed of in an off-site facility, rather than placed in the OSDF. This section will be prepared in accordance with the requirements specified in the WAC Attainment Plan.

Operable-Unit-Specific Documents To Be Prepared (see Figure 1-2)

- **Remedial Action Reports (RARs).** A Remedial Action Report is required for each operable unit after the operable unit specific remedy is completed. The report will summarize all the remedial actions conducted for the operable unit and describe the residual conditions, using information generated and submitted during remediation. Remediation of the Operable Unit 2 waste units, Operable Unit 5 soil, and Operable Unit 3 at- and below-grade debris will be covered under a single RAR.

Sitewide Documents To Be Prepared (see Figure 1-2)

- **Natural Resource Restoration Plan (NRRP).** The NRRP documents the natural resource restoration strategy to be employed at the site and describes the institutional controls necessary to implement restoration goals under the site's selected remedy. This document also serves as the final land use plan for the site. This plan also summarizes the anticipated final contours for the FEMP, generally based on future land use as an undeveloped park.

- **Site Closeout Report (SCR).** A Site Closeout Report will be prepared for the site after all the operable unit-specific remedies are completed. The report will summarize all the remedial actions conducted for the FEMP and will describe the residual conditions, using information provided in the individual Remedial Action Reports.

1.5 SCHEDULE FOR AGENCY SUBMITTALS

The schedule shown in Table 1-5 was established in the Operable Unit 5 Remedial Design Work Plan (DOE 1996a) for formal submittal of remedial design documents. Parts of the original schedule have been modified to reflect the sequencing of remediation areas described in Appendix B. In Area 1 Phase III, Area 2 Phase III, Area 8 and Area 9, no excavation is anticipated and the first document delivered to EPA will be the CDL. The schedule for the IRDPs for Areas 3, 4, 5, and 6 have been reset to provide time to remove materials and hazardous waste from the Plant 1 Pad (Area 3), and to be consistent with the D&D schedule proposed for the Former Production Area (Areas 4, 5, and 6). The

Area 7 IRDP has been rescheduled to allow a reevaluation of treatment alternatives for materials in the silos. Corridors and roadways (Area 10) were not specifically scheduled for an IRDP submittal in the Operable Unit 5 RD Work Plan; this IRDP submittal date is now scheduled for March 2007. Submittal dates for CDLs will be posted in the IRDPs, unless otherwise noted in Table 1-5.

TABLE 1-1
FEMP OPERABLE UNIT REMEDIES AND ASSOCIATED PROJECT RESPONSIBILITIES [a]

OU Description	Remedy Overview [b]	Project Organization/Responsibilities	Planning Documents
Operable Unit 1 Waste pits 1 - 6 Clearwell Burn pit Berms, liners, caps and soil within the operable unit boundary	ROD Approved: March 1995 Excavation of materials within the waste pits, caps, liners, and surrounding contaminated soils; off-site transportation for disposal at the permitted commercial disposal facility, or disposal at NTS if the waste fails to meet the PCDF WAC; the disposition of contaminated soils; and the D&D of the remediation facility Waste processing and treatment by thermal drying (as necessary) Off-site disposal of waste materials at a permitted facility Restoration	Primary Project: Waste Pits Remedial Action Project (WPRAP) is responsible for rail upgrade, excavation of Operable Unit 1 waste units, waste processing and drying, loading, rail transport, and off-site disposal of contaminated soil and debris that exceed the waste acceptance criteria for the On-Site Disposal Facility. (Note: This project will be performed by the WPRAP, SCEP and the ARASA subcontractor.) Related Projects: Soil Characterization and Excavation Project is responsible for sampling, excavation, and disposition of impacted soil beneath the rail construction area and the waste pits, as well as at- and below-grade remediation facilities, including the railroad. Soil excavation will be coordinated by SCEP and the ARASA subcontractor. AWWT and Wastewater Project is responsible for treating contaminated runoff and perched water collected during waste pit excavation; each project is responsible for containing and transporting remediation wastewater to the AWWT facility for treatment. Facilities D&D Project is responsible for D&D of all above-grade Operable Unit 1 remediation facilities.	Operable Unit 1 RA Work Plan SEP and Area 6 IRDP for underlying soil excavation and certification IEMP for sitewide environmental monitoring A D&D Implementation Plan will be developed for above-grade facilities within Operable Unit 1.

TABLE 1-1 (Continued)

OU Description	Remedy Overview [b]	Project Organization/Responsibilities	Planning Documents
Operable Unit 2 Solid waste landfill Inactive flyash pile Active flyash pile (now inactive) North and south lime sludge ponds Other South Field disposal areas Berms, liners and soil within the operable unit boundary	ROD Approved: May 1995 Excavation of all materials with COCs above FRLs Treatment for size reduction and moisture control as required Establishment of on-site WAC OSDF construction WAC attainment certification FRL certification Collection and treatment of Operable Unit 2 subunit and OSDF construction water On-site disposal in the OSDF Off-site disposal of a small fraction of excavated material that exceeds the WAC for the OSDF and lead-contaminated soil from the South Field Firing Range. Restoration	Primary Project: Soil Characterization and Excavation Project is responsible for excavation and disposition of waste from all Operable Unit 2 subunits. Related Projects: On-Site Disposal Facility Design Project is responsible for design, installation, and closure of the OSDF that will contain Operable Unit 2 subunit wastes, Operable Unit 5 soil and debris, and Operable Unit 3 debris; responsible for monitoring leachate within the OSDF and perched groundwater in the till beneath the OSDF. AWWT and Wastewater Project is responsible for treating contaminated runoff and perched water collected during excavation of Operable Unit 2 subunit wastes; each project is responsible for containing and conveying remediation wastewater to the AWWT facility for treatment.	Operable Unit 2 Remdial Design and Remedial Action Work Plan for OSDF construction, management, and closure SEP, Area 2, Phase I IRDP and Area 2, Phase 2 IRDP for waste unit contents removal and soil excavation and certification, respectively IEMP for sitewide environmental monitoring

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TABLE 1-1 (Continued)

OU Description	Remedy Overview [b]	Project Organization/Responsibilities	Planning Documents
Operable Unit 3 Former Production Area and associated facilities and equipment (includes all above-, at-, and below-grade improvements) including, but not limited to: All structures, equipment, utilities, effluent lines, K-65 transfer line Wastewater treatment facilities Fire training facilities Coal pile Scrap metal piles Drums, tanks, solid waste, waste product, feedstocks, thorium	ROD Approved: September 1996 Adoption of Operable Unit 3 IROD Alternatives to disposal through the unrestricted or restricted release of materials, as economically feasible for recycling, reuse, or disposal Treatment of material for on-site or off-site disposal Required off-site disposal for process residues, product materials, process-related metals, acid brick, concrete from specific locations, and any other material exceeding the on-site WAC On-site disposal for material that meets the WAC Restoration	Primary Project: Facilities D&D Project is responsible for D&D of all above-grade buildings and facilities at the FEMP. Related Projects: Soil Characterization and Excavation Project is responsible for removal of at- and below-grade facilities. Responsible for certification sampling beneath excavated facilities. AWWT and Wastewater Project is responsible for treating contaminated and other wastewater during D&D activities. Each project is responsible for containing and conveying remediation wastewater to the AWWT facility for treatment. On-Site Disposal Facility Design Project is responsible for design, installation, and closure of the OSDF that will contain Operable Unit 3 debris, Operable Unit 2 subunit wastes, and Operable Unit 5 soil.	SEP and Areas 3, 4, and 5 IRDPs under SCEP: Removal of all Operable Unit 3 at- and below-grade structures (building foundations, roadways, underground utilities, in-ground basins within Former Production Area, Sewage Treatment Plant, and the Fire Training Facility) and WAC attainment and debris management. Facilities D&D Project Operable Unit 3 Integrated RD/RA Work Plan for D&D of above-grade facilities and applicable Implementation Plans. IEMP for sitewide environmental monitoring.

TABLE 1-1 (Continued)

OU Description	Remedy Overview [b]	Project Organization/Responsibilities	Planning Documents
Operable Unit 4 Silos 1 and 2 (containing K-65 residues) Silo 3 (containing cold metal oxides) Silo 4 (empty and never used) Decant tank system Berms and soil within the operable unit boundary	ROD Approved: December 1994 Removal of silo residues and decant sump tank sludges with on-site vitrification of residues and sludges followed by off-site disposal Demolition and decontamination, to the extent possible, of silos and vitrification facilities Excavation of contaminated soil above the FRLs with on-site disposal for contaminated soil and debris that meet the on-site WAC Contaminated soil and debris that exceed the on-site WAC will be disposed of off-site Restoration	Primary Project: Silos Project is responsible for silo content removal, treatment, and transport off site. Related Projects: Soil Characterization and Excavation Project is responsible for certification, excavation and disposition of contaminated soil beneath the silos that exceed to on-site WAC, and for removal of subsurface structures (i.e., sub-grade silo decant system). AWWT and Wastewater Project is responsible for treating decontamination and other wastewater during D&D activities; each project is responsible for capturing and transporting remediation wastewater to the AWWT facility for treatment. Facilities D&D Project is responsible for D&D of all Operable Unit 4 remediation facilities.	Operable Unit 4 RD documents - planning for removal of silo contents and their transport for off-site disposal SEP and Area 7 IRDP - planning for excavating remaining contaminated soil, attainment of FRLs, final site restoration of Operable Unit 4. IEMP for sitewide environmental monitoring Implementation plans for above-grade D&D

TABLE 1-1 (Continued)

OU Description	Remedy Overview [b]	Project Organization/Responsibilities	Planning Documents
Operable Unit 5	ROD Approved: January 1996	Primary Projects:	SEP and all IRDPs.
Groundwater Surface water and sediments Soil not included in the definitions of Operable Units 1-4 Flora and fauna	Extraction of contaminated groundwater from the Great Miami Aquifer to meet FRLs at all affected areas of the aquifer Treatment of contaminated groundwater, storm water, and wastewater to attain mass-based discharge limits and FRLs in the Great Miami River Excavation of contaminated soil, rubble, and sediment to meet FRLs Excavation of contaminated soil containing perched water that, through contaminant migration, presents an unacceptable threat to the underlying aquifer On-site disposal of contaminated soil and sediment that meet the on-site WAC Soil and sediment that exceed the WAC for the OSDF will be treated, where possible, to meet the on-site WAC or will be disposed of at an off-site facility Site restoration, institutional controls, and post-remediation maintenance	Soil Characterization and Excavation Project is responsible for precertification and certification of sitewide soil; excavation and disposition of contaminated soil, sediment, impacted perched groundwater and at- and below-grade facilities; and final site restoration. Aquifer Restoration Project is responsible for designing, installing, and operating the pumping systems for the Great Miami Aquifer groundwater restoration; responsible for groundwater monitoring in the Great Miami Aquifer, including the groundwater monitoring program for the On-Site Disposal Facility. AWWT and Wastewater Project is responsible for designing, constructing, and operating all treated effluent discharge systems, and for treating and discharging contaminated groundwater, storm water, run-off water, and remedial action wastewater at the FEMP. Related Projects: Facilities D&D Project is responsible for D&D of all Operable Unit 5 remediation facilities. On-Site Disposal Facility Design Project is responsible for design, installation, and closure of the On-Site Disposal Facility that will contain Operable Unit 3 debris, Operable Unit 2 subunit wastes, and Operable Unit 5 soil.	Groundwater Monitoring and Sitewide Environmental Monitoring: Integrated Environmental Monitoring Plan. OU5 AWWT and ARP RAWP OHMMP Groundwater Monitoring and Sitewide Environmental Monitoring: Integrated Environmental Monitoring Plan.

8092

TABLE 1-1 (Continued)

Notes: [a] Source of information is from each operable unit's ROD and RD work plan.
[b] Each remedy includes institutional controls that will be managed for the site through the NRRP.

AWWT	Advanced Waste Water Treatment
D&D	Decontamination and Dismantlement
IEMP	Integrated Environmental Management Project
IRDP	Integrated Remedial Design Project
NTS	Nevada Test Site
PCDF	Permitted Commercial Disposal Facility
RA	Remedial Action
ROD	Record of Decision
SEP	Sitewide Excavation Plan
SCEP	Soil Characterization and Project
WAC	Waste Acceptance Criteria
WPRAP	Waste Pits Remedial Action Project

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TABLE 1-2

CROSS-REFERENCE BETWEEN OPERABLE UNIT REMEDY COMPONENTS AND THE SITEWIDE EXCAVATION PLAN

Remedy Component	Operable Unit	SEP Section Reference
Soil and Sediment	2, 5	2.0, 3.0 and 4.0
Perched Water Treatment	2, 5	2.0, 3.0 and 4.0
Regional Groundwater Aquifer	5	See Operable Unit 5 RD Work Plan
Storm Water/Wastewater	2, 3, 5	2.0 and 3.0
Treatment of Discharges	2, 5	2.0, 3.0, and Operable Unit 5 RD Work Plan
Debris	3, 5	2.0, 3.0, and 4.0
Operable Unit 2 Subunits	2	1.0 and 4.0
Measures to Minimize Environmental Impacts	1, 2, 3, 4, 5	1.0 and 5.0
Institutional Controls/Monitoring	2, 5	2.0 and 5.0
Corrective Action Management Unit (CAMU) Rule	1, 2, 3, 5	1.0
Community Involvement	1, 2, 3, 4, 5	1.0

RD - Remedial Design

TABLE 1-3

REQUIRED PROJECT PLANS [a]

Requirement	Cross-Reference
Sampling and Analysis Plan, including quality assurance project plan(s) and field sampling plan(s)	SEP (Appendices G&H)/PSPs IRDPs/QAjSP/SCQ
Health and Safety/Contingency Plan	SEP (Section 2.3.8)/Project-Specific Health and Safety Plans (SEP Section 6.0)
Permitting Plan (ARARs)	SEP (Section 1.3.1.2)/IRDPs
Groundwater Monitoring Plan	IEMP
Operations and Maintenance Plan	SEP (Section 3.5)/IRDPs/NRRP

Note: [a] As listed in the Amended Consent Agreement (EPA 1991).

ARARs Applicable or Relevant and Appropriate Requirments
IEMP Integrated Environmental Management Project
IRDP Integrated Remedial Design Project
NRRP Natural Resource Restoration Plan
QAjSP Quality Assurance Job Specific Plan
SCQ Sitewide CERCLA Quality Assurance Plan
SEP Sitewide Excavation Project

TABLE 1-4

SUMMARY OF CONTAMINANT LEVELS PERTINENT TO SOIL REMEDIATION AT THE FEMP

Constituent	Practical Quantitation Limit[a]	Background[b]			Waste Acceptance Criteria for Soil and Sediment in the On-Site Disposal Facility[c]	Benchmark Toxicity Value	Final Remediation Levels									
							Operable Unit 5[d]			Operable Unit 2[e]						
		Surface Soil	Subsurface Soil	Sediment (Paddys Run)			On-Property Soil	Off-Site Soil	Sediment	Solid Waste Landfill	Lime Sludge Ponds	Inactive Flyash Pile (over GMA)	Inactive Flyash Pile (>16 ft natural soil)	South Field (over GMA)	South Field (>16 ft natural soil)	Active Flyash Pile
Radionuclides (pCi/g)																
Cesium-137+1d	2.00E-01	7.10E-01	ND			1.20E+04	1.40E+00	8.20E-01	7.00E+00							
Lead-210+2d	5.00E-01	1.30E+00	8.50E-01				3.80E+01	2.20E+00	3.90E+02							
Neptunium-237+1d	2.00E-01				3.12E+09		3.20E+00	4.90E-01	3.20E+01							4.99E+00
Plutonium-238	2.00E-01					3.80E+06	7.80E+01	9.30E+00	1.20E+03							
Plutonium-239/240	2.00E-01					4.10E+06	7.70E+01	9.00E+00	1.10E+03							
Radium-226+8d	2.50E-01	1.42E+00	1.47E+00	5.00E-01		6.70E+02	1.70E+00	1.50E+00	2.90E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00
Radium-228+1d	5.00E-01	1.25E+00	1.31E+00	ND		3.40E+05	1.80E+00	1.40E+00	4.80E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
Strontium-90+1d	5.00E-01	4.20E-01	4.40E-01		5.67E+10	2.80E+03	1.40E+01	6.10E-01	7.10E+03							
Technetium-99	1.00E+00	ND	ND		2.91E+01	9.30E+04	3.00E+01	1.00E+00	2.00E+05					7.10E+01	7.10E+01	
Thorium-228+7d	1.00E-01	1.43E+00	1.38E+00			1.40E+06	1.70E+00	1.50E+00	3.20E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00
Thorium-230	1.00E-01	1.97E+00	1.91E+00			2.10E+05	2.80E+02	8.00E+01	1.80E+04					6.97E+00	6.97E+00	
Thorium-232+10d	1.00E-01	1.36E+00	1.26E+00			2.40E+05	1.50E+00	1.40E+00	1.60E+00	1.50E+00	1.50E+00	1.50E+00	1.50E+00	1.50E+00	1.50E+00	1.50E+00
Uranium-234	f	1.24E+00	1.04E+00							6.29E+01	1.96E+02	8.68E+00	4.24E+00	8.68E+00	4.24E+00	8.64E+00
Uranium-235/236	f	1.60E-01	1.50E-01							6.31E+01	1.95E+02	7.79E+00	3.35E+00	7.79E+00	3.35E+00	7.75E+00
Uranium-238	f	1.24E+00	1.12E+00		3.46E+02	1.20E+04				1.29E+01	4.53E+01	6.12E+00	3.22E+00	6.12E+00	3.22E+00	6.12E+00
Uranium, total[d] (mg/kg) (High K_d)	1.00E-01	3.73E+00	3.69E+00	3.00E+00	1.03E+03	2.30E+02	8.20E+01	5.00E+01	2.10E+02	3.86E+01	1.36E+02					2.80E+01
Uranium, total[d] (mg/kg) (Low K_d)	1.00E-01						2.00E+01	NA				2.48E+01	2.48E+01	2.48E+01	2.48E+01	
Inorganics (mg/kg)																
Antimony	5.00E-01	ND	ND			1.00E+01	9.60E+01	6.10E-01								
Arsenic	1.30E+00	8.20E+00	9.57E+00	7.00E+00		3.00E+01	1.20E+01	9.60E+00	9.40E+01			1.69E+01	1.69E+01			1.69E+01
Barium	1.30E+00	9.41E+01	1.19E+02	2.10E+01		5.00E+02	6.80E+04	1.20E+02								
Beryllium	5.00E-02	6.00E-01	6.20E-01	5.00E-01		5.60E+01	1.50E+00	6.20E-01	3.30E+01							
Boron	4.00E+00				1.04E+03		7.40E+03	4.00E+00								
Cadmium	1.00E-01	8.70E-01	9.10E-01	3.70E+00		5.00E+00	8.20E+01	9.10E-01	7.10E+01							
Chromium VI	2.70E+00	1.55E+01	2.07E+01	1.83E+01		5.00E-02	3.00E+02	1.10E+01	3.00E+03							
Cobalt	3.00E-01	1.42E+01	1.57E+01	4.90E+00			7.40E+02	2.60E+01	3.60E+04							
Copper	5.00E-01	1.41E+01	2.00E+01	1.08E+01		1.00E+02	2.20E+05	2.00E+01								
Cyanide	3.30E-01	2.70E-01	1.70E-01				1.20E+05	8.00E-01								
Fluoride	7.00E-01						7.80E+04	8.50E+02								
Lead	5.00E-02	2.64E+01	1.56E+01			2.00E+02	4.00E+02	4.00E+02						4.00E+02		
Manganese	1.00E+00	1.35E+03	1.30E+03	4.11E+02		1.50E+03	4.60E+03	1.40E+03	4.10E+02							
Mercury	1.30E-01	3.00E-01	2.90E-01	ND	5.66E+04	5.00E+00	7.50E+00	3.00E-01								
Molybdenum	1.30E+01	ND	2.70E+00	ND		1.00E+01	2.90E+03	1.30E+01								
Nickel	4.00E+00	2.09E+01	3.43E+01	1.37E+01		1.00E+02	1.50E+04	3.40E+01								
Selenium	1.30E+00	7.20E-01	ND	ND		3.00E+00	5.40E+03	2.50E+00								
Silver	1.30E+00	ND	ND	ND		1.00E+01	2.90E+04	1.00E+00								
Thallium	1.00E+00	5.80E-01	4.90E-01	ND		6.30E+00	9.10E+01	1.00E+00	8.80E+01							

TABLE 1-4
(Continued)

Constituent	Practical Quantitation Limit [a]	Background [b]			Waste Acceptance Criteria for Soil and Sediment in the On-Site Disposal Facility [c]	Benchmark Toxicity Value	Final Remediation Levels									
							Operable Unit 5 [d]			Operable Unit 2 [e]						
		Surface Soil	Subsurface Soil	Sediment (Paddys Run)			On-Property Soil	Off-Site Soil	Sediment	Solid Waste Landfill	Lime Sludge Ponds	Inactive Flyash Pile (over GMA)	Inactive Flyash Pile (>16 ft natural soil)	South Field (over GMA)	South Field (>16 ft natural soil)	Active Flyash Pile
Vanadium	1.00E+00	3.04E+01	3.78E+01	1.24E+01		1.50E+02	5.10E+03	5.80E+01								
Zinc	1.00E+00	5.96E+01	8.20E+01	1.35E+01		5.00E+02	1.20E+05	8.20E+01								
Organics (mg/kg)																
Acetone	7.00E-03						4.30E+04	4.30E-01								
Aroclor-1254	4.00E-02					1.00E+00	1.30E-01	4.00E-02	6.70E-01							
Aroclor-1260	4.00E-02					1.00E+00	1.30E-01	4.00E-02	6.70E-01					2.50E+01	2.50E+01	
Benzene	1.00E-03						8.50E+02	4.30E-01								
Benzo(a)anthracene	7.00E-04					1.00E+00	2.00E+01	1.60E-01	1.90E+02					4.55E-01	4.55E-01	
Benzo(a)pyrene	7.00E-04					1.00E+00	2.00E+00	9.00E-02	1.90E+01					7.77E-01	7.77E-01	
Benzo(b)fluoranthene	7.00E-04					1.00E+00	2.00E+01	1.60E-01	1.90E+02					5.13E-01	5.13E-01	
Benzo(k)fluoranthene	7.00E-04					1.00E+00	2.00E+02	9.00E-02	1.90E+03					6.03E-01	6.03E-01	
Bis(2-chloroisopropyl)ether	2.20E-01				2.44E-02		4.20E+02	2.00E-01								
Bis(2-ethylhexyl)phthalate	2.20E-01					7.00E+01	8.20E+02	2.60E+01	5.00E+03							
Bromodichloromethane	1.00E-03				9.03E-01		4.00E+00	1.80E-01								
Bromoform	1.00E-02						3.10E+01	1.60E+00	1.60E+02							
Bromomethane	1.00E-02						8.20E+03	2.40E-02								
Carbazole	4.00E-02				7.27E+04		1.20E+01	3.10E+00	6.30E+01							
Carbon disulfide	1.00E-03					7.80E+03	5.00E+03	6.20E+00								
Carbon tetrachloride	1.00E-03						2.10E+00	9.10E-02								
Chlordane	2.00E-03				2.89E+00		1.90E-01	3.80E-02								
Chlorobenzene	1.00E-03						3.40E+02	1.90E+00								
Chloroethane	1.00E-03				3.92E+05											
Chloroform	1.00E-03						4.50E+01	5.00E-01								
Chrysene	2.00E-03					1.00E+00	2.00E+03	1.60E+01	1.90E+04							
Dibenzo(a,h)anthracene	5.00E-04						2.00E+00	1.60E-03						1.57E-01	1.57E-01	
3,3'-Dichlorobenzidine	2.00E-01						5.50E-01	2.00E-01								
1,1-Dichloroethene	1.00E-03				1.14E+01		4.10E-01	5.90E-02								
1,2-Dichloroethene	1.00E-03				1.14E+01		1.60E-01	1.30E-01								
Dieldrin	4.00E-03					4.00E-02	1.50E-02	8.80E-03						9.57E-03	9.57E-03	
Di-n-octylphthalate	2.00E-01						1.10E+03	2.00E-01								
Ethylbenzene	1.00E-02						5.10E+03	1.00E-03								
Heptachlorodibenzofuran	6.00E-06						8.80E-04	5.00E-05								
Heptachlorodibenzo-p-dioxin	6.00E-06						8.80E-04	5.00E-05								
Indeno(1,2,3-cd)pyrene	4.00E-03					1.00E+00	2.00E+01	1.60E-02	1.90E+02					4.96E-01	4.96E-01	
4-Methyl-2-pentanone	7.00E-03						2.50E+03	9.40E-01	2.10E+03							
Methylene chloride	3.00E-03					8.50E+01	3.70E+01	6.30E-01								
4-Methylphenol	2.00E-01						2.50E+02	2.70E-01								
4-N[illegible]ne	9.00E-01				4.42E-02		1.50E[illegible]	8.00E-01								

(Continued)

Constituent	Practical Quantitation Limit[a]	Background[b]			Waste Acceptance Criteria for Soil and Sediment in the On-Site Disposal Facility[c]	Benchmark Toxicity Value	Final Remediation Levels									
							Operable Unit 5[d]			Operable Unit 2[e]						
		Surface Soil	Subsurface Soil	Sediment (Paddys Run)			On-Property Soil	Off-Site Soil	Sediment	Solid Waste Landfill	Lime Sludge Ponds	Inactive Flyash Pile (over GMA)	Inactive Flyash Pile (>16 ft natural soil)	South Field (over GMA)	South Field (>16 ft natural soil)	Active Flyash Pile
N-nitrosodiphenylamine	2.00E-01						5.10E+01	1.30E+01	2.60E+02							
N-nitrosodipropylamine	2.00E-01						2.00E-01	2.00E-01								
Octachlorodibenzofuran	1.30E-05						8.80E-03	1.00E-05								
Octachlorodibenzo-p-dioxin	1.30E-05						8.80E-03	1.00E-05								
Pentachlorophenol	9.00E-01						2.30E+00	9.70E-01								
Phenanthrene	1.00E-03								3.00E-03					1.90E-01	1.90E-01	
Tetrachloroethene	1.00E-03				1.28E+02	2.50E+01	3.60E+00	1.00E+00								
Toluene	1.00E-03						1.00E+05	2.70E+01								
Toxaphene					1.06E+05											
Tributyl phosphate	4.00E-02						2.50E+02	2.90E+00								
1,1,2-Trichloroethane	1.00E-03						4.30E+00	1.90E-01								
Trichloroethene	1.00E-03				1.28E+02		2.50E+01	1.50E+00								
Vinyl chloride	1.00E-03				1.51E+00		1.30E-01	2.30E-03								
Xylenes, total	1.00E-03						9.20E+05	4.00E+02								

Notes: [a] From Operable Unit 5 FS (DOE 1995b)

[b] From Operable Unit 5 RI (DOE 1995e).

[c] From *Impacted Materials Placement Plan - On-site Disposal Facility* (DOE 1996d).

[d] From Operable Unit 5 ROD (DOE 1996e).

[e] From Operable Unit 2 ROD (DOE 1995f).

[f] See Appendix H for practical quantitation limits

ND = Not Detected

NA = Not Applicable

TABLE 1-5 SCHEDULE OF REMEDIAL DESIGN DELIVERABLES

Remediation Area	Revised Schedule	OU5 RD Work Plan
Area 1 Phase I	Submitted	17 Jul 96
Area 1 Phase II	Submitted	21 Nov 97
Area 1 Phase III	31 Mar 00 - CDL	15 Jan 01
Area 2 Phase I	Submitted	14 Mar 97
Area 2 Phase II	31 Dec 01 - IRDP	15 Jan 01
Area 2 Phase III	31 Mar 99 - CDL	NA
Area 3	31 Mar 00 - IRDP	02 Jul 98
Area 4A	31 Dec 01 - IRDP	15 Nov 00
Area 4B	01 Apr 02 - IRDP	15 Nov 00
Area 5	01 Jul 02 - IRDP	15 Nov 00
Area 6	01 Dec 03 - IRDP	15 Jan 01
Area 7	31 Mar 08 - IRDP	15 Jan 01
Area 8 Phase I	Submitted	NA
Area 8 Phase II	30 Sep 98 - CDL	NA
Area 8 Phase III	30 Jun 03 - CDL	NA
Area 9 Phase I	29 Aug 99 - CDL	NA
Area 9 Phase II	27 Aug 00 - CDL	NA
Area 10	30 Mar 07 - IRDP	NA

CDL = Certification Design Letter
IRDP = Integrated Remedial Design Package
NA = Not applicable

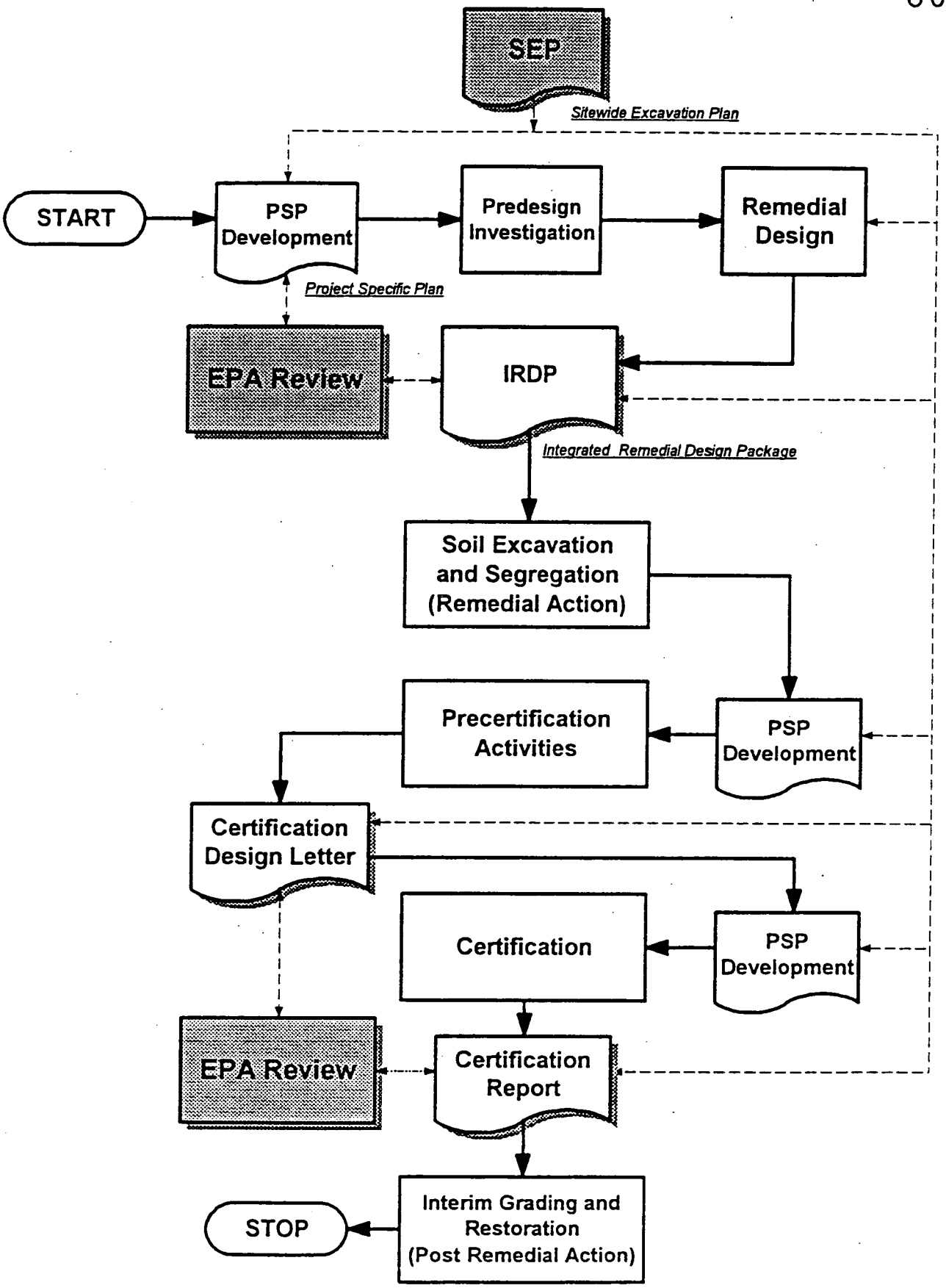


FIGURE 1-1 GENERAL AREA-SPECIFIC SOIL REMEDIATION PROCESS

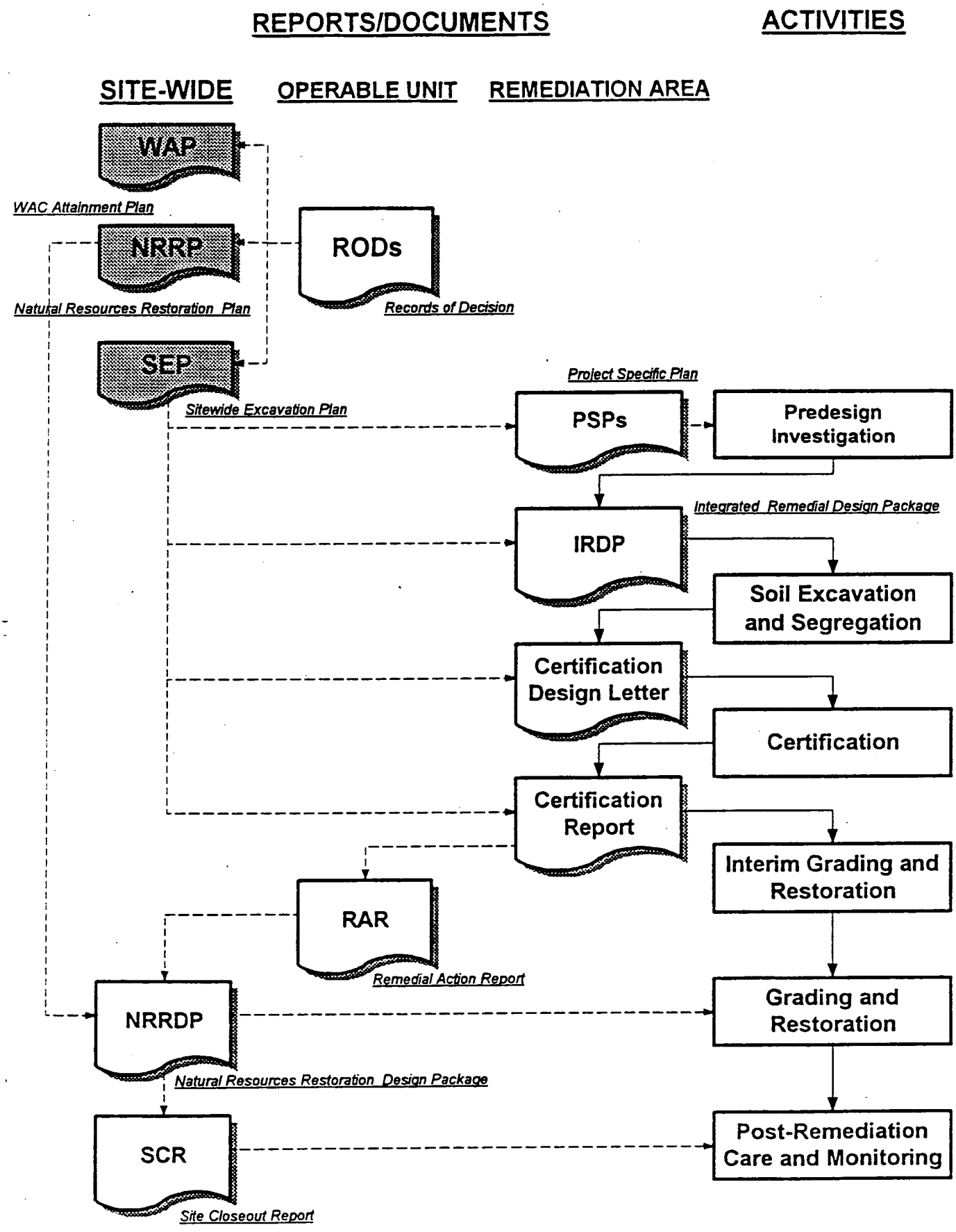


FIGURE 1-2 HIERARCHY OF SOIL REMEDIATION DOCUMENTS

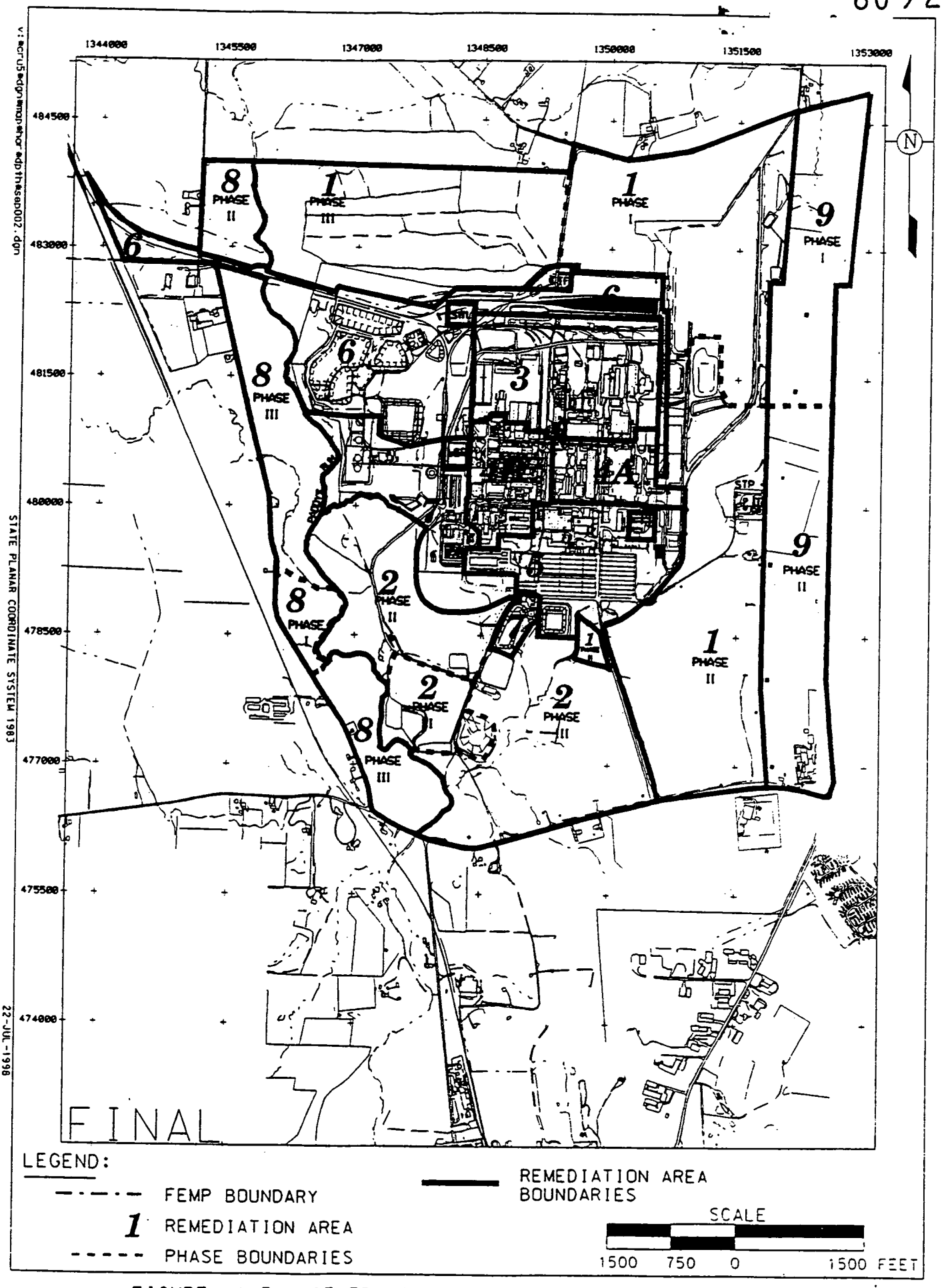


FIGURE 1-3. GENERALIZED SITEWIDE REMEDIATION AREAS

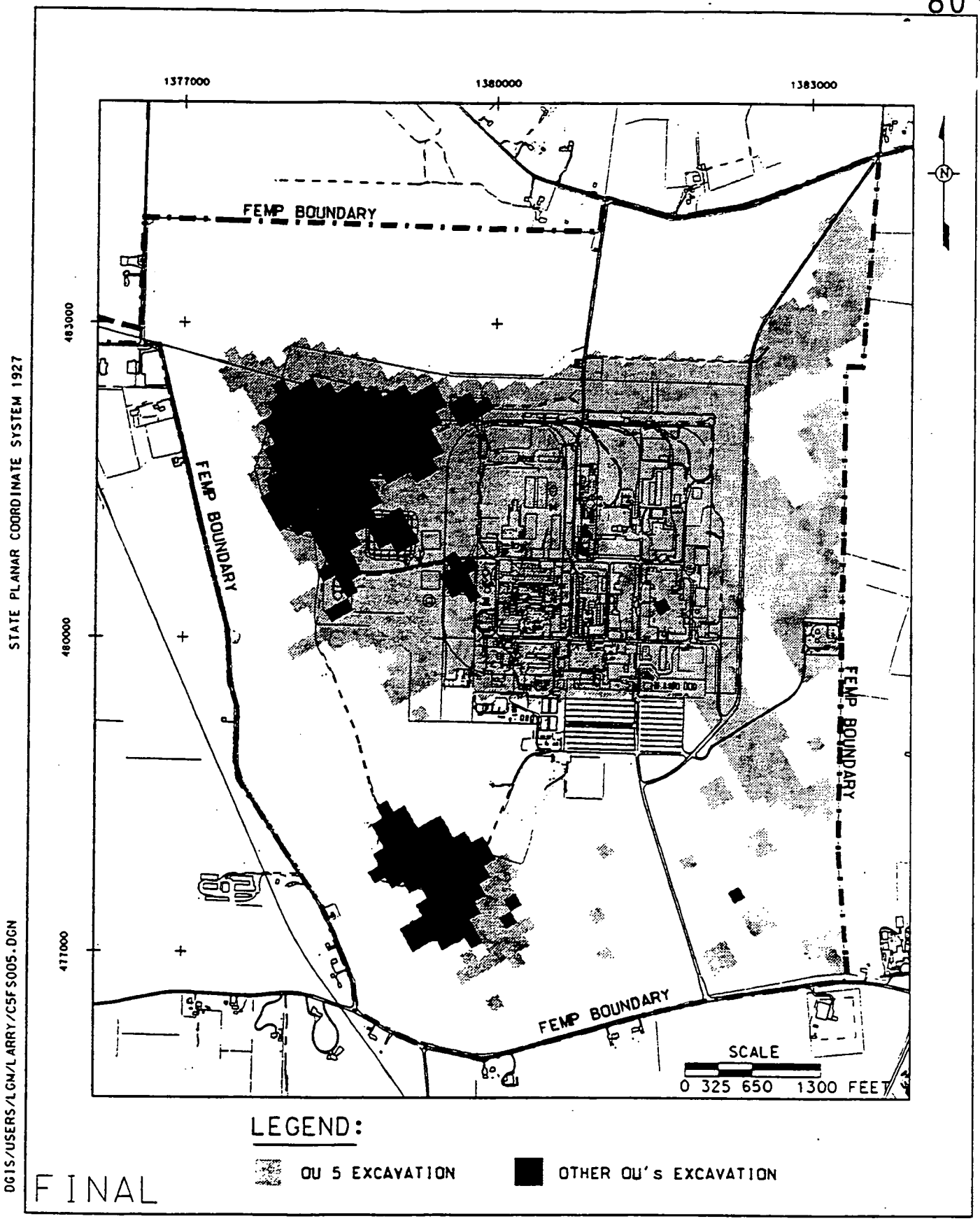
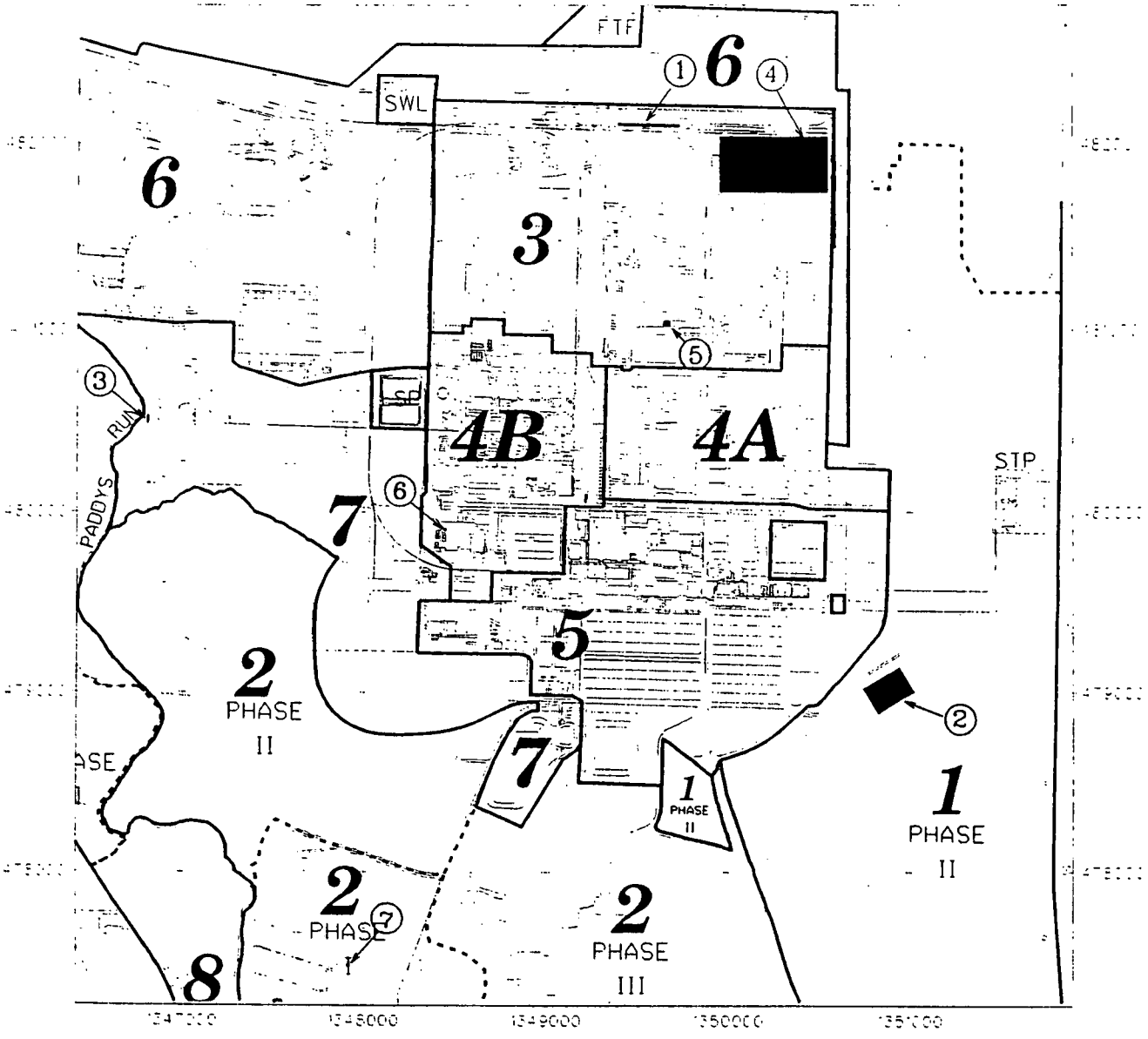


FIGURE 1-4. POTENTIAL EXCAVATION FOOTPRINT, BASED ON OPERABLE UNIT 5 FS



LEGEND

RCRA AREAS

LOCATION IDENTIFIERS

1. AREA BETWEEN FCC WAREHOUSE AND RAILROAD TRACKS
2. TRAP RANGE
3. PADDYS RUN STREAMBANK FILL MATERIAL WEST OF SILOS 1-4
4. SCRAP METAL FILE AREA
5. AREA NORTH OF MAINTENANCE BUILDING
6. ABANDONED SUMP WEST OF PILOT PLANT (HWMU #22)
7. SOUTH FIELD FIRING RANGE

FIGURE 1-5. AREAS REQUIRING FURTHER CHARACTERIZATION AND POTENTIAL TREATMENT OF RCRA TOXICITY CHARACTERISTIC WASTES

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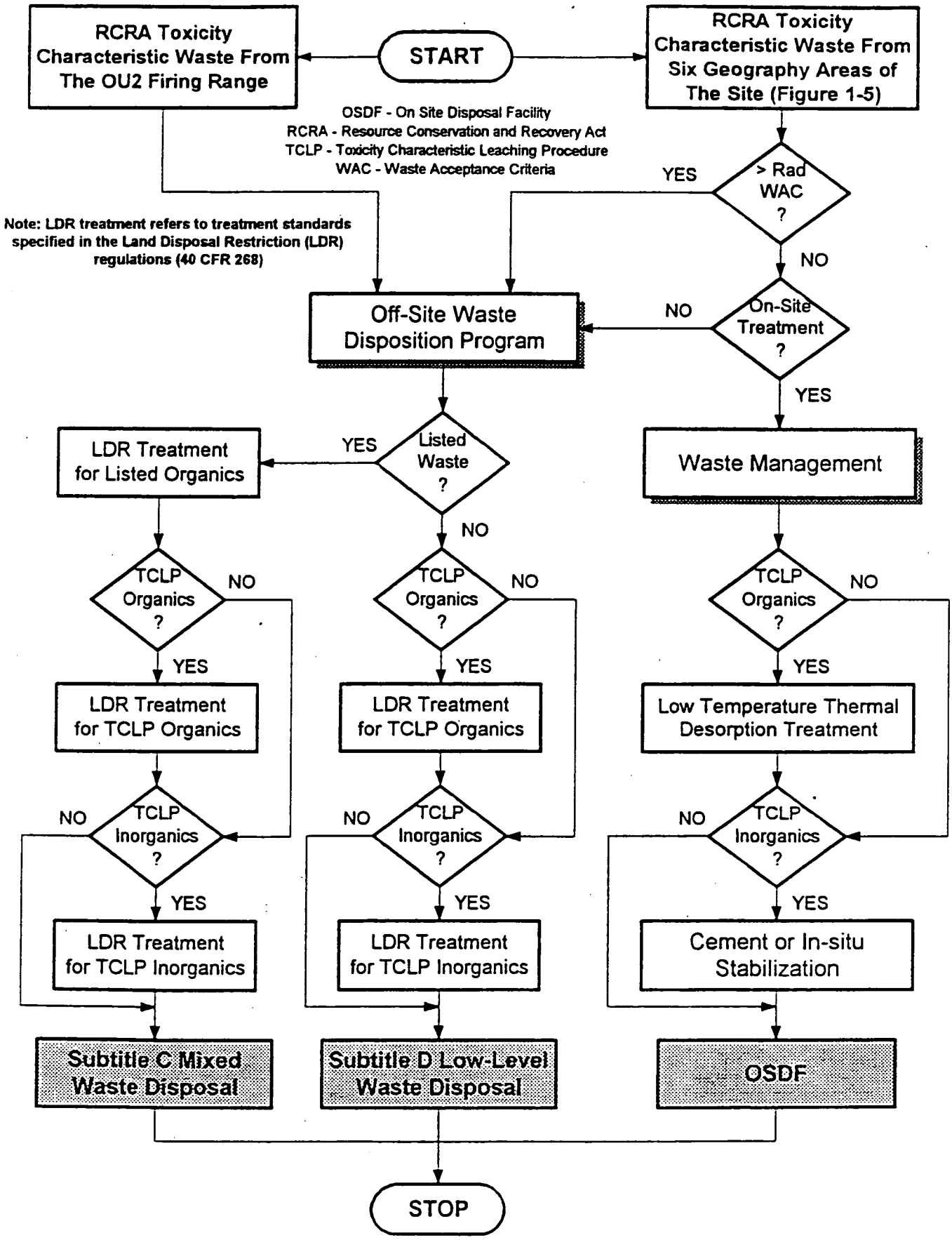
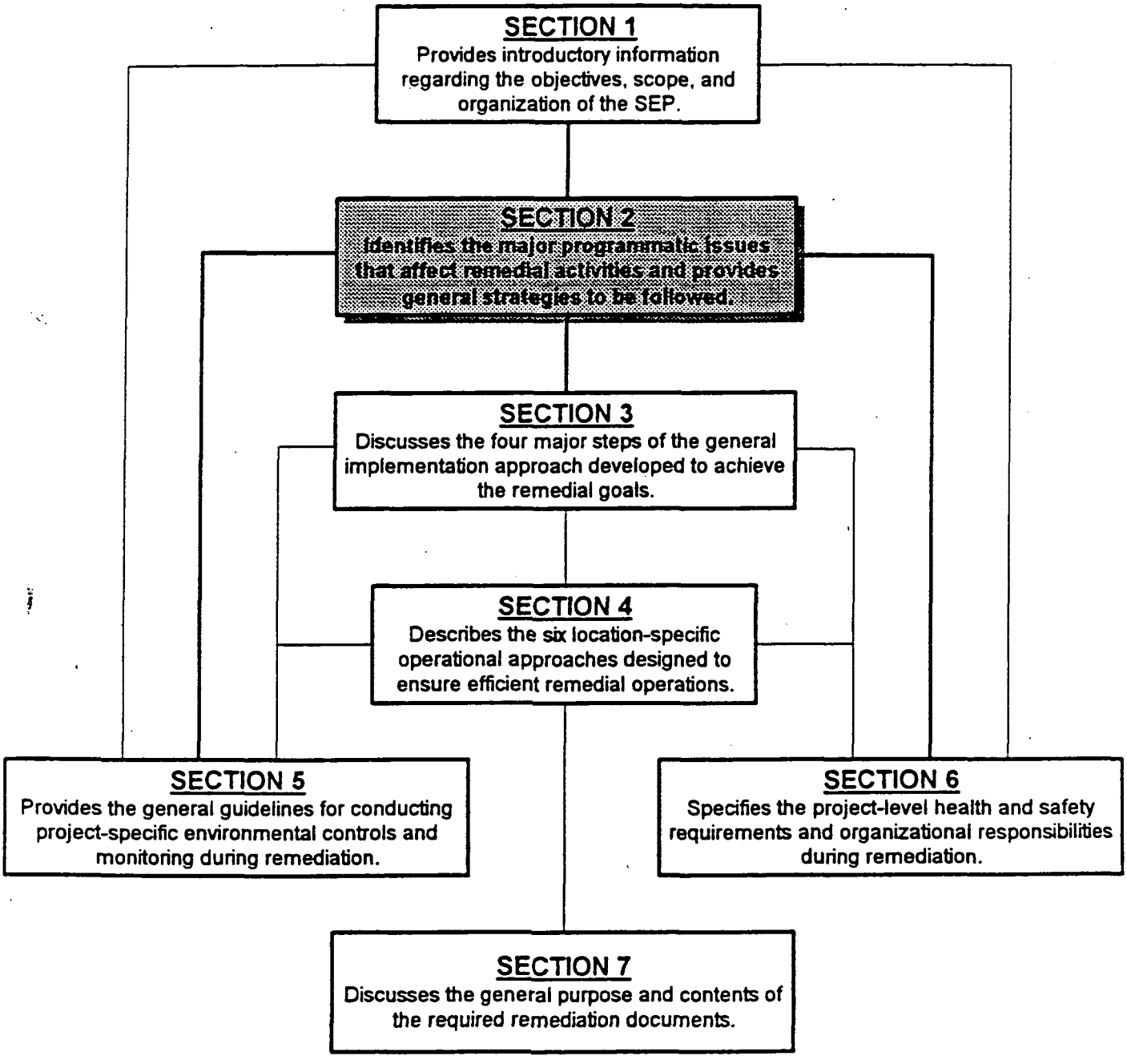


FIGURE 1-6 RCRA-REGULATED SOIL TREATMENT AND DISPOSAL REQUIREMENTS

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

2.0 REMEDIATION ISSUES AND GENERAL STRATEGIES

Throughout the remedial investigation/feasibility study (RI/FS) at the Fernald Environmental Management Project (FEMP), certain implementation decisions were deferred to the remedial design/remedial action phase. During the development of the remedial design/remedial action, additional issues were identified that must be addressed during implementation. This section describes the issues regarding remediation activities associated with the Soil Characterization and Excavation Project (SCEP) at the FEMP; discusses the general strategy for addressing each; and, as applicable, references the subsequent section in this Sitewide Excavation Plan (SEP) where each is discussed in detail.

The factors that influence remediation activities are grouped into five categories:

1. Remediation regulatory drivers
2. Attainment of remediation goals
3. General implementation guidelines
4. Field measurements and laboratory analytical techniques
5. Logistical concerns.

The issues associated with each of these groupings are presented and discussed in the following five subsections.

2.1 REMEDIATION DRIVERS

The following requirements/factors are driving remediation activities at the FEMP:

- Applicable or relevant and appropriate requirements (ARARs) and to-be-considered criteria
- Permits
- Agreements
- Natural Resource Trusteeship.

Five aspects of these general categories are of particular interest in terms of the remediation of soil and at- and below-grade structures and debris:

- The Resource Conservation and Recovery Act (RCRA)
- Waste Acceptance Criteria (WAC)
- Final Remediation Levels
- Benchmark Toxicity Values
- DOE Orders.

The issues regarding each of these, and their respective impact on remediation activities, are discussed in the following paragraphs.

2.1.1 Resource Conservation and Recovery Act

RCRA regulations (40 CFR 260 and 280) and Ohio Environmental Protection Agency (OEPA) regulations (Ohio Administrative Code Chapters 3745-55) specify criteria for the identification and listing of hazardous wastes; regulations concerning the handling, treatment, and disposal of hazardous wastes; requirements for the closure of inactive hazardous waste management units (HWMUs) and underground storage tanks (USTs); and procedures for closing sites that have treated, stored, or disposed of hazardous wastes. These regulations affect three areas related to SCEP remediation activities:

- HWMUs
- USTs
- Toxicity characteristic hazardous wastes.

2.1.1.1 Hazardous Waste Management Units

A HWMU is defined as

> *... a contiguous area of land on/in which hazardous waste is placed, or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area. (40 CFR 260.10)*

RCRA regulations require closure of HWMUs that are no longer in service. There were originally 54 HWMUs at the FEMP. Of these, 11 have been reclassified as solid waste management units and 14 have been or are being closed under RCRA; these require no further action under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The remaining 29 are planned

to be closed under the RCRA/CERCLA integrated remedial response (Table 2-1). As presented in Table 2-1, 15 of these are anticipated to be closed only by the Facility Closure and Demolition Project (FC&DP), while the remaining 14 will be finally closed by SCEP. Of those 14, the above-grade portion will be decontaminated and dismantled by FC&DP, and the at- and below-grade portion and underlying contaminated soil will be excavated by SCEP. To facilitate planning of those activities, the HWMUs in Table 2-1 are grouped by implementing project (SCEP vs. FC&DP), then sequenced within the grouping by the soil remediation area. The procedures to be used by the SCEP to demonstrate attainment of soil final remediation levels (FRLs) and HWMU closure are summarized in Section 2.2.5.

2.1.1.2 Underground Storage Tanks

An UST is defined as

> *... any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground. This term does not include any ... storage tank situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.* (40 CFR 280.12)

RCRA regulations (40 CFR 280.71 through 280.73) and corresponding Ohio regulations (OAC 1301) describe permanent closure requirements for USTs:

> *To permanently close a tank [UST], ... empty and clean it by removing all liquids and accumulated sludges. All tanks taken out of service permanently must also be either removed from the ground or filled with an inert solid material .* (40 CFR 280.71)

This is generally accomplished by removing the UST's contents and residues, either removing the tank structures/equipment or filling them with inert material, and removing contaminated soils from the UST excavation.

There were originally 13 underground storage tanks at the FEMP (Table 2-2). All 13 USTs have been closed under RCRA Subtitle I to the satisfaction of the Ohio Fire Marshal, as presented in Table 2-2 and summarized below:

RCRA Subtitle I Tank Closure Status		Soil FRLs Attainment	
		Certified	Needed
Closed by Removal	12	0	12
Closed In Place	1	0	1
In Place and Awaiting Closure	0	Not Applicable	Not Applicable

Thus, attainment of soil FRLs and completion of final closure will be demonstrated during soil excavation activities. To facilitate planning of those activities, the USTs in Table 2-2 are grouped by the tank closure status categories above, then sequenced within the grouping by the soil remediation area. The procedures to be used by the SCEP to demonstrate attainment of soil FRLs and final UST closure are summarized in Section 2.2.6.

2.1.1.3 Toxicity Characteristic Hazardous Wastes

The RI/FS program at the FEMP identified seven geographic areas where a reasonable potential exists for the presence of soil that qualifies as RCRA toxicity characteristic waste and also presents a reasonable opportunity for cost-effective treatment. These areas are shown on Figure 1-5 and their potentially hazardous constituents are given in Table 2-3. The first six geographic areas listed in Table 2-3 are identified in the Record of Decision (ROD) for Operable Unit 5 (DOE 1996e), whereas the seventh area, the South Field Firing Range, was identified in the ROD for Operable Unit 2 (DOE 1995f). Screening for the presence of characteristic wastes will not be performed outside of these areas. It is conservatively estimated that approximately 28,000 cubic yards of material from these areas could be considered toxicity characteristic hazardous waste.

The potential for toxicity characteristic hazardous waste in these seven areas was identified using validated data in the Sitewide Environmental Database (SED) for constituents with concentrations that exceed 20 times the respective toxicity characteristic leaching procedure (TCLP) limit (40 CFR 261.24). The 20 times rule accounts for the dilution effects of the TCLP test (i.e., 1 liter of diluent per 50 grams of sample). A sample with a contaminant content less than 20 times the TCLP limit cannot possess the toxicity characteristic. If the contaminant concentration is greater than

20 times the TCLP limit, it may be hazardous, depending on the leachability of the contaminant as measured by the TCLP test.

Identified characteristically hazardous waste from six of these geographic areas will be treated and disposed of in either an off-site facility or the On-Site Disposal Facility (OSDF). Toxicity characteristic hazardous waste from the seventh area, the South Field Firing Range, will be dispositioned off site, as required in the OU2 ROD. If waste from the six areas also exceeds the WAC for the OSDF, it will be dispositioned off site. The toxicity characteristic hazardous wastes that are dispositioned off site must be treated to meet land disposal restriction (LDR) treatment standards (40 CFR 268.40) prior to disposal. Any toxicity characteristic hazardous wastes from the six geographic area that will be dispositioned to the OSDF will be treated to remove the identified toxicity characteristic before disposal. The decision as to whether such wastes that do not exceed the radiological WAC for the OSDF will be dispositioned to the OSDF or off site will depend on such factors as the availability of appropriate on-site treatment and the cost differential between on-site and off-site treatment/disposal.

The procedures to be used to identify, excavate, and handle these toxicity characteristic hazardous wastes are similar to those for material with contaminant concentrations that exceed the WAC for the OSDF (Section 2.2.1). Figure 1-6 shows the decision points and treatment options for RCRA toxicity characteristic wastes excavated from any of the seven areas listed in Table 2-3.

2 Waste Acceptance Criteria

WAC are physical and chemical/radiological characteristics of material that must be achieved if the material is to be disposed of in an acceptable manner. WAC are established by waste disposal facilities to assure that design constraints are not exceeded.

Waste generated during remediation of FEMP facilities will be disposed of in both off-site disposal facilities and the OSDF. Two issues are of primary interest in terms of WAC attainment at the FEMP:

- Material shipped to an off-site disposal facility must not exceed the WAC for that facility.
- Material known to exceed the OSDF WAC must not be placed in the OSDF.

2.1.2.1 Waste Acceptance Criteria for Off-Site Disposal Facilities

WAC for potential off-site disposal facilities, and procedures for demonstrating compliance with them, are listed in Appendix E of the Operable Unit 5 Feasibility Study (FS) (DOE 1995b). The conceptual waste disposition process described in Appendix F.5 provides conceptual procedures for managing and tracking the materials to be dispositioned off site during soil remediation.

2.1.2.2 Waste Acceptance Criteria for the On-Site Disposal Facility

The OSDF WAC apply to materials which fall into three basic categories: debris, soil/soil-like material, and ancillary waste. The WAC Attainment Plan (DOE 1998b) provides both the rule book for WAC attainment and a description of the strategies for complying with the rules for all of the materials that will be placed in the OSDF. Therefore, details on the WAC for the OSDF are provided in the WAC Attainment Plan and information in the SEP is limited to a brief overview of the WAC Attainment Plan.

Summary of Waste Acceptance Criteria for the On-Site Disposal Facility

The OSDF WAC are derived from the FEMP RODs (for radiological and chemical WAC; Table 2-[illegible]) and from the OSDF remedial design requirements (for physical WAC and prohibited items; Table 2-5). In accordance with the RODs, the primary material types destined for on-site disposal include all contaminated in-place soil and soil stockpiles (Operable Unit 5); the waste materials present in the South Field, Active and Inactive Flyash Piles, the Lime Sludge Ponds, and the Solid Waste Landfill (Operable Unit 2); and the debris resulting from sitewide facility decontamination and dismantlement (D&D) efforts (primarily Operable Unit 3, with small contributions from other operable units). Taken together, these primary materials represent an on-site disposal volume estimated at 2.5 million cubic yards.

Each of the operable units will also generate a smaller volume of remediation-support waste as a consequence of the cleanup effort, such as personal protective equipment (PPE), Water Treatment Plant residue, analytical laboratory sample returns, and other miscellaneous solid wastes associated with the cleanup. All of these smaller-volume, remediation-support wastes are destined for disposal in the OSDF, provided the WAC are met.

Where the RODs categorically exclude a material type from placement in the OSDF, the material will be sent to an off-site facility for disposal. The management, control, and off-site disposal of these materials is not part of the scope of the WAC Attainment Plan for the OSDF. For example, the primary categorically-excluded materials include the waste pit contents, covers, and liners (Operable Unit 1); nuclear material products, residues, and other special materials (part of Operable Unit 3); and waste materials contained in Silos 1, 2, and 3 (Operable Unit 4). These designated materials will be shipped for off-site disposal, along with the portions of the non-designated waste streams that are determined to exceed one or more of the OSDF WAC.

Application of Waste Acceptance Criteria to Soil Remediation

The 18 WAC constituents of concern (Table 2-4) are considered in the development of area-specific constituents of concern (ASCOCs) for WAC attainment in soil remediation areas.

The process for developing and gaining the U.S. Environmental Protection Agency (EPA) and OEPA approval of the proposed ASCOCs for WAC attainment involves several steps; final approval for proposed ASCOCs within a particular remediation area is gained with approval of the Integrated Remedial Design Package (IRDP). Prior to beginning pre-excavation characterization activities for a given remediation area, the FEMP will produce project-specific plans (PSPs) that initially propose the list of area-specific WAC constituents of concern for the area. The initial proposal will result from a detailed review of the FEMP's environmental databases for soil and sediment to identify those WAC constituents that have been detected within the given remediation area. Based on the concentration ranges and frequencies of detection seen in the existing database, coupled with a review of the overall completeness and representativeness of the WAC constituent data for the area, a short list of constituents will be developed for EPA and OEPA's consideration. Other information from the RI/FS databases that will be used to develop the lists and assess the extent of affected areas includes underlying perched groundwater and the Great Miami Aquifer and nearby surface water analytical results; process knowledge; and any existing real-time analytical results that may be available for a given area.

The justification of the adequacy of the short list will be provided as part of the PSPs. EPA and OEPA will be furnished the PSP for information purposes so that all parties are familiar with the

information used to derive the lists. Actual approval of the lists, however, rests with the approval of the follow-up IRDP, that will generally be submitted to the agencies following completion of the pre-excavation characterization step. The intent of sharing the results of the database searches and area-specific constituent list justifications at the PSP stage is to help alleviate concerns over the adequacy of the FEMP's existing RI/FS data for design purposes, and to allow for the mutual identification of known database shortcomings early in the process before detailed design documents are prepared. If there are any future remediation areas that are found to not require a pre-excavation characterization step, the proposed list of area-specific constituents of concern for WAC attainment, and appropriate justification for them, will be provided at the IRDP step.

Generally speaking, the proposed list of ASCOCs for WAC attainment for a given remediation area will consist of 1) the principle constituents of concern (for example, total uranium and technetium-99) that drive the overall extent of WAC-related excavation; and 2) the secondary constituents of concern (for example, a nonradiological constituent) that are found to be in association with the primary constituent(s).

Several different screening approaches will be applied to soil to verify WAC. In areas where soil is known to exceed the WAC for one or more constituents, soil will be screened with a combination of real-time instruments and physical samples to delineate the extent of above-WAC excavation. For secondary COCs that may be above WAC, physical samples will be collected from the surface and subsurface to the extent necessary to characterize the above-WAC material. Remediation areas suspected to contain soil above the WAC (e.g., some soil piles), will undergo physical sampling and real-time monitoring, if possible. Areas that contain uranium near the WAC will be evaluated for possible WAC exceedance with real-time scanning. In areas that are known to contain soil with COCs below WAC (e.g., west of Paddys Run), real-time instruments, after EPA approval of necessary real-time documentation, will be used to confirm the absence of above-WAC material.

Details on the use of real-time instruments and collection of physical samples will be provided in area-specific predesign PSPs and IRDPs. In general, existing data for the relevant area will be pulled from the SED and evaluated to determine the number of samples with COCs above their WAC (Section 3.1). If the number of existing sample results (RI-based) are deemed insufficient to make a decision on

WAC excavation, due to limited coverage or excessive results at a detection limit above the WAC, additional physical samples and/or real-time measurements will be proposed to ascertain the horizontal and vertical extent of contamination during implementation of the predesign PSPs.

Uranium is the predominant contaminant at the site and will drive the excavation of most soil. However, there are also seven regions of the site with the potential to contain technetium-99 above the WAC. A preliminary identification of the areas that potentially exceed the OSDF WAC for total uranium and technetium-99 is provided on Figures 2-1 and 2-2. The extent of excavation will be determined by implementing the PSPs during the pre-design phase (Section 3.1). Within each area, data from the Operable Unit 5 RI/FS and additional validated data from the SED will be reviewed to determine whether the area to be excavated contains contaminant levels above the WAC. If the data show contaminant levels above the OSDF WAC, the extent of above-WAC material will be determined in the manner described in Section 3.1.3. In such cases, the above-WAC materials will be excavated prior to excavation of the below-WAC/above-FRL soil to be disposed of in the OSDF. If the data evaluation indicates no contaminant levels above the WAC, the soil will be excavated and transferred to the OSDF for disposal. The data substantiating that the contaminant levels in the soil are below the WAC will be documented for the soil and will serve as a basis for acceptance of the soil transfer at the OSDF, as described in the conceptual waste disposition process provided in Appendix F.5.

Application of Waste Acceptance Criteria to At- and Below-Grade Structures and Debris

Remedial planning performed under the SEP for at- and below-grade debris excavation will include an evaluation of the debris to be generated in order to determine handling, treatment, and disposition requirements (Appendix F). This evaluation, which is similar to that used in planning above-grade dismantlement of Operable Unit 3 materials (DOE 1996f), identifies debris for which there may be particular handling concerns. However, based on an initial evaluation of Operable Unit 3 materials that will remain after above-grade D&D, it is anticipated that most debris will not require special handling, treatment, or off-site disposal.

The bulk of the debris anticipated to be encountered during excavation includes concrete pads, asphalt roads, below-grade piping and storm sewers, and structural steel (e.g., supports remaining in basements, etc.). All excavated debris destined for the OSDF will be size-reduced, as necessary, in

accordance with the WAC. Acid brick will be removed as part of Operable Unit 3, above-grade building dismantlement and is generally not expected to be encountered in the below-grade portions of Operable Unit 3. Concrete in four process areas will be scabbled as part of above-grade building dismantlement to ensure that the mass-based technetium-99 limit for Operable Unit 3 debris dispositioned in the OSDF will be met (DOE 1996g). It has been demonstrated in the Operable Unit 3 RI/FS (DOE 1995g) that all remaining concrete to be excavated as part of at- and below-grade remediation meets the OSDF radiological/chemical WAC. As a best management practice for soil excavation, the FEMP will segregate and send off site the vast majority of actual and/or suspected acid bricks that may be unearthed during the excavation of Operable Units 2 and 5, to further reduce the chance that process-related residuals are placed in the OSDF. This best management practice will result in the direct removal and off-site shipment of those bricks that can be readily identified and safely removed during soil excavation and/or placement at the OSDF.

Below-grade piping that is not process-related (e.g., storm sewers, steam lines, potable water lines, conduit, etc.) will be size-reduced, as necessary, in accordance with the WAC and dispositioned in the OSDF. If these non-process pipes are excavated from areas of soil that do not meet the OSDF WAC, the debris will, as a general practice, be sent off site for disposal along with the above-WAC soil.

Below-grade piping that is or has historically been process-related will be managed in accordance with the conceptual waste disposition process described in Appendix F.5. In general, this piping will be inspected to ensure the piping is free from "visible process residues." The definition of visible process residues (green salt, yellow cake, etc.) is material on the interior surface of the pipe that is obvious and that, if rubbed, would be easily removed. Stains, rust, and corrosion do not qualify as visible process material. If a pipe fails visual inspection, a determination will be made either to decontaminate the piping or to containerize it for off-site disposition.

2.1.3 Final Remediation Levels

FRLs are the cleanup goals for the FEMP site. As defined for the FEMP, the FRL is the average concentration of a contaminant that can remain in an area under a given exposure scenario and still be protective of human health and the environment. Remediation at the FEMP will remove contaminated

soil until the average residual concentration in any potential certification unit (CU) is at or below the respective FRL.

The FEMP FRLs are listed in Table 1-4. A summary of how FRL attainment will be demonstrated is provided in Section 2.2.2. Several issues regarding FRLs at the FEMP should be noted:

- Five contaminants listed in Table 1-4 (alpha-chlordane, chlorobenzene, tetrachloroethene, toxaphene, and trichloroethene) have an associated chemical/radiological WAC, but no corresponding FRL. This is because WAC were developed for all RCRA hazardous constituents, regardless of whether the contaminant was detected in environmental media at the FEMP or not.

- The FRL for several contaminants [technetium-99, bis(2-chloroisopropyl)ether, boron, bromodichloromethane, and 4-nitroaniline] is equal to or greater than the corresponding chemical/radiological WAC. This means that all material with contaminant levels that exceed the respective FRL also exceed the WAC. Except for material contaminated with technetium-99, such material must either be transported off-site for disposal, or treated, as required, for disposal in the OSDF. All material with technetium-99 levels above the WAC/FRL will be dispositioned off site. The fact that the FRL is less than or equal to the WAC does not change the approach to be used to excavate such contaminated material. As described in Section 3.3.1.2, the general procedure is to delineate and excavate material that exceeds the WAC first. If all of the material that exceeds the WAC for these contaminants is removed, all of the material that exceeds the respective FRL will also be removed.

- The FRL for several contaminants (3,3'-dichlorobenzidine, heptachlorodibenzofuran, heptachlorodibenzo-p-dioxin, and n-nitrosodipropylamine) is at or below the respective practical quantitation limit (PQL). This is because the PQL was not taken into account when developing the FRL for these contaminants.

- The FRL for total uranium is very low (20 mg/kg) in certain portions of the Former Production Area and at the Sewage Treatment Plant (STP; Figure 2-3 and Table 1-4) because the uranium handled and stored in these areas is more mobile. Uranium mobility in these areas is attributed to the purification process used at the FEMP which involved solubilizing the uranium with strong oxidizing acid to separate it from the ore impurities. This low FRL will require the exclusive use of the HPGe for radiological field surveys during excavation control and precertification activities.

- The FRLs for several radionuclides are very low in certain portions of the Inactive Flyash Pile and the South Field (Table 1-4) because the glacial till (which serves to retard the movement of contaminants) is very thin or nonexistent in these areas. These low FRLs will require special consideration during excavation control, pre-certification, and certification activities.

- The FRLs for select members of the thorium-232 decay chain (i.e., thorium-232, radium-228, and thorium-228) will be assessed using the gamma photon energies given in Appendix H. In the case of surface water samples, analytical data for radium-228 will be used to assess the radium-228 FRL.

- As indicated on Tables 2-1 and 2-2, there are several constituents associated with HWMUs and USTs for which there are no FRLs, as these constituents were screened out during the RI/FS process. In addition, for the active HWMUs, the final list of constituents is to be determined. In all such cases, the nature and extent of contamination associated with HWMUs/USTs will be determined as part of remediation activities to the extent necessary for excavated waste management decisions (e.g., contaminated soil exceeding the OSDF WAC and also containing RCRA F-listed constituents must be disposed at an off-site facility as a RCRA-regulated hazardous waste). To the extent possible, this determination will be made by implementing PSPs during the pre-design investigation (Section 3.1). In some cases, this may be unsafe, impractical or infeasible, in which event the determination of the nature and extent of contamination will be made after the HWMU/UST is removed.

- As discussed in the following paragraphs, a limited list of FRLs for COCs in Table 1-4 is widely applicable to soil and soil-like material (i.e., primary COCs), while a more inclusive list is applicable to certain areas (i.e., secondary COCs).

2.1.3.1 Primary and Secondary Constituents of Concern

Primary COCs are considered to be the widespread contaminants which represent approximately 90 percent of the human health risk from soil. Secondary COCs are those which have localized contamination above the FRL, but the extent of contamination is limited to smaller areas or intermittent hits marginally above the FRL which may or may not reside entirely within the footprint of the primary constituents. Initial sitewide primary and secondary COCs are listed in Table 2-6.

This preliminary list is not intended to serve as a final list of COCs sitewide, and this list will be revised within each remediation area via the screening approach noted in Section 2.5.2.2. Area-specific constituents of concern (ASCOCs) will include both primary and secondary COCs, and are described in the following section.

2.1.3.2 Area-Specific Constituents of Concern

ASCOCs will be established during the excavation design for each remediation area. ASCOCs represent the primary and secondary COCs that have been demonstrated to impact a specific work area and for which concentrations will be certified in that specific work area.

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The sitewide spatial extent of the constituents will be determined with respect to FRLs, Benchmark Toxicity Values (BTVs), and OSDF WAC. To illustrate the approach to this analysis, a series of maps (Appendix I) has been assembled using the RI/FS data which display the known distribution of contamination within the on-property remediation areas (Figure 1-3). These maps also indicate if a COC distribution is confined to a limited area or if it impacts larger areas. The ASCOCs for each of the remediation areas (Table 2-7) have been preliminarily identified based on the sample results represented by these maps, as augmented by process knowledge. Ecological COCs are also included in Table 2-7 to provide a complete, area-specific list of constituents that affect remediation, and are described further in the following section. A more thorough screening of COCs will be performed for each remediation area during the design phase.

2.1.4 Ecological Constituents of Concern

As part of the process of restoring the site to its final land use, DOE must ensure that ecological receptors are not adversely impacted by residual contamination that may remain after remediation is complete. Appendix C provides a means of ensuring the protection of ecological receptors by establishing a screening process for identifying ecological COCs. The results from this screening process are given in Table 2-7 as ecological COCs.

At the time of the Operable Unit 5 ROD, DOE recognized the need to evaluate the impact of contaminants to ecological receptors on and around the property. This was accomplished with the publication of the Sitewide Ecological Risk Assessment (SERA), which was conducted as part of the Operable Unit 5 RI. The SERA contains a preliminary evaluation of potential risks to all organisms that may be exposed to contaminants within Operable Unit 5, exclusive of humans and domestic animals.

Consideration of the information developed in the SERA was deferred when developing human health driven remediation goals (DOE 1995b). However, as negotiations with the FEMP Natural Resource Trustees progressed, it became clear that in order to resolve all trustee concerns, ecological impacts must also be considered before remedial activities are completed.

Appendix C was developed to accomplish this, using the SERA screening approach. For each potential ecological COC, a BTV was established. BTVs are literature-derived, media-specific concentrations that are considered protective of ecological receptors. Maximum sitewide concentrations were compared to these BTVs for all potential ecological COCs with FRLs higher than their corresponding BTV. After eliminating all potential ecological COCs where maximum concentrations were less than corresponding BTVs, the remaining ecological COCs were evaluated against anticipated remnant COC concentrations after soil excavation achieved FRL attainment. From these evaluations, a sampling strategy is established to investigate any ecological COCs that may be a concern after FRL-driven remedial activities have been completed.

The purpose of these sampling efforts will be to further characterize the concentrations of the ecological COCs at the completion of remediation. Because of the very conservative screening methodology used, post-excavation BTV exceedances do not necessarily indicate that impact to ecological receptors will occur. Instead, post-excavation exceedances indicate only that further investigation may be warranted. Therefore, FRL certification will not be dependent on characterization of ecological COCs. Appendix C provides details on the screening process.

2.1.5 Department of Energy Orders

U.S. Department of Energy (DOE) orders provide generic guidelines for residual radioactive material. Of particular interest in terms of soil excavation at the FEMP are those sections which relate to the size of CUs and sitewide criteria for radiological hot spots, and which specify As Low as Reasonably Achievable (ALARA) requirements. Other orders which affect soil excavation activities are listed in Appendix A and will be incorporated into the area-specific IRDPs.

2.1.5.1 General Guidelines for the Size of Certification Units

Guideline levels of radionuclide contaminants are calculated levels that are expected to ensure protectiveness of human health and the environment. Guidelines are expressed in terms of activity per unit mass and are averaged over a predetermined area. Depending upon the regulatory agency, the methodology used to calculate the guidelines, the impacted medium, and the specific type of site, the area used as the basis for the cleanup guideline generally ranges from 100 to 10,000 square meters (or larger) for land areas.

DOE guidelines for soil are defined as contaminant levels averaged over a surface area of 100 square meters (DOE Order 5400.5, Chapter IV, Section 4, Paragraph a). This surface area was originally adopted to ensure consistency of DOE decommissioning activities (in particular, the Uranium Mill Tailings Remedial Action Program) with the EPA mill tailings regulations (40 CFR 192) and the Nuclear Regulatory Commission (NRC) Branch Technical Position, "Disposal or On-Site Storage of Thorium or Uranium Wastes from Past Operations" (NRC 1981). With the exception of sites where the contaminant is mill tailings, an averaging area other than 100 square meters may be established as an integral condition of site-specific guidelines (DOE Order 5400.5, Chapter IV, Section 5, Paragraph a). Conditions and methods for establishing site-specific guidelines are provided in "A Manual for Implementing Residual Radioactive Material Guidelines" (DOE 1989). Development of the CU size during FEMP certification activities is discussed in Section 3.3.3.2.

2.1.5.2 Radiological Hot Spots

Potential radiation doses are influenced by contaminant distribution patterns. Subareas which are significantly smaller than the averaging area will result in a smaller potential dose than would result if the entire averaging area were contaminated at that level. The relationship between acceptable contaminant levels in small areas and the average guideline level varies, depending on the radionuclide, the exposure pathway and scenarios, and the size of the area. DOE Order 5400.5 requires that site-specific limits for such hot-spot areas be developed for situations where the contaminant level in any area of less than 25 square meters exceeds the average guideline level by a factor of $(100/A)^{0.5}$, where A is the area in square meters (DOE Order 5400.5, Chapter IV, Section 4, Paragraph a[1]). From this guidance, it is evident that small areas of residual activity exceeding the average guideline levels may be present while still ensuring that the basic dose criteria are met. The development of radiological hot-spot criteria for the FEMP is discussed in Sections 2.2.3 and 3.4.6, as well as Appendix G.

2.1.5.3 As Low As Reasonably Achievable Requirements

The ALARA philosophy states that potential radiological exposures should be kept as low as reasonably achievable. Therefore, radiological release criteria for equipment, structures, and environmental media must be established as part of the decommissioning planning process (DOE/EM-0246). The document "A Manual for Implementing Residual Radioactive Material Guidelines" (DOE

1989) is identified as the guidance document for developing DOE release criteria (DOE Order 5400.5, Chapter IV). In addition to being protective of human health and the environment, this guidance requires that socioeconomic and technical feasibility issues be considered when establishing ALARA levels for residual contamination. The guidance specifies that, for ALARA purposes, reasonable efforts must be made to remove residual contamination that exceeds 30 times the average guideline level (DOE Order 5400.5 and DOE/CH-8901).

The human-health-derived FRL for total uranium in more than 80 percent of on-property soil is 82 mg/kg. The HPGe instrument used for field measurements during the pre-excavation survey can identify areas of soil containing 50 mg/kg of uranium. Because this material is readily discernible and easily excavated, HPGe measurements can be used to establish the extent of excavation at 50 mg/kg uranium. The ALARA goal of 50 mg/kg will be used to guide the excavation plan development in areas where excavation is required as a result of soil exceeding the uranium FRL of 82 mg/kg, but it is not intended to replace the certification requirement, which will remain set at the FRL of 82 mg/kg in these areas.

2.2 ATTAINMENT OF REMEDIATION GOALS

Prior to final restoration of the site, the remediation goals established for soil excavation activities at the FEMP include: 1) WAC attainment, 2) FRL attainment, 3) hot-spot attainment, 4) RCRA-characteristic-waste compliance, 5) HWMU closure, and 6) UST closure. The general procedures for attaining these goals are discussed in the following paragraphs.

2.2.1 Demonstrating On-site Disposal Facility Waste Acceptance Criteria Attainment

The objective of compliance demonstration is to provide an acceptable level of confidence that a criterion, in this case WAC for the OSDF, has not been exceeded. WAC for the OSDF are presented in the WAC Attainment Plan for the OSDF (DOE 1998b). The WAC are based upon criteria established and approved in the Final ROD for Remedial Actions at Operable Unit 2 (DOE 1995f), the Final ROD for Remedial Actions at Operable Unit 5 (DOE 1996e), and the Operable Unit 3 ROD for Interim Remedial Action (DOE 1996g).

As indicated in these documents, the radiological/chemical WAC were generally developed by:

- Starting with an acceptable concentration of contaminants in the groundwater of the Great Miami Aquifer
- Making a series of conservative assumptions to determine, through transport modeling, the effective concentration of contaminants in the leachate from the OSDF that would produce the acceptable concentrations in the Great Miami Aquifer
- Making additional, conservative assumptions to determine the maximum average solid phase concentration, or total mass of contaminant, in the entire OSDF that would produce the leachate concentrations.

It is estimated that the assumptions used to develop the WAC for the OSDF provide at least an order of magnitude of conservatism in protecting human health and the environment. This built-in conservatism was acknowledged in the WAC Attainment Plan when establishing procedures to demonstrate attainment of WAC for the OSDF. For soil remediation activities, WAC attainment will be demonstrated with RI/FS data, predesign characterization data, real-time excavation-control monitoring of gamma radioactivity and organic vapor levels, and by verifying that the excavations were carried out in accordance with the conservative design specifications. Each excavation approach (Section 4.0) may use a unique combination of excavation sequence, field measurements, and analytical testing to demonstrate WAC attainment.

RI/FS and predesign characterization data will establish the area and depth extent of above-WAC material in all remediation areas, if present. The data will be collected using in situ high-purity germanium (HPGe) detectors, laboratory gamma-spectrometry and other analytical techniques for uranium, as well as laboratory analysis of discrete samples for technetium-99 and metal and organic COCs. The use of HPGe for Analytical Support Level (ASL) B measurements has been established in the "User's Guidelines and Measuring Strategies and Operational Functions for the Deployment of In Situ Gamma Spectrometry at the Fernald Site" (DOE 1998c), referred to as the User's Manual. Therefore, analytical data will be of sufficient quality (i.e., ASL B or higher) to demonstrate that all ASCOCs in soil are below WAC values. Normally, predesign data can be used to tighten the above-WAC excavation extent. However, the number of predesign analytical samples needed to establish the excavation extent will be determined by the nature and extent of ASCOCs and by balancing the cost between laboratory analysis and additional above-WAC soil excavation and disposition. Area-specific

sampling and analysis plans that address pre-excavation and excavation activities will be present:d n the PSPs.

Predesign analytical results will be used to set the area and depth of excavation at the first sample location showing all ASCOCs in soil to be below their respective WAC values. For determinin: e area boundary, the first sample location with all ASCOCs below the WAC values means the ne t perimeter sample along a radial line to the center of the area. In determining the depth of exca a on, the shallowest sample showing all ASCOCs below the WAC values will be used to establish th: excavation floor. Additional information on the delineation of excavation volumes is provided n Section 3.1.3.

After selection of the samples which bound the excavation volume, the analytical results for th s samples will be used in a kriging or appropriate 3-D interpolation model to develop an excava on boundary. The modeled boundary will be provided to engineering design to prepare a final construction drawing of the excavation. Final construction drawings will show the excavatio a a series of cut steps located outside the modeled boundary. Because the modeled boundary will b based on sample results shown to be below the WAC values and the final construction drawing step: (itward from this boundary, a very high level of confidence is placed in the approach to remove all above-WAC material prior to excavating material destined for the OSDF. After excavation i: completed, a survey with NaI instruments or discrete measurements with the field HPGe will b conducted to demonstrate that the remaining soil is below the uranium WAC level. Details on WAC attainment compliance are provided in Section 8.0 of the WAC Attainment Plan (DOE 1998).

2.2.2 Certifying Final Remediation Level Attainment

Another goal of the soil remediation activities at the FEMP is to remove contaminated soil c that the average residual concentration of any contaminant in a CU is at or below the respective FRL. Documentation of FRL attainment must provide an acceptable level of confidence that this has occurred. Complete, or 100 percent, confidence cannot be obtained because it is impossibl sample every cubic foot of soil and, even if it were, there would still be some level of uncertainty n e analytical results. Therefore, to provide a quantitative estimate of the probability that the ave ge residual concentration of a contaminant in a CU does not exceed the respective FRL, it is nec ssary to

000058

use statistical methods. Statistical methods provide for specifying (controlling) the probability of making decision errors and for extrapolating from a limited set of measurements to a specified area in a scientifically valid fashion. Appendix G provides a discussion of statistical methods to be applied to the certification process at the FEMP.

FRLs were developed during the RI/FS process for each operable unit in a manner similar to that used to develop WAC for the OSDF (DOE 1996e). The exception is that specific conditions outside the OSDF, including the hydrogeology and area-specific thickness of underlying formations, were used for the fate and transport modeling process in developing FRLs. Like the WAC for the OSDF, the assumptions used to determine the FRLs also provide a very significant level of conservatism in protecting human health and the environment.

To certify FRL attainment, evidence must be provided to demonstrate that the average concentration of any ASCOC does not exceed the respective FRL. Therefore, the general approach for demonstrating attainment of FRLs is to identify locations where contaminant concentrations exceed the FRL for any ASCOC, remove that material for disposition in the OSDF, and certify, with a specified level of confidence, that the average residual concentration of each ASCOC is below the respective FRL. Additional information on certification is provided in Section 3.4.

FRL attainment will be demonstrated using RI/FS and predesign characterization data, post-excavation NaI surveys and HPGe measurements, physical certification samples, and verifying that the excavations were carried out in accordance with conservative design specifications in a manner analogous to establishing the WAC excavation boundaries. FRL attainment for primary COCs will also be demonstrated with RTRAK and/or HPGe measurements during precertification activities prior to the sampling and analysis activities conducted during the final certification process.

2.2.3 Detection of and Criteria for Hot Spots

FRLs are designed to limit risks incurred by various human receptors from direct and indirect exposures to contaminants in a large area. These risks are calculated using the assumption that contaminants are distributed approximately uniformly across a source area. This assumption is the basis for assessing the residual concentration of contaminants within each CU. As described in

Section 3.4.4 and Appendix G, statistical methods will be used to determine the attainment status of the CU based on the average level of each ASCOC compared to the FRL. However, there is a finite possibility that small areas of elevated residual contamination (i.e., hot spots) will be missed by the sampling program. It is desirable to identify and remove these hot spots, if possible.

The concept of hot spots may be applied to all COCs. However, some primary COCs (Table 2-6) can be detected in situ using field scanning technologies and experience has shown that other secondary COCs at the site are often co-located with the primary COCs. This in situ scanning technology (DOE 1998c) provides an additional capability to look for hot spots in real time, which is beyond that normally used for chemical contaminants. A real-time capability allows the field survey teams to look for hot spots actively during precertification activities. By identifying and excavating hot-spots containing the primary COCs, this method also reduces the probability that hot spots of secondary COCs will remain.

Currently the radiological scanning instrumentation discussed in the User's Manual (DOE 1998c) allows hot spots of uranium, thorium-232, and radium-226 to be identified and delineated at values of two or three times their FRLs. An area average of three times the FRL will designate a hot spot when the area is smaller than 10 m^2, whereas two times the FRL will be used when the area is greater than 10 m^2. Specific detection limits of the HPGe instrument are also provided in the User's Manual. The proposed radiological scanning provides additional confidence that all primary COCs will be remediated to health protective levels.

Scanning as much of the remediated surface as possible will reduce the possibility that radiological hot spots are missed. However, such scanning may not be possible near obstructions such as trees and water, and in deep, narrow excavations, such as those for pipelines. In the case of deep excavations where scanning of side slopes may be difficult to impossible, additional emphasis will be placed on the collection of certification data from side slopes, benches, and the bottom of the excavation (Section 3.1.3).

2.2.4 RCRA Characteristic Waste Compliance

There are seven locations delineated where the potential exists for preferential treatment of soil that may exhibit the toxicity characteristic (Figure 1-5). Characteristic waste compliance under the SEP means that excavated soil exhibiting the characteristic of toxicity that is derived from any of the seven designated site RCRA areas will be segregated and treated prior to disposal. Toxicity characteristic waste from the South Field Firing Range will be sent off site for disposal in accordance with the Operable Unit 2 ROD. In these seven locations, the subsurface FRL excavation boundary will be established, and the areal footprint of the potential RCRA toxicity characteristic area will be extended to the subsurface FRL boundary to establish the volume of soil requiring screening via the 20-times rule or TCLP test for the toxicity characteristic to identify the need for treatment prior to disposal.

In each of the seven locations, discrete surface- and subsurface-soil samples will be collected as described in Section 3.1.3. Collected samples will undergo the 20-time rule screening and/or TCLP testing, and samples that fail the TCLP test will be used to determine the lateral extent and depth of the toxicity characteristic material. In addition, a contiguous area surrounding the administrative boundary of the defined source area (i.e., a boundary identified in the Operable Unit 5 ROD) will be investigated with the 20-times rule screening or TCLP test to ensure all above-TCLP material is identified for excavation. The excavation depth will be set at the first sample location below the deepest sample failing the TCLP test or the FRL boundary, whichever is shallower. The established depth will be extrapolated to the lateral extent of the waste characteristic footprint determined by surface samples, including the contiguous area, to set the volume of soil requiring treatment for the toxicity characteristic. Treatment prior to OSDF disposal may consist of in situ stabilization followed by excavation or excavation followed by on-site treatment. If a portion of this designated volume contains radiological COCs above the WAC, it will be excavated first and set aside for off-site treatment and disposal. The options for treatment and disposal of toxicity characteristic waste from the RCRA areas are shown on Figure 1-6. Excavated RCRA material will be containerized and placed on the Plant 1 Pad or an equivalent approved RCRA storage facility. If all samples pass the TCLP test, the excavation of soil in the location will be driven by WAC and FRL criteria, and no special treatment will be required prior to disposal.

2.2.5 Hazardous Waste Management Unit Closure

Twenty-nine (29) HWMUs at the FEMP remain to be closed under the CERCLA remedial response action (Table 2-1). RCRA regulations (40 CFR Part 265) and OEPA regulations (OAC Chapter 3745-66) describe closure requirements for various types of HWMUs, including tank systems, surface impoundments, waste piles, land treatment units, container storage areas, landfills, and miscellaneous units. These regulations require closure in a manner that

> . . . *controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.* (40 CFR 265.111 and OAC 3745-66-11)

This is generally required to be accomplished by removing the hazardous waste residues, and removing or decontaminating structures/equipment contaminated with the waste or leachate, contaminated containment system components, and contaminated soils.

Closure of a HWMU under the SCEP indicates that the constituents for which the waste managed in the unit was deemed hazardous, and for which the unit itself was declared a HWMU (COCs in Table 2-1), are below established site-specific FRLs in soil remaining in the HWMU footprint. The soil FRL attainment certification/closure process for a HWMU to be closed under the SCEP is briefly described in the next paragraph, then presented in a bullet format to serve as a check-list to facilitate future planning.

Predesign PSPs for soil remediation areas containing HWMUs will identify whether unit-specific COC sampling and analysis will be conducted during predesign to define/refine the extent of excavation. The IRDP for a particular soil remediation area (or that for a subdivided phase — e.g., Area 1, Phase II) will present findings of investigations to that point, reference those investigations, and present the excavation strategy for the area. The Certification Design Letter (CDL) for a soil remediation area will address each (if any) of the HWMUs contained therein, and the specifics of sampling and analysis required to satisfy demonstration of soil FRL attainment and closure. Discussion of the sampling design, analytical results, and the statistical analysis conducted for the HWMUs undergoing soil FRL

attainment certification/closure under the SCEP will be presented in a dedicated section of the area-specific Certification Report (Section 7.4).

The closure process for HWMUs will:

- Bound the needed excavation during the predesign investigation using predesign sampling and analysis as needed
- Complete above-WAC-driven excavation in the area first
- Complete large-scale FRL-driven excavation in the area second
- Delineate each HWMU footprint as a distinct CU
- Combine multiple HWMUs within a building footprint can be combined into a CU
- Provide details of the HWMU(s) certification/closure sampling approach in a dedicated section of the CDL (Section 7.3)
- Provide for at least eight physical samples from the HWMU footprint and sidewalls of the excavation (if present)
- Include the HWMU COCs (Table 2-1) in the CU-specific COC list developed for certification sampling and analysis
- Provide methodology for computing the upper confidence limit on the mean and comparing it to the soil FRL as the criterion for HWMU(s) certification/closure (Section 3.4.4)
- Provide discussion of the sampling and analytical results, and the statistical analysis, for the HWMU(s) certification/closure in a dedicated section of the Certification Report (Section 7.4)
- Include analytical results for the HWMU(s) in the Certification Report
- Document final closure of the HWMUs via Ohio EPA acceptance of the certification report for a soil remediation area containing HWMU(s).

2.2.6 Underground Storage Tank Closure

Thirteen (13) USTs remain in need of demonstrating soil FRL attainment and completion of closure under the CERCLA remedial response action. Like the HWMUs, all of these USTs are relatively shallow with respect to the anticipated depth of excavation to achieve FRLs; unlike most of the

HWMUs, all of these USTs are relatively small. Thus, the mechanism for demonstration of soil FRL attainment and completion of closure for an UST under the SCEP is analogous to that presented for HWMUs (i.e., substitute UST for HWMU, and Table 2-2 for Table 2-1). Completion of UST closure under the SCEP indicates that the hazardous constituents of its former contents (Table 2-2) are below established site-specific FRLs in soil remaining in the UST footprint.

2.3 GENERAL IMPLEMENTATION GUIDELINES

One of the purposes of the SEP is to establish guidelines for the implementation of remediation activities at the FEMP. Issues include remediation priorities, procedures for implementation of remediation activity, sequencing and coordination, planning for unexpected conditions, tracking of data, audit and assessment procedures, reporting requirements, and health and safety. Each of these is discussed in the following paragraphs.

2.3.1 Remediation Priorities

There are a variety of issues that drive and influence soil remediation activities at the FEMP and to avoid potential conflicts and unacceptable mixing of materials during the excavation, segregation, handling, and disposal processes, these issues have been prioritized as follows:

1. Health and Safety (Section 6.0)
2. WAC attainment (Section 2.2.1)
3. FRL attainment (Section 2.2.2).

The health and safety of personnel associated with remediation activities has to be the prime consideration during remediation activities. After that, removal, segregation, and proper disposal of material with the highest levels of contamination (e.g., above WAC) is of major importance. This priority is followed by removal, segregation and proper disposal of material with lower levels of contamination (e.g., FRLs). The final priority is the demonstration that long-term residual risk has been minimized by removal of material exceeding the FRLs. Additionally the ALARA concept is addressed during excavation of the above-FRL soils. Achievement of these goals will satisfy other related issues, including meeting ARARs and complying with DOE orders.

2.3.2 Implementation Procedures

Remedial action implementation under the scope of the SCEP includes all activities associated with planning, design, excavation, management, and disposition of at- and below-grade soil, structures, and debris at the FEMP. As described in Section 7.2, implementation plans, design, and construction specifications will be used to prepare area-specific IRDPs. Lessons learned during the Area 1, Phase I remediation project have been incorporated into the SEP. All future IRDPs developed pursuant to the SEP will incorporate lessons learned from previous projects. Based on the information contained in the IRDPs, construction contractor(s) will be selected to complete the excavation. The general construction implementation and material handling procedures are provided in Appendix F.

2.3.3 Sequencing and Coordination

Effective sequencing and coordination of remediation activities at the FEMP depend on a complex relationship between a wide variety of activities, including:

- D&D of above-grade facilities
- Construction of the OSDF
- Excavation of soil and at- and below-grade structures and debris
- Placement, and proper mix ratios of soil and debris, in the OSDF
- Schedules for waste pit and silo remediation activities
- Availability of storm water and remediation wastewater treatment capacity.

The objective of excavation activities is to remediate the FEMP in a safe, timely and cost-effective manner that is protective of human health and the environment, and the purpose of sequencing and coordination is to facilitate this objective. The following paragraphs describe how sequencing and coordination will occur on both a sitewide basis and within each remediation area during remediation activities.

2.3.3.1 Sitewide Sequencing Approach

The sitewide sequencing and coordination described in Appendix B will be protective of human health and the environment by minimizing potential exposure to contamination during remediation. In addition, sequencing will minimize the potential for cross-contamination and recontamination. These goals will be achieved by:

- Prioritizing the excavation of contamination source areas

- Excavating from upgradient toward downgradient surface drainage areas to prevent cross contamination and recontamination

- Controlling haul routes to minimize cross-contamination of all areas and recontamination of clean areas

- Using paved roads and dust control methods, to the extent practical, to minimize dust generation, avoid cross-contamination between areas, and prevent recontamination of clean areas.

Also, sitewide sequencing and coordination activities will be cost effective by:

- Minimizing double handling of material
- Establishing large work areas to provide efficient utilization of equipment
- Minimizing haul distances, to the extent possible
- Minimizing unneeded treatment of water from excavation activities
- Minimizing sheeting and shoring of excavated slopes.

The remediation areas and phases shown on Figure 1-3 and described in Appendix B were established to achieve the stated objective and implementation strategies.

2.3.3.2 Sequencing Within a Remediation Area

Excavation within each remediation area will, in general, be governed by the same objectives and implementation strategies upon which sitewide activities are based. In addition, excavation within each remediation area will generally progress by:

- Removing at- and below-grade foundations and structures and transferring them to the Waste Acceptance Operations (WAO) for decontamination, size reduction and disposition

- Removing material that exceeds WAC for the OSDF

- Removing underground utilities and plugging potential pathways for the migration of contaminants

- Removing material that exceeds FRLs.

This sequence is necessary to efficiently address remediation and to minimize the mixing of contaminated material that requires segregation because of different handling and disposition

requirements. Specific details regarding the sequencing and coordination of activities within each remediation area, as well as other site activities, will be included in the IRDPs (Section 7.2).

2.3.4 Contingency Plans

Contingency plans are required for unexpected conditions. The three general categories of unexpected events are:

1. Unearthing of materials that require special handling
2. Discovery of unexpected cultural or historic resources
3. Encountering environmental or material conditions that may pose a risk to human health or the environment if standard excavation practices are used.

Typically, these circumstances cannot be managed through standard excavation guidelines. The procedures to be used in these circumstances are described in Appendix F.

2.3.5 Material Information Tracking

It is important to track excavated material to provide an audit trail demonstrating proper handling and disposition. The Integrated Information Management System (IIMS) will be used to track excavated material, including its characterization data, from its original location, through interim staging/storage, to final disposition. The IIMS interfaces with the SED to retain connections to the RI/FS, historical, and newly generated data when excavated material is moved from the source location. The information data tracking system currently used at the FEMP is summarized in Section 2.5.2.

2.3.6 Quality Assurance

The programmatic QA controls that are applicable to the implementation of the SEP are described in the "Sitewide CERCLA Quality Assurance Project Plan" (SCQ; DOE 1993b) and SEP Quality Assurance Project Plan (QAPP) in Appendix E. The objective of the QAPP is to ensure FEMP and EPA QA/QC programmatic requirements flow down to PSPs, IRDPs, data quality objectives (DQOs), procedures, subcontracts and other documents necessary to control soil excavation activities. Independent assessments will be conducted through auditing, surveillance, inspections, and surveying practices that measure quality, performance, and process compliance. Objective evidence of assessment activities will be part of project records.

2.3.7 Reporting Requirements

The record keeping and reporting requirements for the SCEP remedial activities will be met through submission of four documents:

1. A Certification Report, demonstrating attainment of all remediation drivers for each remediation area

2. A Remedial Action Report, which transfers further closeout responsibilities after remedial activities in each operable unit are completed

3. A Site Closeout Report, which will summarize all of the Remedial Action Reports and certify that site remedial goals specified in the RODs have been achieved

4. The Natural Resource Restoration Design Package, which will specify the necessary restoration activities to achieve the final land use in the remediation area as defined in the NRRP.

Details regarding the contents of these documents are included in Section 7.0.

2.3.8 Health and Safety

Health and safety is a priority at the FEMP at all times, and especially during construction activities. To emphasize this, the subcontractor for each project will prepare a Safe Work Plan, which will describe how the work is to be performed, including training requirements, an analysis of hazards, procedures for exposure monitoring, and radiological requirements. The Safe Work Plan will be prepared in accordance with the contract documents utilizing the Project-Specific Health and Safety Requirements Matrix (PSHSRM). The PSHSRM is prepared by DOE's prime site management contractor as an aid in identifying hazards associated with the project. It includes a hazard analysis for each project task and required mitigators, such as personal protective equipment, engineering and administrative controls, planning and permits, personnel and air monitoring, medical monitoring and surveillance, and decontamination and disposal procedures. In addition, the prime DOE contractor will prepare a Project-Specific Health and Safety Plan (PSHASP), which will specify health and safety procedures to be used by the subcontractor and his subcontractors, as well as all personnel on the project site, including visitors, vendors, and prime contractor and DOE employees (DOE 1995h). More discussion regarding project health and safety is included in Section 6.0.

000096

2.4 MEASUREMENT APPROACHES

One primary task during a soil remediation project is to identify contaminated soil and to quantify the amount of contamination present. An array of field and laboratory instruments and methods will be used at the FEMP to accomplish this task. Each of the methods has advantages and disadvantages, and the selection of a method for a specific task is related to the ASCOC list and the task's DQOs. Specific remedial action applications are discussed below and a detailed presentation of field and laboratory instruments and their application is provided in Appendix H.

2.4.1 Remedial Action Applications

Soil remediation at the FEMP will require the collection of additional data on specific contaminants for many purposes. Some of the more important phases of data collection are listed below:

- Pre-Design Surveys and Sampling and Analysis - The nature and extent of contamination at the site must be quantified to delineate the excavation footprint and estimate the excavation volume. Characterization data will be used to plan the ultimate disposition of the material removed. Examples include soil containing more than 29.1 pCi/g technetium-99, soil from the seven areas with the potential to exhibit RCRA toxicity characteristics, and soil containing ASCOC concentrations that might exceed the OSDF WAC.

- Excavation Control Surveys - As surface soil is removed, the soil beneath it is exposed. In areas where the depth profiles of contaminant concentrations cannot be efficiently determined before excavation, information on the status of this residual soil must be gathered to determine whether the soil is above or below the removal criteria for that task. This information will be used in the decision to continue excavating or to stop at the current grade level and/or lateral extent.

- Precertification Surveys - Once excavation is complete in an area, the residual soil concentrations of the contaminants that governed the excavation can be determined. This information will be used to verify that the remediation objectives for the area have been met prior to initiating final certification activities.

- Certification Sampling and Analysis - After the precertification survey has indicated the remedial objectives have been met, additional data will be collected on physical samples to confirm this. This confirmatory data will be the data of record that defines the area's final status and will be used to certify that the area is suitable for release to its final land use.

Each of the phases listed above requires characterization of the concentrations and extent of COCs in soil and sediment. Data collection during each of these phases will be supported through a coordinated

and integrated combination of direct instrument measurements in the field and laboratory analysis. Table 2-8 presents a list of the data collection phases and the measurement methods that can be used during each remediation phase. Instrumentation and survey methods will be selected based on area-specific physical conditions and COCs, and the selected approach will be presented in each IRDP. Appendix H presents details on the analytical methods and a summary of design considerations that will be incorporated into the selection process.

2.4.2 Field Measurements

Field measurements will be performed to identify and quantify (ASL A or ASL B) many of the sitewide COCs listed in Table 2-6 during the predesign, excavation, and precertification phases of the remediation. NaI detectors (a.k.a. gross beta/gamma friskers, RSS and RTRAK) and the in situ high-purity germanium detectors (a.k.a. HPGe) will be used routinely to identify and quantify isotopes of uranium, thorium, and radium (i.e., the primary COCs). The screening process to be used with these instruments is described in the User's Manual (DOE 1998c). A field portable x-ray fluorescence instrument is capable of screening for metals and can be useful as a quantitative tool when metal concentrations of interest are significantly higher (e.g., WAC levels) than the detection limit of the instrument. Photoionization detectors (PIDs) and/or immunoassay techniques will be used to screen for the presence of volatile organic compounds and specific organic compounds at all excavation locations. Several of the secondary COCs listed in Table 2-6 can only be detected or quantitated by sampling and analysis (e.g., plutonium-238, technetium-99, strontium-90, fluoride, dieldrin, etc). Additional information on the capability and application of field and laboratory instruments is provided in Appendix H.

2.4.3 Discrete Sampling and Laboratory Analysis

Although effective guidance is provided by field measurements, final remedial and verification decisions for ASCOCs will be linked directly to analytical laboratory determinations. Field data will help ensure the optimum use of laboratory analysis, including identification of the appropriate analytical requirements and performance. Table 2-8 summarizes the anticipated use of laboratory analytical methods during remedial activities.

000098

Gamma spectroscopy is the easiest laboratory method for quantifying the primary radiological COCs listed in Table 2-6 because sample digestion is not required prior to analysis. However, other analytical techniques may be more appropriate (e.g., alpha spectroscopy or ICP/MS) if a low minimum detectable activity (MDA) is required or if large batches of samples are submitted. In the case of a large batch of samples (e.g., 20 samples), alpha spectroscopy or ICP/MS may provide a turn-around time more rapid than gamma spectroscopy. Radiochemistry laboratories are generally set up with 20 or more detectors to count alpha decay while their capability for counting gamma photons is limited to several detectors. In a similar fashion, mass measurements using the ICP/MS are carried out very rapidly relative to gamma spectroscopy once the samples have been digested and prepared for analysis. Therefore, the time spent preparing the sample for alpha spectroscopy or ICP/MS is recovered by the simultaneous count or short analytical time of 20 or more samples. Additional information on laboratory techniques and their application are provided in Appendix H.

Alpha spectroscopy can be used to quantify uranium and thorium isotopes of interest as well as the secondary COCs plutonium-238 and neptunium-237, after a chemical digestion and separation is performed to isolate the element of interest. For beta emitting isotopes (e.g., strontium-90, technetium-99, radium-228, etc) liquid-scintillation and gas-proportional counting techniques are used to quantify beta emitting isotopes following the digestion and chemical separation of the element. Additional information on the methods and applications is provided in Appendix H.

For metal and organic COCs, the common laboratory methods of interest are inductively coupled plasma atomic emission spectroscopy (ICP) and gas chromatography/mass spectroscopy (GC/MS). These techniques will be used to quantify the secondary COCs listed in Table 2-6. Additional information on the instruments and capabilities are provided in Appendix H.

The number of laboratory samples and the ASCOCs to be analyzed will be determined in the area specific PSPs, IRDPs, and CDLs. In accordance with the requirements of the SCQ, the sampling plans will specify the appropriate number and type of QA/QC samples to be collected, based on the analytical methods and number of samples. Samples collected for analysis will be submitted to an approved laboratory and analyzed for the indicated contaminants at ASL B when sampling is used to support the pre-excavation and excavation activities and at ASL D for certification. Additional

information on the use of ASLs to support remediation activities is provided in the SEP QAPP (Appendix E).

2.4.4 Design Considerations for Area-Specific Measurement Approach

The selection of the instrumentation and measurement approach will depend on a number of considerations including:

- Which COCs are in the area? Certain analytical techniques are better suited to quantify some COCs, while other technologies will be better for others. For example, uranium concentrations can be characterized in soil using gamma spectroscopy, alpha spectroscopy, and ICP/MS, whereas plutonium-238 is limited to alpha spectroscopy.

- What is the appropriate number of samples to collect? The number of samples required to satisfy the sampling program's objectives is determined by the specific COCs expected in the area and their projected distribution. As a general rule, areas with a history of past contamination, or areas with a heterogeneous concentration distribution will require more samples per unit area to characterize them than will areas with no history of contamination or with a homogeneous distribution. Further guidance on determining the appropriate number of certification samples is provided in Appendix G.

- What is the lowest detection limit that is acceptable? If the purpose of the measurements are to determine if uranium concentrations in surface soil are above or below the WAC, the HPGe or portable XRF instruments can be used to determine the uranium concentration. If the purpose is to certify the remediation area as being below the FRL of applicable COCs, then sampling and analysis will be needed to meet MDAs and MDLs.

- What are the physical conditions in the area? Very rough terrain, trees, structures, and steep slopes may preclude the use of vehicle mounted measurement systems like the RTRAK. Gamma spectroscopy systems calibrated for planar (flat) geometries will not give reliable results in trenches or pits unless properly calibrated for those geometries.

- What are the data quality objectives of the data collection program? The data quality objectives of a program will determine which methods are acceptable. For example, if the purpose of the data collected is to screen samples to determine if they require special handling, ASL A quality data will be sufficient. If the purpose of the program is to provide predesign information on COCs all data must meet acceptance criteria for ASL B. When certifying the remediation area for FRL attainment, all data must meet acceptance criteria for ASL D. Additional details on specific ASLs applied to the remediation activity are presented in the SEP QAPP (Appendix E).

- How quickly will the analytical results be needed? A rapid turn-around time may limit the number of analytical options available. Additionally, the batch size submitted for analysis must be considered when turn-around time is important (see the example given for alpha versus gamma spectroscopy under Section 2.4.3).

When the COCs have been selected, the MDAs and MDLs determined, and validation criteria have been set, the SCQ will specify which analyses are acceptable and set the sampling and analytical criteria. Table E-2 in Appendix E of this Plan provides a quick reference guide to pertinent sections of the SCQ, and Appendix H provides details on matching instruments to remediation activities.

2.5 LOGISTICS

Several logistical issues are important to implementing soil remediation activities at the FEMP. These include:

- Accounting for area-specific conditions
- Data queries associated with the SEP
- Dealing with data gaps
- Handling perched water, deep pile foundations, and subsurface utility lines
- Managing deep pile foundations
- Managing subsurface utility lines
- Cross-contamination/recontamination
- Handling special materials
- Capacity of the OSDF
- Concerns with off-site shipments
- Weather
- Access to off-property areas
- Grading and restoration.

Each of these issues is discussed in the following paragraphs.

2.5.1 Area-Specific Conditions

Because of its size and complexity, the SEP cannot address all of the area-specific conditions anticipated at the FEMP. Therefore, the SEP only provides programmatic guidance and area-specific conceptual approaches for completion of excavation activities. The IRDPs for individual excavation projects will provide details of project-specific activities, issues, and conditions (Section 7.2).

2.5.2 Sitewide Environmental Database

The SED was created to serve as a central repository for all environmental data collected in support of RI/FS and remediation activities. In addition to this central repository, there are several related but distinct data subsets or tables contained within the same database system. This section of the SEP will discuss the subsets of the SED and present the screening approach to be employed for compiling the list of ASCOCs.

2.5.2.1 Subsets of the SED

The subsets of the SED that are of interest to performing COC screening for the SEP include the live SED tables, frozen RI datasets, historical soil data, and the construction management data (CMD) set. Each subset is defined and briefly described below.

Live SED Tables

These are the core data tables in the SED, into which all data entry and electronic data loading is done. The intent is to maintain this dataset as the most complete and up-to-date set of environmental and remediation data possible. If properly documented corrections are required, they are made in these tables with sufficient backup records that document the changes. New data is continually added to these tables.

Frozen RI Datasets

These datasets were developed in accordance with criteria that was established for the respective operable unit. The Operable Unit 2 RI data was first assembled in the live SED tables and then copied into 'frozen' tables upon completion of Operable Unit 2 RI report. The Operable Unit 5 RI data, which includes some Operable Unit 2 samples, was first assembled in the live SED, then exported to finalize the Operable Unit 5 RI and finally, in June 1994, exported back to the SED into 'frozen' tables. 'Frozen' means the data in the tables is not changed. The purpose of these tables is to have an electronic snapshot of the data that was used to create the RI.

Historical Soil Data

There are overlaps among the previously described datasets. All of the Operable Unit 5 and Operable Unit 2 samples also remain in the live SED. In addition, a large number of the Operable Unit 2 samples were included in Operable Unit 5. In large measure the overlapping samples are the same in each dataset. However, there are some differences due to:

- Different or changing validation criteria
- New information requiring a correction to an existing sample (not a common occurrence)
- Historical data from other identified sources
- Differences in the way calculated "Uranium, Total" was used.

For these reasons it became apparent that some effort was required to standardize the data that was to be used in the soil remediation design.

The Historical Soil tables represent the best efforts to incorporate all soil samples collected on site into one comprehensive data set to support remedial design activities. Data that was included in these tables included Operable Unit 5 RI, Operable Unit 2 RI, SED, removal actions, and project data. In order to present a clear summary of the in situ soil conditions, Operable Unit 5 and Operable Unit 2 results were excluded from these tables based only on the following:

- Excavated sample
- Geotechnical sample
- TCLP sample
- Analytical data were rejected in data validation
- Multiple samples collected from the same depth (highest validated result used)
- Samples collected from the waste pit berms
- Sludge samples.

Summary reports can be generated that demonstrate the extent of the changes for each COC.

Construction Maintenance Database

The Construction Maintenance Database (CMD) set contains data that was collected in support of various construction projects that were conducted at the FEMP. This data was not collected in support of any RI/FS activity, was not validated and previously had not been entered into the SED. This data was entered into the SED in 1996 in order to supplement existing soil data.

2.5.2.2 Screening Approach for Waste Acceptance Criteria and Final Remediation Level Area-Specific Constituents of Concern

The proposed methodology for screening soil data to generate a move conservative list of ASCOCs for WAC and FRL attainment involves defining a set of search criteria (i.e., media, project, area, depth of samples, parameters) and then applying these criteria to the live SED tables (which contain all subsets and newly acquired data). The proposed query criteria are as follows:

1) The entire remediation area will be considered.

2) All soil and sediment results will be queried, including results from areas where soil or sediment has been removed by a remedial action.

3) All detection limit values will be reported at the detection limit value (i.e., detection limit values will not be halved)

4) When field duplicate samples are reported, the highest value will be passed forward for evaluation.

5) When multiple results exist for the same sample (e.g., off-site and on-site analyses), the highest value is selected, with preference given to validated data.

6) TCLP results are considered in and around the seven designated RCRA toxicity characteristic areas.

7) When available, the total uranium calculated from the uranium isotopes is used, otherwise the mass uranium total is used.

COCs returned by implementing these query criteria will be retained as ASCOCs if they exceed WAC or FRL levels. However, the number of samples requiring characterization and the type of analysis to perform for each COC will be determined on an area-by-area basis and documented in the PSPs.

2.5.3 Data Gaps

As demonstrated in the RI/FS reports and RODs for the various operable units, the RI/FS data are generally sufficient for determining the nature and extent of contamination at the FEMP and for selecting the remedy. However, there are known deficiencies associated with these data that will affect remedial design. For instance:

- Data for previously sampled material that has been moved or removed through removal actions and other activities remain in the SED. Although conditions at the source areas may have changed as a result of removal action, this information will be used to establish the list of potential COCs.

- Data for many COCs may be reported at detection limit values that exceed FRL or WAC levels. These values will be retained as part of the COC screening process.

As other deficiencies are identified, they will be considered in the design process. In addition, all data gaps will be used to focus PSPs implemented during the predesign investigation, the results of which will then supplement the existing RI/FS data to fill in the identified data gaps and deficiencies. Revisions and additional data will be presented in the area-specific IRDPs and reflected in the remedial designs.

2.5.4 Perched Water

Perched water will be encountered during excavation in most areas of the FEMP, depending on the depth of excavation. Perched water control actions will include:

- Investigate potential perched water yield, quality, and AWWT facility compatibility in the excavation area during the predesign investigation

- Schedule deep excavations in high-yield areas during dryer seasons (if possible)

- Collect perched water by using dewatering wells (i.e., pressure relief), interception trenches, and/or sumps within or around the excavated area to maintain the working area as dry as possible

- Delineate and sequence deep excavation zones to simplify potential dewatering needs and to prevent recontamination of an excavated area by inflow of perched water from adjacent unexcavated areas

- Consider potential impacts of perched water on excavation stability during the design process

- Prevent full penetration of the glacial till layer overlying the GMA to minimize the introduction of perched water into the GMA (Note: deep excavations that penetrate the unsaturated sand and gravel above the GMA will be lined with clay)

- Minimize mixing of perched water from different stratigraphic levels until sampling and analysis have determined the treatment option

- Coordinate treatment schedule and capacity requirements with the AWWT facility

- Provide efficient and cost-effective transport systems to send the collected water to designated treatment and/or discharge points (e.g., maximize the use of existing, overland, mobile, and/or reusable piping/hoses, pumping, and/or trucking systems)

- Suspend excavation when the collection, storage, and/or treatment capacities are exceeded

- Provide engineering details of the perched water control system in the area-specific IRDPs

- Document the perched water volume and water quality information collected during excavation

- After receiving regulatory approval of the certification report, divert storm water via existing or new drainage channels to Paddys Run and stop the local perched water collection systems (Note: selected deep excavation areas will not be backfilled after certification and will be maintained as ponds that are fed by precipitation and perched water).

In addition, some contaminated, perched water zones present an unacceptable threat to the underlying aquifer. Remediation activities will involve excavation of soil in these zones. All perched water,

000106

including surface water and rainfall that is mixed with perched water, will be treated at the Advanced Wastewater Treatment (AWWT) facility.

The need for pretreatment of remediation-generated wastewater (i.e., storm water, perched water, and decontamination water), and the appropriate main treatment loop of the AWWT (i.e., Phase I and Phase II), will be evaluated during the design process using the AWWT's wastewater acceptance guidelines based on NPDES permit requirements, and coordinated with the AWWT facility.

Anticipated FEMP remediation wastewaters containing RCRA F-listed spent solvent constituents (e.g., perched water from the Sludge Drying Beds and Fire Training Facility areas, Hazardous Waste Management Unit decontamination water, and containerized wastewaters presently in inventory) meet the conditions in the Hazardous Waste Mixture Rule Exclusion [OAC 3745-51-03(a)(2)(e) and 40 CFR 261.3(a)(2)(iv)]. These wastewaters are not principal wastewater streams, are small in nature relative to the primary wastewater flow (i.e., storm water and groundwater), and generally contain concentrations of spent solvents far below the "after mixing" thresholds discussed in the rule. Therefore, these wastewaters can be appropriately managed as a wastewater exempted from RCRA listing through the on-site wastewater treatment system. More specifically, wastewaters that contain organic contaminants at concentrations below the thresholds discussed in the Hazardous Waste Mixture Rule Exclusion will be treated directly through the Phase II AWWT without pretreatment. Phase II AWWT includes carbon filtration capable of treating volatile organic compounds in these wastewaters.

For the purposes of demonstrating compliance with the Hazardous Waste Mixture Rule Exclusion thresholds, any unanticipated waste streams identified during future predesign investigations that contain significant concentrations of F-listed spent solvents will be held in the Surge Lagoon. The FEMP has identified the Surge Lagoon as the head works of the Phase II AWWT and the flow-through capacity of the Phase II AWWT system for those waste streams discharged on a more continuous basis. These identifications are necessary as they will be the basis for evaluating mixing of individual waste streams, some of which may contain concentrations of F-listed spent solvents above the stated thresholds.

The IRDPs will describe expected locations, depth, quantity, quality, and treatment requirements (if any) for perched water, as well as procedures to minimize potential impacts to the underlying Great Miami Aquifer during excavation activities, for each project.

2.5.5 Deep Pile Foundations

Several buildings in Remediation areas 3 and 4 have pile foundations that extend to a considerable depth below grade and below any known soil contamination. In Area 3, Building 1A (Preparation Plant) and the Plant 1 Conveyor Pit have sheet piles potentially extending to 33 feet below grade. Similarly, in Area 3, Building 10A (Boiler House) has pile foundations extending approximately 40 feet below the surface, as well as a multi-level basement at least 30 feet below grade. In Area 4, the former Plant 8A Thorium Silos (silos removed) have pile foundations that potentially extend 22 feet below grade.

Because of their depth, none of these pile foundations are expected to be readily removable. If the piles can be removed, it will not be feasible to obtain measurements or collect samples to the full depth of excavation, because the sands of the Great Miami Aquifer will collapse as the piles are removed. In addition, removal of the pile foundations could provide an enhanced pathway for contaminant transport. Finally, any groundwater contamination in the Great Miami Aquifer associated with the piles will be remediated by the aquifer restoration project.

If, for technical reasons, some deep pilings cannot be removed, each piling will be addressed on a case-by-case basis. Factors to be considered when deciding to leave in place or remove a piling include:

- The technical difficulties in removing the piling
- Process knowledge about the mobility and quantity of potential contaminants
- Analytical results from soil borings surrounding the piling
- The final grade of the excavation.

Potential impacts associated with this approach will be reviewed during the remedial design phase, and any necessary modifications will be made at that time and described in the appropriate IRDP.

000103

2.5.6 Subsurface Utility Lines

Subsurface utility lines include storm, sanitary, water, electric, gas, and sump lines. Excavation of utilities will include the utility lines themselves and backfill material, which typically consists of sand or gravel and extends below the lines. As described in Appendix F, active utilities within excavation areas will be either permanently shut off and/or rerouted prior to any excavation activities.

2.5.7 Cross-Contamination/Recontamination

Cross-contamination is defined as elevated levels of contamination from one location being transported to another area where the contamination did not previously exist or was not previously present at the elevated concentration. Recontamination is the cross-contamination of remediated locations. The transport of this contamination can occur through wind erosion, wind-blown dust generated by excavation-related activities, vehicular traffic, and/or storm water run-on. As described in Section 2.3.3.1, a major consideration in the sequencing of remediation activities is to minimize cross-contamination and recontamination. A comprehensive material inventory and tracking system has been developed to provide assurance that cross-contamination and recontamination will be minimized.

The basic elements of the material inventory and tracking system are as follows:

- All remediation, construction, and maintenance projects are required to generate a project waste identification document (PWID) during project planning activities.
- PWID development includes a review of the SED and a determination of the character of the waste streams to be encountered. The source location, profile number, estimated volume, and planned disposition for each anticipated waste stream are identified on the PWID.
- Unique Material Tracking Location (MTL) numbers are used in conjunction with gridded project drawings to designate each source location and any stockpiles where excavated material will be staged.
- PWIDs are reviewed and approved by the SCEP Project Manager.
- Administrative controls will ensure routine application of the PWID planning process to projects not directly associated with SCEP by linking generation of a PWID to the

issuance of the FEMP's well-recognized internal penetration permit. This will extend control to the occasional maintenance-type actions that occur outside of the soil remediation project.

The actual movement of waste material is preceded by the preparation of a Field Tracking Log (FTL) which identifies the source and destination MTL as well as the volume of material moved. These FTL are completed by WAO field representatives who monitor ongoing work activities.

Data from the PWID, the MTL locations, and the FTL are all recorded into an electronic database (the IIMS) which ties the SED data to the stockpile placement via the FTL. IIMS reports can list the volume in each stockpile, the source of the material in a stockpile, and the SED data associated with the material in the stockpile. Other reports can also track where excavated soils were staged during project activities.

The stockpile control system requires perimeter fencing and color-coded placards. The placard identifies the MTL number, status of the staged material relevant to the OSDF WAC, a contact name and phone number, and the statement "No unauthorized use". These requirements apply to stockpiles sitewide. However, the requirements do not apply to "working stockpiles" (e.g., excavated soils staged for backfill upon completion of the activity) unless they remain inactive for 45 days or more. The stockpile management approach will:

- Define clear project responsibilities regarding stockpile management through clear site procedures
- Establish a full inventory of all the existing stockpiles and track future movement of materials in and out of the stockpiles through the IIMS
- Provide color-coded designations and physical access controls for all non-working stockpiles to prevent mixing of materials
- Provide sufficient dust and runoff controls of all stockpile
- Use underlying geotextile or infiltration barrier when necessary

000110

- Conduct sufficient WAC attainment characterization, including multi-phase physical sampling, potential TCLP tests, and statistical analysis before the final excavation and disposal of the Removal Action 17 stockpiles

- After removal of a stockpile, remediate and certify underlying soil with COCs identified in the pile if an infiltration barrier was not installed under the pile

- Establish unloading, loading, and/or decontamination procedures for the centralized above-WAC pile and the OSDF staging area.

Other controls directed at wind and water erosion include application of cover (e.g., crusting agent, vegetation or tarp) to stockpiles that are inactive for 45 days or more. Appendix F contains additional details on seeding requirements to minimize erosion and cross contamination. The above-listed requirements for excavated materials under this SEP supersede the documentation and data management methods for those materials under the Removal Action 17 Work Plan.

2.5.8 Special Materials

The following materials, if encountered during excavation activities, will require special handling because of operational or health and safety concerns:

Asbestos	Transformers
Lead acid batteries	Medical/infectious waste
Miscellaneous debris	Pressurized containers
Piping	Tires
Nonpressurized containers	Uranium metal
Non-soil residues	Brick, including acid brick

Some special materials will be eligible for disposition in the OSDF but may first require physical processing, sampling and analysis, or interim containerization. The remainder will be dispositioned off site. Protocols for handling special materials are described in the conceptual waste disposition process described in Section F.5 of Appendix F.

2.5.9 Capacity

The capacity of the OSDF is limited. Therefore, care must be taken during excavation activities to minimize the amount of soil and debris being dispositioned to the OSDF, while attaining FRLs in a cost-effective manner. These goals will be accomplished by:

- Supplementing, as necessary, RI/FS characterization data with predesign investigation data to allow, as much as practical, the extent of excavation to be sufficiently defined during remedial design
- Excavating to the levels defined by the remedial design, then using field measurement methods, as much as practical, to control additional excavation
- Precertifying the attainment of FRLs to identify areas of elevated levels of contaminants that may require further attention (i.e., additional localized excavation) before certification sampling (Section 3.4).

Remediation activities are discussed further in Section 3.0. The area-specific conceptual models of excavation presented in Section 4.0 are designed to attain FRLs in as cost-effective and timely manner as possible. This will be accomplished by minimizing the amount of below-FRL material that is dispositioned to the OSDF and by minimizing the amount of costly re-excavation and certification activities that would be required by initial failure to attain FRLs.

2.5.10 Off-Site Shipments

It is expected that a certain amount of material will be transported to one or more off-site facilities for final disposition and/or treatment and final disposition. This is material that exceeds the WAC for the OSDF (Tables 2-4 and 2-5) and has one or more of the following characteristics:

- Is prohibited from disposal in the OSDF
- Does not meet the physical criteria of the OSDF
- Is toxicity-characteristic waste from one of the six Operable Unit 5 areas shown on Figure 1-5 that cannot be cost-effectively treated for disposal in the OSDF
- Exceeds one or more of the other OSDF chemical or radiological WAC.

000112

The primary issues regarding off-site shipments are:

- Obtaining in advance of initiating transportation off site, and optimally prior to making off-site treatment/storage/disposal contract arrangements, a determination of acceptability under the CERCLA Off-Site Rule (40 CFR §300.400) for a potential receiving facility.

- Obtaining in advance an exemption from DOE Order 5820.2A for disposal of low-level waste at other than a DOE facility; no such exemption is needed for mixed waste.

- Meeting the LDR requirements for any hazardous waste, or the hazardous components of mixed waste.

- Meeting the waste acceptance criteria of the receiving facility, and attendant information and documentation to demonstrate such [e.g., sampling in conformance with off-site facility requirements, completion of the off-site facility's waste profile form(s) and other coordination with the off-site facility for waste stream acceptance in advance of preparing the waste for transport.

- Properly manifesting, packaging, labeling, marking, and placarding waste, in accordance with EPA and/or U.S. Department of Transportation requirements, before transporting low-level, mixed, or hazardous waste off site for either treatment or disposal.

- Contracting with a transportation firm(s) with the proper license(s) and/or permit(s).

2.5.11 Weather

The wide range of potential weather conditions at the FEMP can pose operational concerns during remediation activities. Such conditions include heat, cold, heavy rain, drought, snow and ice, high winds, and tornadoes. In general, construction operations during or pursuant to these conditions will be addressed in the FEMP subcontractor's Safe Work Plan, which is required by the contract documents. Health and safety issues regarding these conditions will be addressed in the PSHSRM and PSHASP prepared for each project (Section 6.0).

In addition to these conditions, some winterization activities may be required. Winterization encompasses those activities necessary to ensure that an excavation area can be re-entered with minimal time needed for construction to restart. Winterization requirements are described in Appendix F.

2.5.12 Access to Off-Property Areas

Permission to access off-property areas will be required prior to obtaining samples during the predesign investigations, and may also be required during remedial action. Such areas include, but are not limited to:

- Area 9 Phase II adjacent to the STP, where samples will be collected, excavation might be required in support of deep excavation requirements at the STP, and remediation of contamination might be required.
- The area east of the STP to the Great Miami River, where samples will be collected, excavation will be required to remove the abandoned outfall line, and additional excavation might be required to remediate contamination.
- The area adjacent to the northeast corner of the site (Area 9, Phase I), where samples will be collected and remediation of contamination might be required (Figures 1-3 and 1-4).

A procedure for access to off-property areas requiring certification will be developed by DOE and EPA in cooperation with the affected property owner. In general, this procedure should require that:

1) Proper permits be obtained through the FEMP Real Estate Department

2) NEPA requirements are reviewed by the FEMP Natural and Cultural Resource Program to ensure all areas designated for ground disturbing activities met the intent of the NEPA

3) The Advisory Council on Historic Preservation be notified if there will be adverse effects on historic properties

4) FEMP Construction, Engineering, Planning, and Bidding review all necessary documentation relevant to remedial actions

000114

5) Permission is obtained from the off-property owner prior to performing any remedial action.

The DOE is committed to the development of a good relationship with the nearby property owners during the planning, design, and implementation of any remedial action. Therefore, the DOE will work with the EPA and the property owners to schedule information meetings during the design process that will keep the property owner cognizant of proposed remedial actions. The information meetings should discuss a quick decision making process for the off-site certification issues, ways to reduce off-site impacts from on-site activities, and regular updates of site activities by FEMP public relations personnel.

The applicable IRDP will, as appropriate, describe the need for access to off-property areas and account for necessary permitting and approval times in the schedule. Off-property areas will be handled as part of the remediation of the adjacent, on-property area, to the extent possible. As necessary, separate IRDP(s) for off-property areas will be prepared.

2.5.13 Grading and Restoration

The DOE has made the commitment to accelerate the restoration of natural resources into the remediation process whenever possible. Areas that have been accelerated to the certification process are listed in Table 1-5 and discussed in Appendix B. The development of restoration guidelines is generally a three-phase process that will end with establishing vegetation to develop the proposed habitat for the final land use. The three major phases include:

- Rough or interim grading, to be performed after certification
- Final grading, to include the use of borrow material, additional excavation, placement of topsoil, and construction of required drainage features
- Habitat development, to include planting vegetation for the proposed land use.

The last two steps will be guided by the area-specific NRRDP. Each of these phases is detailed in Appendix F.

TABLE 2-1

HWMUs TO BE CLOSED UNDER CERCLA

HWMU IDENTIFICATION AND DESCRIPTION[1, 2]			SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
HWMUs TO BE CLOSED BY SCEP							
41	Sludge Drying Beds	Inactive land-based surface impoundments that are part of the sanitary wastewater treatment system; managed wastewater treatment sludges which contained listed spent solvent. No spills are recorded.	1 Phase II	SCEP to demonstrate soil FRL attainment and certify closure	Tetrachloroethene	Tetrachloroethene[6]	N/A[6]
11	Tank Farm Sump	Inactive land-based surface impoundment unit. Sump was used to collect and neutralize waste acid. No soil was identified to indicate pH <2. Spills (from leaking drums stored in area) are recorded.	3	SCEP to demonstrate soil FRL attainment and certify closure	Corrosive (low pH)	N/A	N/A
20	Plant 1 Storage Pad	Active outdoor and indoor container storage area. Paved outdoor portion with partial secondary containment berm system presently only manages containers without free liquids; indoor portion with secondary containment system manages containers with free liquids. Spills are recorded.	3, 4b	SCEP to demonstrate soil FRL attainment and certify closure	Methylene Chloride	Methylene Chloride[6]	N/A[6]
					Tetrachloroethene	Tetrachloroethene[6]	N/A[6]
					1,1,1-Trichloroethane	1,1,1-Trichloroethane[6]	N/A[6]
					Xylene	Xylene[6]	N/A[6]
					Barium	Barium[6]	N/A[6]
					Lead	Lead[6]	N/A[6]
					Additional constituents TBD dependent on documented waste codes stored[6]	TBD[5]	TBD[5]
36	Storage Pad North of Plant 6	Inactive outdoor paved container storage area without secondary containment berm system. Managed containers with free	4a	SCEP to demonstrate soil FRL attainment and	1,1,1-Trichloroethane	1,1,1-Trichloroethane[6]	N/A[6]
					Lead	Lead[6]	N/A[6]

000116

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TABLE 2-1
(Continued)

HWMU IDENTIFICATION AND DESCRIPTION[1, 2]			SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
4	Drum Storage Area Near Lab Bldg. Loading Dock	Inactive outdoor unpaved (during active life) container storage area without secondary containment system. Managed containers with free liquids. No spills are recorded. Unit has documented soil contamination from roofing tar. Area is presently overlain by concrete due to loading dock expansion.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Corrosive (low pH)	N/A[6]	N/A[6]
					Benzene	Benzene[6]	N/A[6]
					Tetrachloroethene	Tetrachloroethene[6]	N/A[6]
					Toluene	Toluene[6]	N/A[6]
10	Nitric Acid Recovery (NAR) System Components	Inactive tank system, primarily indoor with single outdoor tank; indoor and outdoor components have secondary containment system. Stored waste nitric acid. Spills are recorded.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Corrosive (low pH)	N/A[6]	N/A[6]
					Chromium	Chromium IV[6]	N/A[6]
14	Box Furnace	Inactive outdoor furnace/ incinerator unit; has structurally sound flooring pad, but no secondary containment berm system. Managed only solid materials; burned rags and gloves contaminated by spent solvents. No spills are recorded.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Tetrachloroethene	Tetrachloroethene[6]	N/A[6]
					1,1,1-Trichloroethane	1,1,1-Trichloroethane[6]	N/A[6]
					Trichloroethene	Trichloroethene[6]	N/A[6]
					Barium	Barium[6]	N/A[6]
					Chromium	Chromium IV[6]	N/A[6]
					Lead	Lead[6]	N/A[6]
					Silver	Silver[6]	N/A[6]
17	Plant 8 East Pad	Inactive outdoor paved container storage area with secondary containment system. Managed containers with free liquids. Spills are recorded.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Ignitable (Xylene)	Xylene[6]	N/A[6]
					Methyl Ethyl Ketone	N/A[6]	N/A[6]
					Lead	Lead[6]	N/A[6]
18	Plant 8 West Pad	Inactive outdoor paved container storage area with secondary containment system. Managed containers with free liquids. Spills are recorded.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Ignitable (Xylene)	Xylene[6]	N/A[6]
					Methyl Ethyl Ketone	N/A[6]	N/A[6]
					Lead	Lead[6]	N/A[6]

000117

TABLE 2-1
(Continued)

HWMU IDENTIFICATION AND DESCRIPTION[1, 2]			SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
22	Abandoned Sump West of Pilot Plant	Inactive tank system. Sump contents failed TCLP for metals. Spills (leakage from the sump) are recorded. NOTE: Also identified as an area where the soils might be RCRA toxicity characteristic hazardous for barium and lead.	4b	SCEP to demonstrate soil FRL attainment and certify closure	Benzene Tetrachloroethene Barium Chromium Lead Mercury	Benzene Tetrachloroethene Barium Chromium IV Lead Mercury	N/A Tetrachloroethene Barium (by TCLP) N/A Lead (by TCLP) Mercury
5	Drum Storage Area South of W-26	Inactive outdoor unpaved container storage area without secondary containment system. Managed containers with free liquids. No spills are recorded. Unit has documented soil contamination from roofing tar.	4b, 5	SCEP to demonstrate soil FRL attainment and certify closure	Lead Mercury	Lead[6] Mercury[6]	N/A[6] N/A[6]
1	Fire Training Facility	Inactive land-based miscellaneous unit; fire training exercise area, used oil and listed spent solvents were spread on ground and ignited. Spills are recorded. Soil contamination previously excavated under Removal Action 28.	6	SCEP to demonstrate soil FRL attainment and certify closure	1,1,1-Trichloroethane Toluene	1,1,1-Trichloroethane[6] Toluene[6]	N/A[6] N/A[6]
27	Waste Pit 4	Inactive land-based land disposal unit. No spills are recorded.	6	SCEP to demonstrate soil FRL attainment and certify closure	Barium	Barium	N/A
42	Waste Pit 5	Inactive land-based land disposal unit. No spills are recorded.	6	SCEP to demonstrate soil FRL attainment and certify closure	1,1,1-Trichloroethane Other possible characteristic constituents TBD during removal of waste pit contents[6]	1,1,1-Trichloroethane TBD[5]	N/A TBD[5]

TABLE 2-1
(Continued)

	HWMU IDENTIFICATION AND DESCRIPTION[1, 2]		SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
HWMUs TO BE CLOSED BY FC&DP							
19	CP Storage Warehouse (Butler Building)	Active indoor container storage area with secondary containment system. Manages containers with and without free liquids. Spills are recorded.	Not Applicable (3)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A [6]	N/A [6]
34	KC-2 Warehouse	Active indoor container storage area with secondary containment system. Manages containers with and without free liquids. Spills are recorded.	Not Applicable (3)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A [6]	N/A [6]
35	Plant 9 Warehouse	Active indoor container storage area with secondary containment system. Sealant applied prior to initiating strorage of hazardous waste in 1990. Manages containers with and without free liquids, equipped for storage of ignitible liquids. Spills are recorded.	Not Applicable (3)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A[6]	N/A[6]
37	Plant 6 Warehouse	Active indoor container storage area with secondary containment system. Sealant applied prior to initiating strorage of hazardous waste in 1989. Manages containers with and without free liquids, equipped for storage of ignitible liquids. Spills are recorded.	Not Applicable (4a)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A[6]	N/A[6]
15	Oxidation Furnace #1	Inactive indoor furnace/ miscellaneous unit with cracked, pitted and heavily stained flooring pad but only a partial secondary containment diking system (where two ancillary scrubber liquid pumps were located). Managed materials with free liquids. No spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	1,1,1-Trichloroethane	N/A [6]	N/A[6]

000119

TABLE 2-1
(Continued)

	HWMU IDENTIFICATION AND DESCRIPTION[1, 2]		SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
25	Plant 1 Storage Building	Inactive indoor paved container storage area without secondary containment system. Managed containers with free liquids. No spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Ignitability	N/A[6]	N/A[6]
28	Trane Thermal Liquid Incinerator	Inactive indoor incinerator unit, with outdoor ancillary above-ground one-tank tank system and two outdoor paved container storage areas. Indoor components with structurally sound flooring pad; outdoor tank system and one container storage area with secondary containment system, other without. Stored then burned oil containing lead and listed spent solvents. No spills are recorded; however, potential yellow cake in immediate area.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	1,1,1-Trichloroethane	N/A[6]	N/A[6]
					Lead	N/A[6]	N/A[6]
29	Plant 8 Warehouse	Active indoor container storage area with secondary containment system. Sealant applied prior to initiating strorage of hazardous waste liquids in 1996. Manages containers with and without free liquids. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A[6]	N/A[6]
33	Pilot Plant Warehouse	Active indoor container storage area with secondary containment system. Herculite diking constructed prior to initiating storage on liquids in 1992. Manages containers with and without free liquids. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Constituents TBD dependent on documented waste codes stored[6]	N/A[6]	N/A[6]

TABLE 2-1
(Continued)

	HWMU IDENTIFICATION AND DESCRIPTION[1, 2]		SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
46	UNH Tanks - NFS Storage Area	Inactive outdoor five-tank above-ground tank system with secondary containment system. Stored corrosive UNH. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Barium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]
					Lead	N/A [6]	N/A [6]
					Mercury	N/A [6]	N/A [6]
47	UNH Tanks - North of Plant 2A	Inactive outdoor three-tank above-ground tank system with secondary containment system. Stored corrosive UNH. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Barium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]
					Lead	N/A [6]	N/A [6]
					Mercury	N/A [6]	N/A [6]
48	UNH Tanks - Southeast of Plant 2A	Inactive outdoor one-tank above-ground tank system with secondary containment system. Stored corrosive UNH. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Barium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]
					Lead	N/A [6]	N/A [6]
					Mercury	N/A [6]	N/A [6]
49	UNH Tanks - Digestion Area (2 locations)	Inactive indoor eight-tank above-ground tank system with secondary containment system. Stored corrosive UNH. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Barium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]
					Lead	N/A [6]	N/A [6]
					Mercury	N/A [6]	N/A [6]

8092

TABLE 2-1
(Continued)

HWMU IDENTIFICATION AND DESCRIPTION[1, 2]			SCEP REMEDIATION AREAS	SCEP REMEDIATION ACTION	HWMU COCs OR RCRA CHARACTERISTICS[1, 6]	FINAL REMEDIATION LEVEL COCs[3]	OSDF WAC[4] OR RCRA TC COCs
50	UNH Tanks - Raffinate Building (2 locations)	Inactive indoor four-tank above-ground tank system with secondary containment system. Stored corrosive UNH. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Barium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]
					Lead	N/A [6]	N/A [6]
					Mercury	N/A [6]	N/A [6]
54	Thorium Nitrate Tank (T2)	Inactive outdoor one-tank above-ground tank system with secondary containment system. Stored corrosive thorium nitrate. Spills are recorded.	Not Applicable (4b)	None; clean closure by FC&DP; D&D report to certify closure	Corrosive (low pH)	N/A [6]	N/A [6]
					Cadmium	N/A [6]	N/A [6]
					Chromium	N/A [6]	N/A [6]

NOTES:

(1) Sources: Table 1-1, HWMU Identification, OU5 FS (DOE 1995b); and Terry Hagen, October 30, 1995 memo, M:EC:95-0071, titled "Hazardous Waste Management Unit/CERCLA Constituents of Concern" and its attached table entitled "RCRA COCs for Active and Inactive Units to be Closed Under CERCLA/RCRA Integrated Process" (October 17, 1995).
(2) Source: HWMU Release History, T. Spradlin to M. Strimbu Memorandum, June 24, 1997; based upon retrieval from Release History file.
(3) Source: Table 9-3, Final Remediation Levels for Soil, OU5 ROD (1996e).
(4) Source: Table 4-1, On-Site Disposal Facility Waste Acceptance Criteria (WAC), FEMP OSDF Impacted Materials Placement Plan (DOE 1998a); else, "(by TCLP)" means by concern for RCRA Toxicity Characteristic (TC), where TCLP is the Toxicity Characteristic Leaching Procedure.
(5) Specific RCRA waste COCs are yet to be determined dependent on documented waste codes managed/stored in these HWMUs.
(6) Potential for RCRA waste COC to be present in soil is low. Source: Table 4-68, Hazardous Constituents in Hazardous Waste Management Units (HWMUs) and Soil, OU5 RI (DOE 1995e).

CERCLA Comprehensive Environmental Response, Compensation and Liability Act
COCs Constituents of Concern
D&D
report individual project completion report for the above-grade decontamination & dismantlement project
FC&DP Facility Closure and Demolition Project
FRL Final Remediation Level
HWMU Hazardous Waste Management Unit(s)
N/A Not applicable
OSDF On-Site Disposal Facility
RCRA Resource Conservation and Recovery Act
SCEP Soil Characterization and Excavation Project
TBD To be determined
TC Toxicity Characteristic
TCLP Toxicity Characteristic Leaching Procedure
UNH Uranyl nitrate hexahydrate
WAC Waste Acceptance Criteria

8092

TABLE 2-2

USTs TO BE CLOSED UNDER CERCLA

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
TANKS CLOSED BY REMOVAL — DEMONSTRATION OF SOIL FRLs ATTAINMENT NEEDED			
RAILROAD ENGINE HOUSE - BUILDING 24B			
UST-3	Remediation Area: 3 Former Location: 25 feet NE of Railroad Engine House (Bldg. 24B) Fomer Volume: 12,500 gallons Former Size: 10 foot diameter x 21 foot length; steel Former Accessories: Pump located immediately S of tank	Material: Diesel Fuel COCs: Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) Reference MEFs: 203, 584	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** Tank removed. Soil samples taken during tank removal had elevated concentrations of BETX, TPH and Lead. An additional 530 cubic yards of soil was removed from the UST-3 pit based on visual staining, petroleum odors and headspace analysis vs. background. Hydrocarbon contamination also found under train tracks in upper 3 feet of soil (tracks ran to W side of pit to engine house and E side pit) and soil was excavated to headspace criteria. Excavation was backfilled with clean gravel. Results from post-excavation soil sampling conducted at 20-foot intervals. Results for Lead (<4.7-12 mg/kg) were below the established FRL; BETX constituents were not detected; TPH was 28-112 mg/kg (no FRL established). [Source: UST-3 Tank Closeout Report (DOE 1992a)].

000423

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
MAINTENANCE SHOP - BUILDING 12			
UST-6	Remediation Area: 3 Former Location: 1 foot N of Maintenance Shop (Bldg. 12) Former Volume: 1,000 gallons Former Size: 4 foot diameter x 12 foot length; steel Former Accessories: N/A	Material: Gasoline COCs: Acetone . . . . . (FRL; no OSDF WAC) Benzene . . . . . (FRL; no OSDF WAC) Carbon Tetrachloride . . . . . (FRL; no OSDF WAC) 1,2-Dichloroethane . . . . . (FRL; no OSDF WAC) 1,1-Dichloroethene . . . . . (FRL; OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Methyl Chloride . . . . . (no FRL; no OSDF WAC) Methyl Ethyl Ketone . . . . . (no FRL; no OSDF WAC) Tetrachloroethene . . . . . (FRL; OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) 1,1,1-Trichloroethane . . . . (no FRL; no OSDF WAC) Trichloroethene . . . . . (FRL; OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Cadmium . . . . . (FRL; no OSDF WAC) Chromium . . . . . (FRL as VI; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) Reference MEFs: 501, 1616, 1618, 1672, 2746, 10026	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** Tank removed. Analytical results from 3 soil samples collected (selected based on highest PID levels) from the excavation indicated Lead (5.98-8.85 mg/kg), Toluene (5.4 μg/kg) and Xylene (11.8 μg/kg) are below established FRLs; Benzene (< 5.0 μg/kg) and Ethylbenzene (< 5.0 μg/kg) were below detection limits, and below established FRLs; TPH was < 10.0 mg/kg (no FRL established). [Source: Closure Assessment Report for Petroleum USTs (DOE 1991a)].

8092

000124

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
PLANT 1 TRUCK DOCK			
UST-11	**Remediation Area:** 4b **Former Location:** Buried under gravel approximately 6 feet E of Plant 1 Truck Dock and S of Bldg. 1. Also 2 feet N of UST-12 and 2 feet S of Plant 1 cyclone fence. **Former Volume:** 3,000 gallons **Former Size:** 5½ foot diameter x 18 foot length; steel **Former Accessories:** Tank piping ran N under cyclone fence, then approximately 10 feet to gas pump.	**Material:** Kerosene, Gasoline **COCs:** Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Methyl Isobutyl Ketone . . . (no FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) 1,1,1-Trichloroethane . . . . (no FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Chromium . . . . . (FRL as VI; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) **Reference MEFs:** 345, 492, 1408	**REMOVED — Demonstration of Soil FRLs Attainment Needed.** USTs-11, -12, and -13 were in poor condition upon removal. Soils surrounding USTs -11, -12, and -13 were sampled in 1990 upon completion of tank removal. Results for Benzene (342 μg/kg), Toluene (519 μg/kg), Ethylbenzene (2,920 μg/kg), Xylene (11,400 μg/kg), and Lead (19.7 mg/kg) are below established FRLs; maximum TPH was 1,810 mg/kg (no FRL established). [Source: Underground Storage Tanks Removal Site Evaluation (DOE 1991b)]. In 1991, additional soil excavation extended to approximately 11 feet deep and horizontally until structural constraints or non-petroleum hydrocarbon contamination discovered - 5,000 square feet with estimated volume of 2,000 cubic yards of soil. *No soil sampling conducted following 1991 excavation.* [Source: USTs-11, -12 and -13 Closure Report (DOE 1993c)]. The following is from R.E. Tiller 2/11/1992 letter to USEPA & OEPA: *During 1991 excavation, pocket of fly ash and rubble found approximately 50 feet E of tank cluster at 9 foot depth. Inconsistent organic vapor reading led to soil sampling. Results indicated presence of acetone and methanol* (could not find results in file) [NOTE: Acetone—FRL; no OSDF WAC; Methanol—no FRL; no OSDF WAC]. Also evidence of petroleum-contaminated soils underneath Plant 1 Truck Dock.

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
UST-12	**Remediation Area:** 4b **Former Location:** Approximately 6 feet E of Plant 1 Truck Dock and S of Bldg. 1. Also 2 feet S of UST-11. **Former Volume:** 3,000 gallons **Former Size:** 5½ foot diameter x 18 foot length; steel **Former Accessories:** Tank piping ran across UST-11, under cyclone fence, then approximately 10 feet to gas pump.	**Material:** Gasoline **COCs:** Benzene . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) **Reference MEFs:** 492, 6055	**REMOVED — Demonstration of Soil FRLs Attainment Needed.** See entry for UST-11.
UST-13	**Remediation Area:** 4b **Former Location:** Approximately 25 feet E of Plant 1 Truck Dock and 40 feet S of Bldg. 1 cyclone fence. **Former Volume:** 3,000 gallons **Former Size:** 5½ foot diameter x 18 foot length; steel **Former Accessories:** Pump and remote fill at N end of paved road S of tank	**Material:** Kerosene, Gasoline **COCs:** Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Methyl Isobutyl Ketone . . . (no FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) 1,1,1-Trichloroethane . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Chromium . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) **Reference MEFs:** 345, 492, 1408	**REMOVED — Demonstration of Soil FRLs Attainment Needed.** See entry for UST-11.

8092

000126

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
GARAGE - BUILDING 31			
UST-1	**Remediation Area: 5** **Former Location:** Centerline approximately 51 feet E of Garage (Bldg. 31). Tank was buried approximately 1½ feet beneath a ½ foot concrete slab. **Former Volume:** 1,500 gallons **Former Size:** 8 foot diameter spherical tank; fiberglass **Former Accessories:** Piping from top of UST-1 to aboveground gasoline pumps and a 2 inch vent line from UST-1 to UST-2 and to Bldg. 31.	**Material:** Unleaded Gasoline **COCs:** Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) **Reference MEFs:** 181, 60053	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** USTs -1, -2, -8, -9, -10 removed in concert. Soil excavated to maximum depth of 11 feet within footprint of the 5 tank cluster. Horizontal excavation continued until a physical constraint was encountered. Final excavation covered approximately 6,000 square feet of surface area. Excavated volume estimated at 2,500 cubic yards of soil. 9 soil samples (based on highest PID levels) were collected in 1990 when the tanks were removed but prior to final soil excavation. Results for Benzene (1,210 μg/kg), Toluene (382 μg/kg), Ethylbenzene (1,190 μg/kg), Xylene (1,1300 μg/kg), and Lead (35.6 mg/kg) are below established FRLs; TPH was 656 mg/kg (no FRL established). *No samples were collected during excavation; no post-excavation samples were collected.* USTs-1, -2, -8, -9 and -10 Closure Report (DOE 1993d) concluded that only minor residual petroleum contamination remained after excavation. Since USTs were located in an area with significant uranium contamination and further excavation was impractical, any additional remediation would be conducted under CERCLA.

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
UST-2	**Remediation Area: 5** **Former Location:** Centerline approximately 51 feet E of Garage (Bldg. 31). Tank was buried approximately 1½ feet beneath a ½ foot concrete slab. **Former Volume:** 1,500 gallons **Former Size:** 8 foot diameter spherical tank; fiberglass **Former Accessories:** Piping from top of tank to aboveground gasoline pumps and 2 inch vent line from UST-2 to UST-1	**Material:** Unleaded Gasoline **COCs:** Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) **Reference MEFs:** 181, 60053	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRL Attainment Needed.** See entry for UST-1.
UST-8	**Remediation Area: 5** **Former Location:** 12 feet NE of Garage (Bldg. 31). Tank was buried under 8 inch concrete slab with 2 foot x 2 foot 8 inch concrete dispensing pump foundation extending above pavement at N end of tank. **Former Volume:** 1,000 gallons **Former Size:** 4 foot diameter x 12 foot length; steel **Former Accessories:** Remote fill line ran from tank to 10 feet W of tank	**Material:** Leaded Gasoline **COCs:** Acetone . . . . . (FRL; no OSDF WAC) Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Methyl Ethyl Ketone . . . . . (no FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) **Reference MEFs:** 183, 487	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** See entry for UST-1.

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
UST-9	**Remediation Area: 5** **Former Location:** 8½ feet from NE corner of Garage (Bldg. 31). ¼ of tank was buried under an 8 inch concrete pad. **Former Volume: 1,000 gallons** **Former Size:** 4 foot diameter x 12 foot length; steel **Former Accessories:** Remote fill line - tank to E wall of garage	**Material: Diesel Fuel** **COCs:** Acetone . . . . . (FRL; no OSDF WAC) Benzene . . . . . (FRL; no OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Methyl Ethyl Ketone . . . . . (no FRL; no OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) **Reference MEFs: 131, 487, 60331**	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRL Attainment Needed.** See entry for UST-1.
UST-10	**Remediation Area: 5** **Former Location:** Centerline approx. 43½ feet E of Garage (Bldg. 31). Tank was buried beneath 2 gas pumps on concrete pad. **Former Volume: 3,000 gallons** **Former Size:** 5½ foot diameter x 18 foot length; steel **Former Accessories:** Concrete pump island with 2 pumps directly over tank	**Material: Leaded Gasoline** **COCs:** Acetone . . . . . (FRL; no OSDF WAC) Methylene Chloride . . . . . (FRL; no OSDF WAC) Trichlorofluoromethane . . . (no FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) **Reference MEFs: N/A; See MSDS**	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** See entry for UST-1.

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
UST-5	**Remediation Area: 5** **Former Location:** Approximately 10 feet E of Garage (Bldg. 31). **Former Volume: 200 gallons** **Former Size:** 2½ foot diameter x 6 foot length; steel	**Material:** Wastewater from Oil/Water Separator - contained hydraulic oil, motor oil, gasoline, diesel fuel and cleaning solvents (such as 1,1,1-Trichloroethane @ 6.3-6.9 mg/kg) **COCs:** Acetone . . . . . (FRL; no OSDF WAC) Aroclors/PCBs . . . . . (FRL; no OSDF WAC) Benzene . . . . . (FRL; no OSDF WAC) Carbon Tetrachloride . . . . . (FRL; no OSDF WAC) Cyclohexanone . . . . . (no FRL; no OSDF WAC) 1,2-Dichloroethane . . . . . (FRL; no OSDF WAC) 1,1-Dichloroethene . . . . . (FRL; OSDF WAC) Ethylbenzene . . . . . (FRL; no OSDF WAC) Ethyl Ether . . . . . (no FRL; no OSDF WAC) Methylene Chloride . . . . . (FRL; no OSDF WAC) Methyl Ethyl Ketone . . . . . (FRL; no OSDF WAC) Methyl Isobutyl Ketone . . . (no FRL; no OSDF WAC) Tetrachloroethene . . . . . (FRL; OSDF WAC) Toluene . . . . . (FRL; no OSDF WAC) 1,1,1-Trichloroethane . . . . (no FRL; no OSDF WAC) Trichloroethene . . . . . (FRL; OSDF WAC) Trifluorochloromethane . . . (no FRL; no OSDF WAC) Xylene . . . . . (FRL; no OSDF WAC) Arsenic . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Cadmium . . . . . (FRL; no OSDF WAC) Chromium . . . . . (FRL as VI; no OSDF WAC) Lead . . . . . (FRL; no OSDF WAC) Mercury . . . . . (FRL; OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) Silver . . . . . (FRL; no OSDF WAC) **Reference MEFs:** 386, 1616, 1618, 1672, 1832, 10026, 10031, 30046, 60115, 60329, 60342	**REMOVED — UST Removal Action appears to meet FRL criteria; Demonstration of Soil FRLs Attainment Needed.** Tank reclassified from HWMU to SWMU (based on Waste Water Treatment Unit exemption); tank removed; soil removed during tank excavation was placed back into hole because no visibly contaminated soils were present [Source: USTs-5, -7, -14 and -17 Closeout Report (DOE 1995h)]. Soil samples were collected in 3/1990 after rainwater flowed into the tank after it had been uncovered. These sampling results were erroneously summarized in the UST-5 Removal Site Evaluation (RSE) (DOE 1993e) and USTs-5, -7, -14 and -17 Closeout Report (DOE 1995h). Review of analytical data indicates that results for rain water in tank and soil were switched in Table 1 of the RSE (and carried over into Closeout Report). As a result, these reports state that 1,1,1-Trichloroethane was detected in soils when the analytical data from the laboratory reports (included as Attachment 1 of the RSE) indicates that it was not detected. Results for Xylene (32 μg/kg), Barium (100 mg/kg), Arsenic (5.50 mg/kg), Cadmium (0.285 mg/kg), Chromium (20.7 mg/kg), Lead (11.1 mg/kg), and Silver (0.119 mg/kg) are below established FRLs; Benzene, Ethylbenzene and Toluene were not detected; Methanol (195 μg/kg) was detected but has no established FRL. No other semi-volatile or volatile organic compounds were detected in the soil.

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TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
HEAVY EQUIPMENT BUILDING - BUILDING 46			
UST-17	**Remediation Area: 5** **Former Location:** Approximately 10 feet N of Heavy Equipment Building (Bldg. 46). **Former Volume: 200 gallons** **Former Size:** 2½ foot diameter x 6 foot length; steel	**Material: Waste Oil from Oil/Water Separator** **COCs:** Acetone . . . . . (FRL; no OSDF WAC) 1,1,1-Trichloroethane . . . . . (FRL; no OSDF WAC) Barium . . . . . (FRL; no OSDF WAC) Selenium . . . . . (FRL; no OSDF WAC) **Reference MEFs: 123, 124, 60035** **SWMU - Not regulated by BUSTR**	**REMOVED — Demonstration of Soil FRsL Attainment Needed.** Tank and concrete slab above tank was removed (slab was at 8 foot depth) - tank was in very poor condition and, upon removal, water inside tank emptied into the excavation (water accumulated after tank was emptied of its contents). Water in excavation was immediately removed and drummed. Soils that came into contact with water or that were discolored were excavated — 3 drums with Lot code W050-741-P011-0395. [Source: USTs-5, -7, -14 and -17 Closeout Report (DOE 1995h)]. Soil samples were collected prior to excavation. Results for Xylene (27 μg/kg) and Lead (29.7 mg/kg) were below established FRLs; Benzene, Toluene and Ethylbenzene were not detected; maximum TPH was 3,300 mg/kg (no FRL established); no other volatile or semi-volatile organic compounds were detected in the soil samples. Note that one soil sample collected prior to excavation did contain 12.9 mg/L Chromium (EP Tox); but Chromium (10.9 mg/kg) is below the 300 mg/kg FRL established for Chromium VI; other metals analyzed (Arsenic, Barium, Cadmium, Mercury, Selenium and Silver) were below establsihed FRLs. 1,1,1-Trichloroethane was detected in the oil-separator (1,050 μg/kg) but was not detected in the soil (no FRL established). *No post-excavation soil samples were collected.* [Sources: USTs-5, -7, -14 and -17 Closeout Report (DOE 1995h); UST-17 Removal Site Evaluation (DOE 1993f)].

TABLE 2-2
(Continued)

TANK ID	DESCRIPTION	FORMER CONTENTS	STATUS & DESCRIPTION OF CLOSURE ACTIVITIES
TANK CLOSED IN PLACE – TO BE REMOVED FROM THE GROUND UNDER CERCLA			
PLANT 6			
UST-14	**Remediation Area:** 4a **Location:** Buried under concrete floor in former scrap melting area (S end) of Plant 6. **Volume:** 3,000 gallons **Size:** 5½ foot diameter x 18 foot length; steel	**Material:** Waste Soluble Machining Oil - a heavy napthenic petroleum oil. **COCs:** Methanol . . . . . (no FRL; no OSDF WAC) **Reference MEFs:** N/A; see MSDS Analysis of tank residues: Methanol, 40 mg/kg; no other volatile or semi-volatile compounds or metals were detected. [Source: UST-14 Closure Report (DOE 1992b)].	**CLOSED IN PLACE – UST to be removed from the ground; Demonstration of Soil FRLs Attainment Needed.** Removed perched water from tank, disconnected process piping and filled tank with grout. To sample the soil beneath the UST, a hole was cut in the bottom of the tank. Perched water began flowing into the tank. *The presence of water precluded the sampling of underlying soils.* [Source: UST-14 Closeout Report (DOE 1995i).] Two soil samples were collected at a total depth of 2 feet below the base of the oil supply line. Results for Lead (17.8 mg/kg) were below the established FRL; BETX constituents (Benzene, Ethylbenzene, Toluene and Xylene) were not detected; TPH was 139-174 mg/kg (no FRL established). [Source: 6/1992 UST-14 Closure Report (DOE 1992b).] An inspector from the State Fire Marshal's office inspected and approved tank abandonment in place on 03/16/1995 [Source: UST-14 Closeout Report (DOE 1995i)].

BETX	Benzene, Ethylbenzene, Toluene and Xylenes
BUSTR	Ohio Bureau of Underground Storage Tank Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COCs	Constituents of Concern
FRL	Final Remediation Level
HWMU	Hazardous Waste Management Unit
MEF	Material Evaluation Form
mg/kg	milligrams per kilogram
MSDS	Material Safety Data Sheet
N/A	Not applicable
OSDF	On-Site Disposal Facility
PID	Photoionization Detector
RSE	Removal Site Evaluation
SWMU	Solid Waste Management Unit
TPH	Total Petroleum Hydrocarbons
μg/kg	micrograms per kilogram
UST	Underground Storage Tank
WAC	Waste Acceptance Criteria

TABLE 2-3

AREAS POTENTIALLY CONTAINING RCRA CHARACTERISTIC WASTE IN SOIL

Description of Area	Remediation Area	Potentially Hazardous Constituent(s)
Area between the KC-2 Warehouse and adjacent to railroad tracks	3	Lead
Trap Range	1	Lead
Paddys Run streambank fill materials west of the Silos	7	Chromium Lead
Scrap Metal Pile	3	Lead
Area north of the Maintenance Building	3	Lead TCE
Abandoned Sump west of the Pilot Plant [a]	4b	Barium
South Field Firing Range[b]	2	Lead

Note: [a] Also designated as HWMU No. 22.

[b] RCRA characteristic material from the South Field Firing Range will be disposed of off site as required by the Operable Unit 2 ROD.

000133

TABLE 2-4

RADIOLOGICAL AND CHEMICAL WASTE ACCEPTANCE CRITERIA (WAC) FOR ON-SITE DISPOSAL FACILITY [1]

	Constituent	Concentration/Activity	Units
1.	Neptunium-237	3.12×10^{9}	pCi/g
2.	Strontium-90	5.67×10^{10}	pCi/g
3.	Technetium-99	2.91×10^{1}	pCi/g
4.	Uranium-238 or	3.46×10^{2}	pCi/g
	Total Uranium	1.030×10^{3}	mg/kg
5.	Carbazole	7.27×10^{4}	mg/kg
6.	Bis(2-chlorisopropyl)ether [2][3]	2.44×10^{-2}	mg/kg
7.	Alpha-chlordane	2.89×10^{0}	mg/kg
8.	Bromodichloromethane[3]	9.03×10^{-1}	mg/kg
9.	4-Nitroaniline[2][3]	4.42×10^{-2}	mg/kg
10.	Chloroethane	3.92×10^{5}	mg/kg
11.	Vinyl chloride	1.51×10^{0}	mg/kg
12.	Tetrachloroethene	1.28×10^{2}	mg/kg
13.	Trichloroethene	1.28×10^{2}	mg/kg
14.	1,1-Dichloroethene	1.14×10^{1}	mg/kg
15.	1,2-Dichloroethene	1.14×10^{1}	mg/kg
16.	Toxaphene	1.06×10^{5}	mg/kg
17.	Boron[3]	1.04×10^{3}	mg/kg
18.	Mercury	5.66×10^{4}	mg/kg

(1) This table is based on information contained in the Operable Unit 2 and Operable Unit 5 Records of Decision.

(2) The WAC for these constituents are below their practical quantitation limit (PQL). Analytical limitations will be addressed in Project Specific Plans developed for each remediation area.

(3) The WAC for these constituents are below their corresponding final remediation level.

TABLE 2-5

PHYSICAL WASTE ACCEPTANCE CRITERIA (WAC) AND PROHIBITED ITEMS FOR THE ON-SITE DISPOSAL FACILITY (OSDF)

PHYSICAL WASTE ACCEPTANCE CRITERIA
The maximum length of irregularly shaped metals or other components of a building superstructure or finish components shall be 10 feet.
The maximum thickness of irregularly shaped metals or other components of a building superstructure or finish components shall be 18 inches.
The maximum thickness of an individual concrete member or other component of a building slab or substructure shall be 4 feet, when the item is handled individually and is a regular shape having no concrete protrusions greater than 18 inches.
Concrete reinforcement bars shall be cut within a nominal 12 inches of the concrete mass. The additional length added by these bars is not considered in determining the total length of the concrete mass.
The maximum thickness of uniform pallets of building cladding (e.g., transite panels), properly banded into rectangular shapes, shall be 4 feet.
Regulated asbestos-containing material (ACM) shall be double-bagged.
ACM brick and commingled debris shall be double contained.
Piping having ACM insulation shall be segregated.
Equipment shall be drained of all oils and liquids.
Piping with a nominal diameter of 12 inches or greater shall be split in half.
OSDF Category 3 items having voids greater than 1 cubic foot shall be filled with a quick-set grout, or flowable cohesionless material approved by the OSDF Construction Manager. If a grout is used in this manner, it shall be allowed to set for a minimum of four hours prior to the commencement of placement of that item.

TABLE 2-5
(Continued)

PROHIBITED ITEMS	
Prohibited Item	Comments/Examples
Materials not accompanied by the required manifest	Integrated Information Management System will provide the manifest
Material received from off-site that was not generated as a direct result of FEMP remediation	OSDF is designated for Fernald material only
RCRA characteristic waste[a]	Treat to below characteristic level (except material from South Field Firing Range which must be disposed off-site)
Pressurizable gas cylinders	Cylinders must be emptied and sized/filled to meet OSDF Category 2 or 3
Process-related metals	Examples include uranium derbies, ingots, billets, and uranium scrap
Product, residues, other special material	Examples include green salt, black oxide, and sump sludges from process facilities
Material containing free liquids[b]	
Intact drums	Drums must be emptied and crushed
Acid brick[c]	
Transformers	Transformers must be crushed or filled with grout
Whole or shredded scrap tires	The specific prohibited tires are defined by OEPA
Used oils	

[a]Sampling for characteristic waste will be performed in the seven areas presented in Sections 1.3.2.7 and 2.1.1.3 of this plan in accordance with the Operable Unit 2 and Operable Unit 5 Records of Decision and the Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility.
[b]The intent of the exclusion of free liquids is to prevent contaminated liquid waste from being directly disposed of in the OSDF (e.g., a drum of solvent). Materials that contain rainwater or, like sludges, that have an inherent moisture content are not excluded from disposal in the OSDF. If a material that arrives at the OSDF for disposal is too wet to meet moisture content or compaction requirements, the material will be air dried or blended with a drier WAC-acceptable material at the OSDF, in accordance with construction quality control requirements.
[c]As a best management approach, actual and/or suspected acid brick from the FEMP's soil excavation activitiesm including the excavation of the Operable Unit 2 waste units, will be segregated from other debris during excavation and sent off site for disposal. The objective is to remove the vast majority of the brick (i.e., that brick which can be readily identified and safely removed during soil excavation and OSDF placement activities) to further minimize the chance that brick containing process residuals is placed in the OSDF.

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TABLE 2-6

SUMMARY OF SITEWIDE CONSTITUENTS OF CONCERN (COCs)

Constituent of Concern	Driver [a]	Constituent of Concern	Driver [a]
Primary COCs			
Uranium, total	WAC, FRL	Thorium-228	FRL
Radium-226	FRL	Thorium-232	FRL
Radium-228	FRL		
Secondary COCs			
Aroclor-1254	FRL	Heptachlorodibenzo-p-dioxin	FRL
Aroclor-1260	FRL	Indeno(1,2,3-cd)pyrene	FRL
Arsenic	FRL	Lead	FRL
Benzo(a)anthracene	FRL	Lead-210	FRL
Benzo(a)pyrene	FRL	Manganese	FRL
Benzo(b)fluoranthene	FRL	Neptunium-237	FRL
Beryllium	FRL	4-Nitroaniline	WAC
Bis(2-chloroisopropyl)ether	WAC	Octachlorodibenzo-p-dioxin	FRL
Bromodichloromethane	FRL	Plutonium-238	FRL
Cesium-137	FRL	Strontium-90	FRL
Dibenzo(a,h)anthracene	FRL	Technetium-99	WAC, FRL
1,1-Dichloroethene	FRL	Tetrachloroethene	FRL
Dieldrin	FRL	Thorium-230	FRL
Fluoride	FRL	Trichloroethene	WAC, FRL
Ecological COCs			
Antimony	BTV	Molybdenum	BTV
Cadmium	BTV	Lead	BTV
Silver	BTV	PAHs	BTV

Notes:

[a] WAC and FRLs will drive remediation, but BTVs will be evaluated in the certification process.

WAC = Waste Acceptance Criteria
FRL = Final Remediation Level
BTV = Benchmark Toxicity Value
PAHs = polyaromatic hydrocarbons (see list in footnote of Table 2-7)

000137

TABLE 2-7

PRELIMINARY IDENTIFICATION OF PRIMARY, SECONDARY AND ECOLOGICAL COCS ASSIGNED TO REMEDIATION AREAS

RA 1	RA 2	RA 3	RA 4	RA 5	RA 6	RA 7	RA 8
PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total	PRIMARY COCs radium-226 radium-228 thorium-228 thorium-232 uranium-total
SECONDARY COCs aroclor-1254 aroclor-1260 arsenic beryllium cesium-137 dieldrin [a] heptachloradibenzo-p-dioxins lead manganese [a] neptunium-237 technetium-99 thorium-230	SECONDARY COCs aroclor-1254 aroclor-1260 [a] arsenic benzo(a)pyrene beryllium bromodichloromethane [a] cesium-137 dibenzo(a,h)anthracene 1,1-dichloroethene [a] dieldrin lead neptunium-237 technetium-99 thorium-230	SECONDARY COCs aroclor-1254 aroclor-1260 arsenic benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene beryllium bromodichloromethane [a] cesium-137 dibenzo(a,h)anthracene 1,1-dichloroethene dieldrin [a] fluoride indeno(1,2,3-cd)pyrene lead technetium-99 tetrachloroethene thorium-230 trichloroethene	SECONDARY COCs aroclor-1254 aroclor-1260 arsenic benzo(a)pyrene beryllium bromodichloromethane [a] cesium-137 dieldrin fluoride lead plutonium-238 strontium-90 technetium-99 tetrachloroethene thorium-230	SECONDARY COCs aroclor-1254 aroclor-1260 [a] arsenic beryllium dieldrin [a]	SECONDARY COCs aroclor-1254 aroclor-1260 arsenic benzo(a)pyrene benzo(b)fluoranthene beryllium bromodichloromethane [a] cesium-137 dibenzo(a,h)anthracene 1,1-dichloroethene dieldrin fluoride heptachloradibenzo-p-dioxins indeno(1,2,3-cd)pyrene octachlorodibenzo-p-dioxin technetium-99 tetrachloroethene thorium-230	SECONDARY COCs aroclor-1254 aroclor-1260 [a] arsenic beryllium cesium-137 dieldrin [a] lead lead-210 manganese technetium-99 thorium-230	SECONDARY COCs to be determined
ECOLOGICAL COCs antimony lead molybdenum	ECOLOGICAL COCs antimony silver cadmium lead molybdenum	ECOLOGICAL COCs cadmium silver antimony molybdenum PAHs*	ECOLOGICAL COCs antimony		ECOLOGICAL COCs silver antimony cadmium PAHs*	ECOLOGICAL COCs antimony cadmium molybdenum silver PAHs*	

Notes: [a] Not detected above the FRL in the RA, but the non-detect value is greater than the FRL
COCs = constituents of concern
RA = remediation area
FRL = final remediation area
* PAHs include: Benco(A)anthracene, Benco(A)pyrene, Benco(B)fluoranthene, Benco(G,H,I)perlene, Benco(K)fluoreanthene, Fluorenathene, chrysene, Dibenco(A,H)anthracene, Indeno(1,2,3-Co)pyrene, Phenantrene, pyrene

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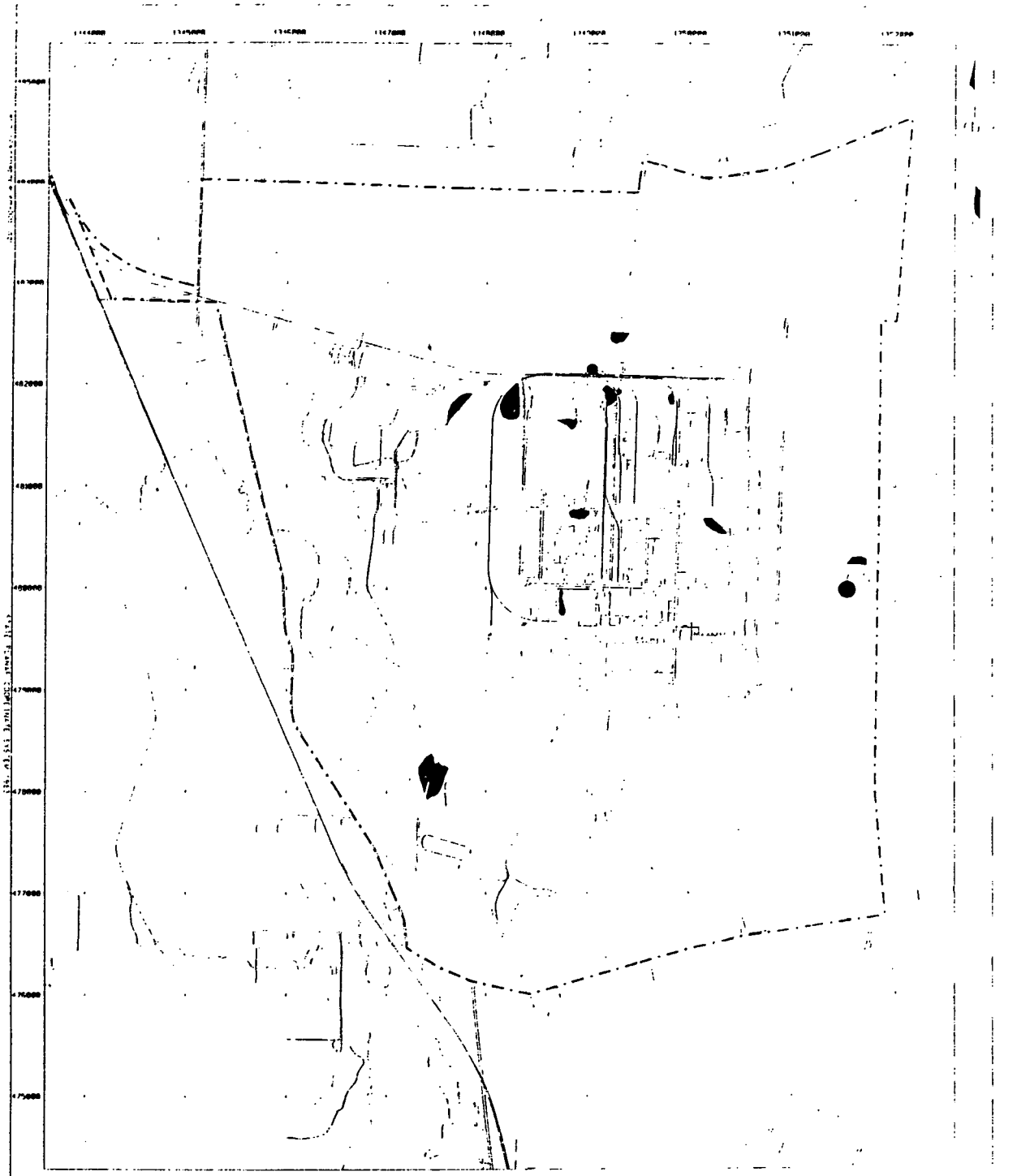
TABLE 2-8

MEASUREMENTS AND ANALYSIS

Function or Application	Field Measurements			On-Site and Off-Site Lab		
	ASL A or ASL B			ASL B or ASL D		
	Radiation	Metals	Organics	Radiological	Metals	Organics
1. Pre-excavation						
Footprint						
Primary COCs[a]	NaI or HPGe			alpha spectroscopy gamma spectroscopy ICP/MS		
Secondary COCs[a]	NaI or HPGe	XRF	PID	alpha spectroscopy gamma spectroscopy ICP/MS gas proportionality counting liquid scintillation counting	ICP XRF	GC/MS
Depth Profile						
Primary COCs[a]	NaI	XRF	PID	alpha spectroscopy gamma spectroscopy ICP/MS liquid scintillation counting		
Secondary COCs[a]	NaI	XRF	PID	alpha spectroscopy ICP/MS gas proportionality counting liquid scintillation counting	ICP XRF	GC/MS
2. Excavation Control						
Primary COCs[a]	NaI or HPGe					
Secondary COCs[a]	NaI or HPGe	XRF	PID			
3. Pre-Certification						
Primary COCs[a]	NaI or HPGe					
Secondary COCs[a]	NaI or HPGe	XRF				
4. Certification						
Primary COCs[a]				alpha spectroscopy gamma spectroscopy ICP/MS		
Secondary COCs[a]				alpha spectroscopy gamma spectroscopy gas proportionality counting liquid scintillation counting	ICP XRF	GC/MS

[a]Primary and secondary COCs defined in Table 2-7

NaI = sodium iodide frisker or RTRAK
XRF = x-ray fluorescence
PID = photoionization detector



LEGEND:

FEMP BOUNDARY

WAC AREA

FINAL

FIGURE 2-1. FEMP AREAS WITH TOTAL URANIUM CONCENTRATIONS GREATER THAN WAC

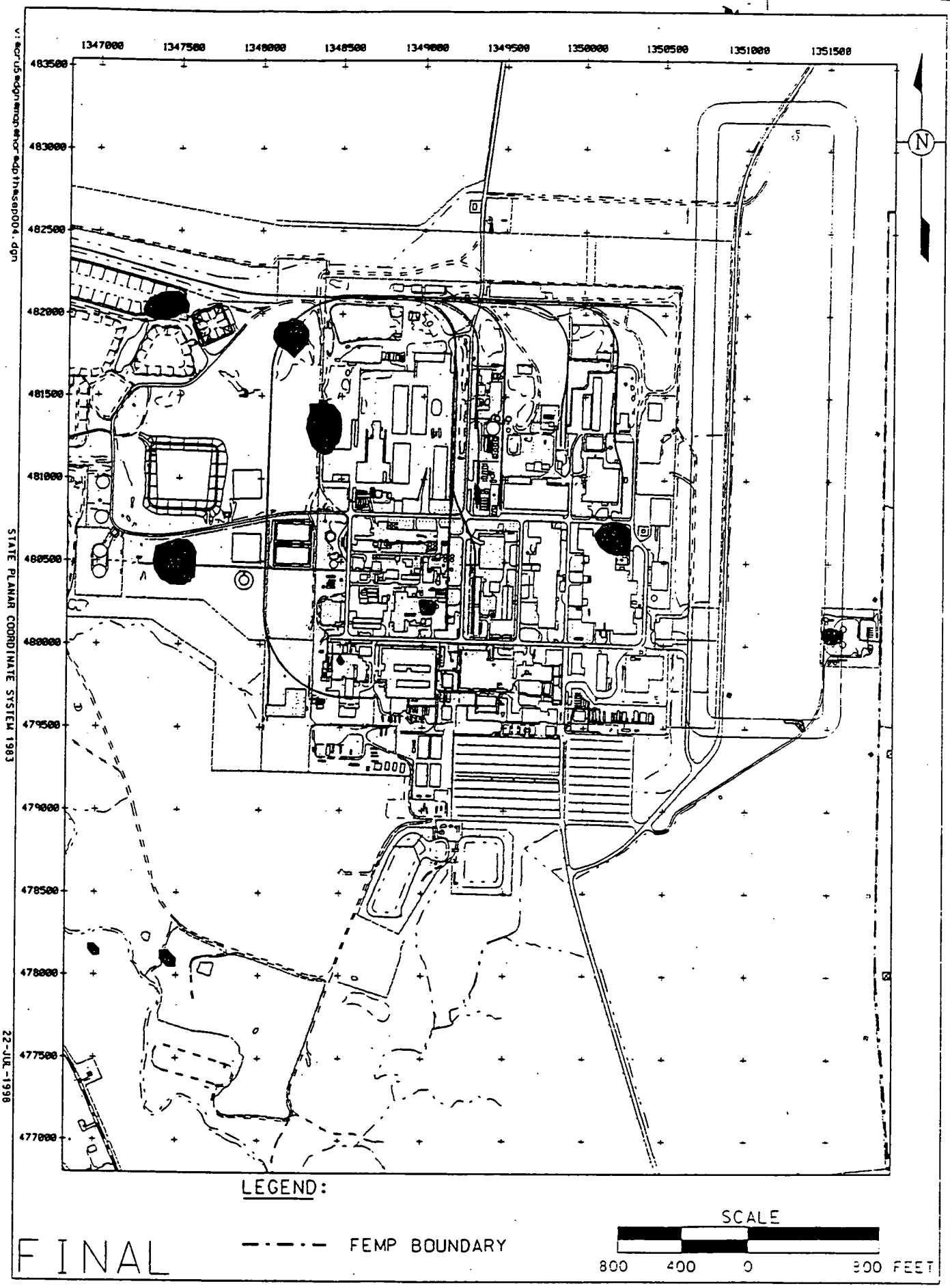


FIGURE 2-2. FEMP AREAS WITH TC-99 LEVELS POTENTIALLY GREATER THAN WAC/FRL (FOR INFORMATION PURPOSES ONLY)

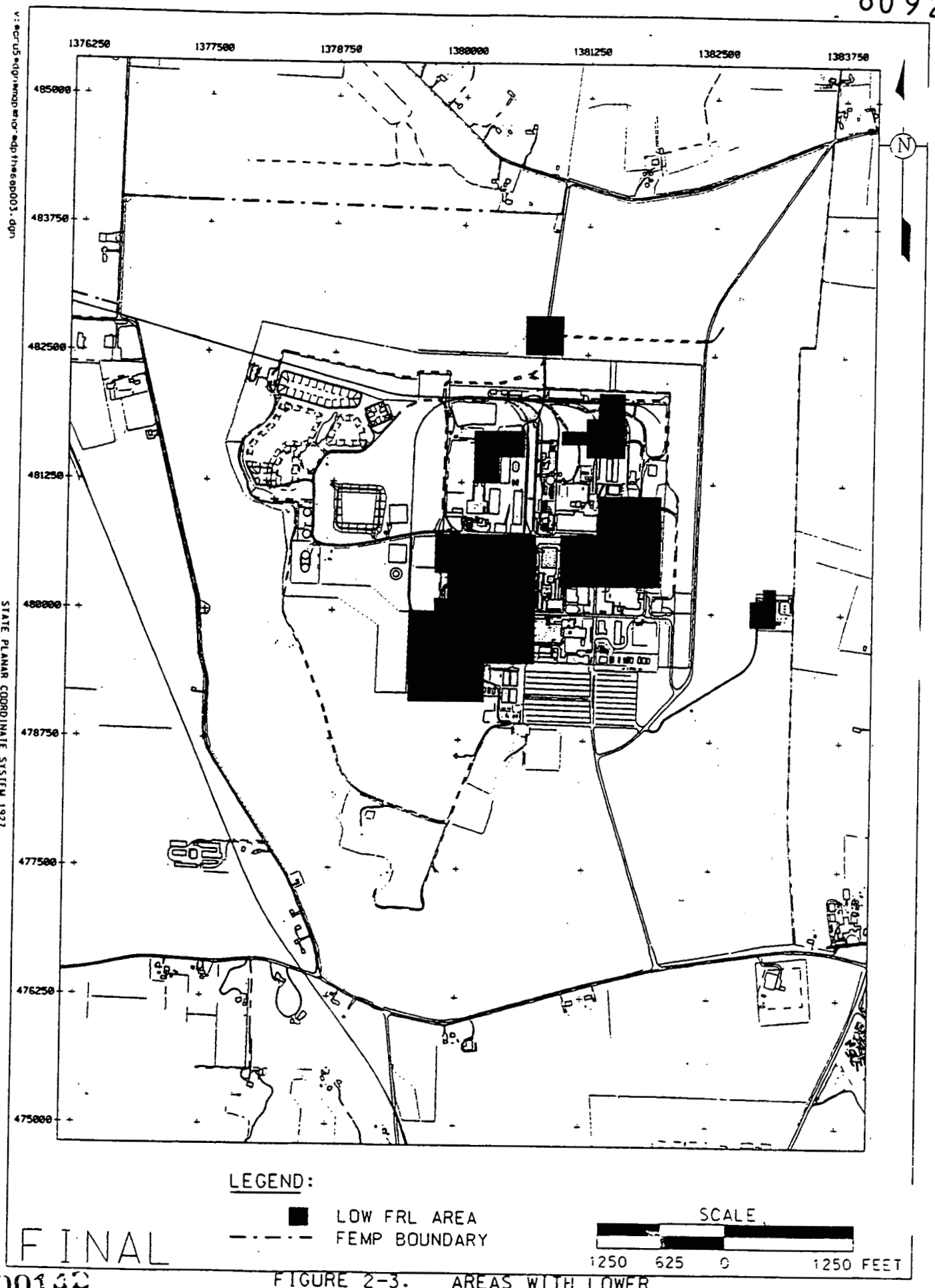
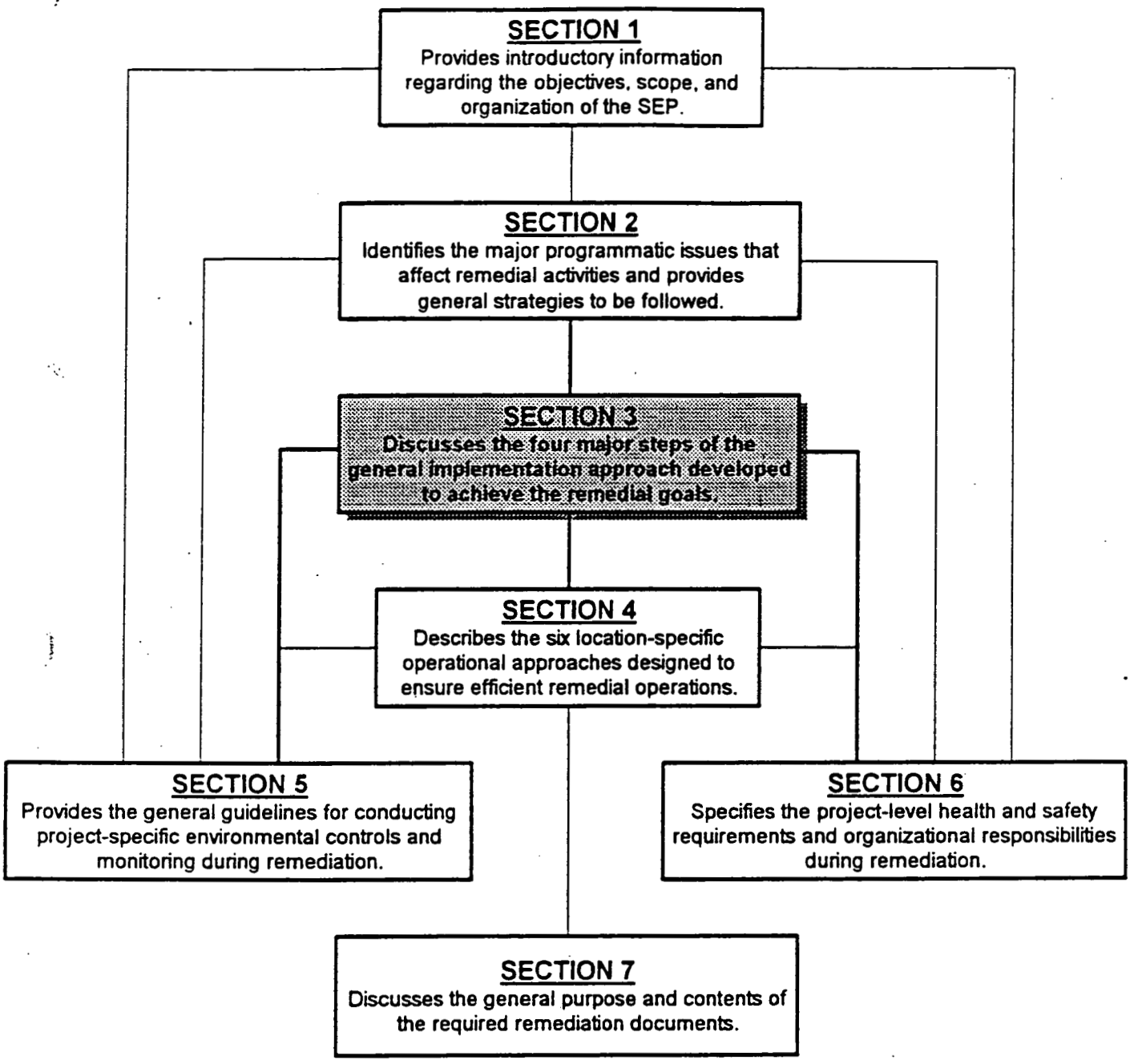


FIGURE 2-3. AREAS WITH LOWER URANIUM FRL DUE TO HIGH LEACHABILITY

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

3.0 GENERAL IMPLEMENTATION APPROACH

This section provides details on the general implementation approach in a remediation area for performing excavations during remedial activities at the Fernald Environmental Management Project (FEMP) and for completing postremedial actions, as well as record keeping and data management. The discussions provided in this section address many of the issues identified in Section 2.0 and also form the basis for presentation of the detailed area-specific excavation approaches discussed in Section 4.0. Section 3.0 also identifies the important remediation documents that will be delivered during the soil remediation process. All contingency plans pertinent to the activities discussed in this section are noted and detailed in Appendix F.4.

Figure 3-1 summarizes the steps in the general soil remediation process in a remediation area and identifies their integration with three remediation documents that will be delivered to the U.S. Environmental Protection Agency (EPA) as part of the remediation process. The remediation process begins with the preparation of Project-Specific Plans (PSPs) for field activities carried out during the predesign investigation. The PSPs will provide additional characterization data, as needed, to establish the type and extent of the excavation. Field activities implemented by the PSP may consist of radiological surveys, geophysical surveys, and collection and analysis of discrete samples, as needed. A data summary will be issued for each executed PSP to provide the needed information to the predesign investigation.

Results from the predesign investigation are forwarded to the remedial design step to prepare the first deliverable document, the Integrated Remedial Design Package (IRDP), which will guide the actual excavation of the soil. After the IRDP has been approved, soil excavation will begin and materials designated as above waste acceptance criteria (WAC) will be segregated from those destined for the On-Site Disposal Facility (OSDF). Upon completion of the excavation, a PSP will be developed for the precertification survey prior to commencement of the final certification activities. If the precertification survey identifies soil that contains constituents of concern (COCs) above their respective final remediation level (FRL) or applicable hot-spot criteria, additional localized excavation will take place to remove the affected soil.

Prior to final certification, the second deliverable document, a Certification Design Letter (CDL), will be issued to the EPA. This letter will establish the boundaries of each certification unit (CU) that subdivides the remediation area, sampling locations within each CU, and a list of CU-specific COCs that require laboratory analysis (ASL D) to determine whether the certification criteria have been met.

After the CDL has been issued to the EPA and approval is obtained, a PSP will be developed for certification sampling and analysis according to the CDL. Analytical results obtained on the certification samples will be evaluated against the certification criteria to demonstrate that the CUs and the remediation area can be released. Interim data will be maintained on a website for EPA access and review during the certification process. Upon successful certification of all CUs in the area, a third deliverable document, the Certification Report, will be released for the remediation area. This report will contain summary information on sampling locations, analytical results, statistical methods, certification criteria, and notification of successful certification. During the review process, necessary access control and protective maintenance in the remediated area will be sufficiently maintained. After EPA approval of the Certification Report is obtained, interim grading and restoration of the area can begin.

The remediation activities have been grouped chronologically into steps to facilitate discussion in this document. These steps are: 1) predesign investigation (Section 3.1); 2) remedial design (Section 3.2), 3) remedial actions (Section 3.3); 4) certification (Section 3.4); and 5) postremedial actions (Section 3.5). Record keeping and information management issues associated with these five steps are presented in Section 3.6.

3.1 PREDESIGN INVESTIGATION

The flow of the predesign investigation process is shown on Figure 3-2. This process consists of PSP development that is tied to:

- Data review and initial delineation of excavation areas
- Selection of area specific COCs

- Identification of potential technetium-99, toxicity characteristic, hazardous waste management units (HWMUs), underground storage tanks (USTs), above-WAC, and above-FRL areas
- Identification of geotechnical and potential perched water management issues
- Surveying, sampling, and analysis to support the investigations
- Final delineation of excavation areas and depth and contaminated perched water boundaries, if applicable.

It is expected that the sequence of events will follow this flow, but unusual or unexpected events can occur to change the order in which the steps are implemented. Nonroutine events that may occur and the contingency plans developed to deal with them are provided in Appendix F.4.

3.1.1 Types of Potential Excavation Areas

The remedial excavations at the FEMP will be conducted using a phased approach. Soil containing constituents that require special handling (e.g., technetium-99) will be excavated first. When these soils have been removed, the remainder of the soils identified for remediation (if any) will be excavated. To follow this approach, the location, spatial extent, and concentrations of constituents of interest in the soil must be delineated. This will be done through PSP implementation as part of the predesign investigation performed in each remediation area requiring excavation.

3.1.1.1 Overall Excavation Extent

An area-specific predesign investigation will open with a review of remedial investigation/feasibility study (RI/FS) data to identify the COCs present in the area (Figure 3-2). This will be followed by an estimate of the total excavation soil volume in the remediation area. In most cases, the areal extent of the uranium footprint is expected to encompass all other COCs. If this is true, an estimate of the excavation's extent will be determined by analyzing the uranium RI/FS characterization data collected on surface and subsurface soil samples. In some areas, the spatial distribution of other COCs, such as radium and/or thorium, will not be correlated with the uranium distribution. When this happens, the excavation footprint will be based on the combined extent of all COCs. PSPs will be developed if the need arises to obtain additional characterization data to delineate the appropriate excavation volume.

3.1.1.2 Excavation/Segregation Phases

Surface and subsurface soil characterization data (e.g., RI/FS and predesign data) at or immediately below a COC's FRL will be used to generate an excavation profile through kriging or other appropriate 3-D interpolation techniques. Once the overall excavation footprint has been delineated, RI/FS and predesign characterization data will be used to identify soil within the footprint that may require special handling and disposal. For example, soil containing technetium-99 concentrations that exceed the WAC of 29.1 picoCuries per gram (pCi/g) will require segregation and off-site disposal. When such areas are identified, their extent will be delineated during the predesign investigation by implementing a PSP.

COCs selected to drive each phase of the excavation will depend on the distribution and concentration/activity of the COC in the area, the type of excavation area, applicable treatment options, and final disposition of soil for disposal (i.e., off site versus OSDF). In most remediation areas, uranium, radium, and/or thorium concentrations will drive the remediation. Remediation of areas with technetium-99, RCRA toxicity characteristic soil, or HWMUs/USTs may be driven by technetium-99 activity or the concentrations of toxicity characteristic metals or F-listed spent solvent organic compounds.

Based on the FEMP site history, process knowledge, and RI/FS data, potential technetium-99, RCRA, HWMU, UST, and above-WAC areas have been identified that may require excavation under this plan. There are seven potential locations where technetium-99 excavation may take place (Figure 2-2), seven locations where toxicity characteristic soil may be present (Figure 1-5), up to 14 HWMUs that may require excavation (Table 2-1), 13 UST locations (Table 2-2), and eight locations where uranium is potentially above the soil WAC (Figure 2-1).

Soil containing technetium-99 above the FRL/WAC limit of 29.1 pCi/g will be excavated and staged for off-site disposal in the Operable Unit 1 waste pits or Soil Pile 7 area (formerly the location of Soil Pile 5). This above-WAC soil will be disposed of with the material in the waste pits as part of the Operable Unit 1 remediation. If soil in a RCRA area exhibits the toxicity characteristic and overlaps with the area delineated for technetium-99 excavation, this material will be staged separately in the Soil Pile 7 area to await a decision by Waste Programs Management (WPM) on treatment and final off-site disposal options.

The seven identified RCRA areas may be excavated to remove characteristic waste, if the toxicity characteristic is demonstrated by the toxicity characteristic leaching procedure (TCLP) test. Identified toxicity characteristic material from the six areas defined in the Operable Unit 5 Record of Decision (ROD) can be placed in the OSDF if the material is treated to remove the toxicity characteristic and if radiological COCs are below their WAC before treatment. Lead bullets from the South Field Firing Range, and the associated soil that is identified as toxicity characteristic, is categorically excluded from the OSDF by the Operable Unit 2 ROD and will be shipped off site for disposal. In the six areas covered by the Operable Unit 5 ROD, excavation of the footprint will be driven by the FRLs of all applicable area-specific COCs (ASCOCs), and TCLP tests will be conducted to determine whether treatment is required prior to disposal in the OSDF. Any above-WAC soil possessing the toxicity characteristic that is excavated from an identified RCRA area will be sent to the Soil Pile 7 area and segregated from other distinct above-WAC material (e.g., above-WAC material containing technetium-99). Decisions regarding off-site treatment and final off-site disposal will be made by WPM.

Excavation of other above-WAC soil (i.e., excluding soil in the identified six RCRA areas and areas where technetium-99 is above its WAC value) will be driven by concentrations of uranium-238 (or total uranium), neptunium-237, strontium-90 or boron, if they are shown to exceed the WAC. Soil containing these COCs at values above the WAC will be excavated and sent to the Operable Unit 1 waste pits or Soil Pile 7 area where they will receive further handling prior to disposal. Operable Unit 1 will be responsible for decisions regarding final off-site disposal of this soil.

For remaining excavation areas and HWMUs or UST footprints, excavation of the soil will be driven by the FRLs of all COCs present within the unit. Any above-WAC material excavated from a HWMU footprint will be will be evaluated (sampled) to determine if it contains a RCRA F-listed waste constituent or exhibits a RCRA hazardous characteristic. If so, it will be sent to the Soil Pile 7 area, where it will be segregated from other distinct above-WAC material. WPM will be responsible for decisions on treatment and final off-site disposal of above-WAC material.

3.1.2 Predesign Sampling and Analysis

The objective of the predesign (or pre-excavation) sampling effort is to fill in RI/FS data gaps by collecting supplemental data using sodium iodide (NaI) surveys, in situ high purity germanium (HPGe)

detectors, and/or sampling and analysis. Prior to initiating sampling activities, a PSP (or several PSPs) will be prepared to establish the list of COCs, summarize existing data, and provide the sampling design and approach. Prior to executing the PSP, the current level of access control will be determined for each area affected by sampling activities. Entry and access procedures for sampling activities will comply with the most current level of access control. Appendix F.2 contains a more complete discussion of access controls, and Section 2.4 and Appendix H discusses field and laboratory measurements suitable for a variety of sampling approaches.

3.1.2.1 Material Contaminated by Technetium-99

Where RI/FS data indicate technetium-99 is present in soil above its FRL/WAC of 29.1 pCi/g, the RI/FS data will be reviewed to determine whether enough data exist to establish a reasonable excavation footprint to guide removal of the technetium-99. If additional information is needed, a PSP will be developed to initiate the sampling and analysis required to define the extent of excavation for technetium-99. This task will consist of collecting discrete surface and subsurface soil samples and submitting them to a laboratory for analysis of characteristic beta radiation. Sample collection, handling procedures, sample preparation, analytical methods, and detection limits are presented in Section 2.4, Appendix H, and the Quality Assurance Job-Specific Plan (QAjSP) (Appendix E).

3.1.2.2 RCRA Waste

In the six RCRA areas identified in the operable Unit 5 ROD where the potential exists to excavate and treat toxicity characteristic soil, a sampling and analysis task will be initiated to establish whether toxicity characteristic soil is present. Where appropriate, this task will be integrated with the technetium-99 sampling and analysis program. Discrete surface and subsurface soil samples will be collected and subjected to the TCLP test to determine whether the soil exhibits the toxicity characteristic. Sample collection, handling procedures, sample preparation, analytical methods, and quantitation limits are presented in Section 2.4, Appendix H, and Appendix E.

3.1.2.3 Material Containing COCs Above WAC

Material containing COCs above the WAC will be demonstrated to fulfill the data requirements specified in the sitewide WAC Attainment Plan (DOE 1998b). Potential above-WAC excavation areas will undergo radiological surveys and/or sampling and analysis to establish the extent of excavation for material containing COCs at levels above their corresponding WAC. In deep excavations containing

000119

mild side slopes, the shallow side slopes will be scanned using the RTRAK and HPGe instruments to monitor the activity of gamma-emitting radionuclides. The RTRAK has been used to conduct a WAC scan of the surface of some soil stockpiles that have slopes similar to the shallow slopes anticipated for some excavations. HPGe measurements carried out at and/or above the toe of these shallow slopes can also provide meaningful results for above-WAC decisions. With a conservative design on the excavation extent and the use of near real-time scanning, time consuming physical sampling and analysis of soil and the side slope can be eliminated. However, when vertical barriers are needed in deep excavations, a sufficient number of soil borings will be collected and analyzed to better define the contamination profile in the vertical face during the predesign investigation. Where appropriate, this task will be integrated with the technetium-99 and/or RCRA sampling and analysis activities.

RI/FS data and predesign sampling and analysis will be used to determine the excavation extent for the area-specific radiological, metal, and organic COCs. If the RI/FS data are not sufficient to determine the extent of the excavation, a PSP (or several PSPs) will be developed to execute the needed predesign sampling and analysis that will collect the additional information. The areal extent of soil containing uranium in concentrations that exceed the WAC can be determined by using the large-volume NaI detector or HPGe gamma spectrometry systems discussed in the User's Manual (DOE 1998c). Discrete soil samples will be collected and sent to a laboratory for analysis to generate information on the areal extent of non-uranium COCs. Information on the vertical extent of COCs will be obtained using a geoprobe or similar method to collect distinct subsurface samples for laboratory analysis. In all cases, sufficient field measurements and laboratory analyses will be available to demonstrate that material placed in the OSDF meets the WAC. Survey methodology, instrument sensitivity, sample collection, handling procedures, sample preparation, analytical methods, and detection limits are presented in Appendices E and H.

3.1.2.4 Other Considerations

Surface NaI surveys, HPGe measurements, and/or sampling and analysis will be carried out to define all above-WAC or above-FRL COCs and to identify a representative COC that can serve to bound the overall excavation extent of all COCs. In most cases, this COC will be uranium and the excavation extent will be the applicable area-specific uranium FRL, with consideration given to obtaining final uranium levels as low as reasonably achievable (ALARA).

HWMU and UST excavations will require no characterization outside of that carried out to identify above-WAC and above-FRL boundaries, as all listed waste may be placed in the OSDF under the corrective action management rule (CAMU) rule if it meets WAC. However, the closure requirements discussed in Sections 2.2.5 and 2.2.6 will apply to HWMU and UST footprints.

After the analytical results for all ASCOCs have been used to determine the extent of excavation, an assessment may be conducted to determine if additional geotechnical samples are needed to design the construction aspects of the excavation.

3.1.3 Establish Extent of Excavation

Radiological surveys, HPGe measurements, and sampling and analysis will be executed as needed to establish the extent of excavation for technetium-99, RCRA toxicity characteristic, above-WAC and/or above-FRL areas. The specific number of samples needed to establish the excavation extent will depend on the nature and extent of ASCOCs and the balancing of cost between laboratory analysis and soil excavation. A large number of samples will result in very accurate delineation of excavation volumes, which may be too precise to follow during excavation. Conversely, too few samples will result in delineation of excavation volumes that overestimate the soil volume above the FRL, and unneeded excavation will take place. Therefore, this section is restricted to presenting a conceptual model that can be used to assist in the development of PSPs to acquire the appropriate area-specific number of predesign samples.

The PSP approach used to establish the extent of a given excavation type will be similar to the conceptual model outlined on Figure 3-3. This approach sets the excavation type (e.g., technetium-99, RCRA, etc), selects COCs and appropriate analytical methods, and uses data from the Sitewide Environmental Database (SED) in a three-dimensional (3-D) interpolation model to determine the initial excavation volume. A unit volume not to exceed one-fourth of the total estimated volume is then selected to determine the cell size of the overlying grid. Using the above-FRL excavation type as an example, the grid is surveyed to locate any potentially elevated activity areas to ensure the grid nodes lie on these areas. HPGe measurements and/or samples are collected from the grid nodes and the analytical results evaluated to determine whether all nodes lie below the FRLs of applicable COCs. If the perimeter nodes are greater than the FRL criteria, the sampling grid is extended until all soil above the FRL is captured. When the lateral extent of COCs is determined, geoprobe borings are

000151

placed at the nodes exhibiting the most elevated levels of COCs, and a core soil boring sample is obtained to a depth of 3 feet to determine the vertical distribution of the COCs. At least one subsurface sample is collected in every 1-foot interval, and if the deepest sample contains ASCOCs above their respective FRL, the geoprobe boring is extended an additional 3 feet to obtain at least three additional samples. Additionally, if the subsurface interval at the perimeter of the excavation exceeds the criteria, the lateral extent will be extended and additional subsurface cores will be collected. Sampling will continue until the depth and lateral extent of excavation is established at the location of the deepest sample with ASCOCs less than their respective FRL. The excavation volume is then refined based on the depth of excavation established at each geoprobe boring location. Additional excavation types (e.g., technetium-99, RCRA, above-WAC, etc.) are established in a similar manner concurrently with the FRL volume. After the excavation volumes have been established for all excavation types, the collected data will be used to finalize the excavation profiles that will be presented in the IRDP.

The data collected from the PSP predesign characterization will be used to generate an excavation profile through kriging or other appropriate 3-D interpolation techniques. The kriged profile will be forwarded to remedial design so that a final volume and slope of excavation can be determined from the kriged profile of each excavation type (e.g., technetium-99, above WAC, etc.). In all cases, the final engineered slope of excavation will be located outside the profile estimated from the kriging data, owing to standard construction practices for slope stability. This approach will provide added assurance that the WAC will be attained for soil placed in the OSDF and that soil left in place is below the FRL established for each COC. The final engineered design will appear in the IRDP.

Steep sidewalls will be avoided during deeper excavations (i.e., over 6 feet), such as those to be encountered in the Former Production Area. The preferred approach is to construct multiple benches in the side slope and to allow progressively decreasing lateral excavation extent with depth (Figure 3-4). The footprint of the excavation will be determined in the conservative fashion noted above to encompass all the expected subsurface soil and debris that need to be excavated. Although subsurface contamination cannot be fully characterized before excavation, any unexpected contamination that is found by the continuous excavation control scanning process on lower sections of the side slope will be removed during excavation. The benched side slope design can allow easier

extension of the lower lateral excavation boundary, relative to a single-step sidewall when the need arises to remove additional contamination.

Although the above described multi-step side slope approach is preferred for deep excavations, and area boundaries will be delineated to facilitate implementation of such design, it may not always be possible to slope all sides of an excavation due to limited area access. When necessary, driven vertical barriers (e.g., sheet pilings) or other means of maintaining excavation integrity may be used.

Regardless of the configuration of the side slope, deep excavations will generally be conducted in lifts to facilitate real-time scanning and to allow visual inspection of excavated materials to identify potential above-WAC conditions.

3.2 REMEDIAL DESIGN AND THE IRDP

After completion of predesign investigation activities and prior to the start of excavation activities, a remedial design will be developed and documented in the IRDP (Figure 3-1), following the technical guidelines and requirements provided in the SEP. The remedial design details have been assigned to the IRDP so that flexibility can be maintained to integrate upgraded methods and lessons learned on preceding excavation activities to the next scheduled excavation. Area-specific interim and/or final grading and restoration requirements will also be provided in the IRDP. The IRDP will be reviewed and approved by the Ohio Environmental Protection Agency (OEPA) and EPA before excavation activities begin.

An IRDP will be developed for each remediation area or a combination of remediation areas when similar ASCOCs and excavation approaches are used. All area-specific information (e.g., RI/FS and additional pre-design investigation data) required to delineate excavation areas and conduct soil remediation, as outlined by the SEP general technical guidelines and appropriate area-specific excavation approaches (Section 4.0), will be presented in each IRDP. Each IRDP will also include an area-specific implementation plan that incorporates area-specific elements of a remediation work plan, such as ASCOCs, anticipated excavation depths, excavation controls, coordination of soil excavation with decontamination and dismantlement (D&D) activities in the Former Production Area, waste disposition, environmental controls and monitoring, health and safety, interim/final grading, and

000153

restoration design. All design drawings and specifications for the remediation elements will be provided in the IRDP.

The need for soil treatment (either on-site or off-site) and/or remediation-generated wastewater treatment will be specified. Remediation-generated wastewater is the stormwater, perched water, and other waters (e.g., excavation and other heavy equipment wash-down water) generated during the remediation process. The IRDP will include protocols for design change control and updating the contingency plans presented in Appendix F. Additional details on the content of the IRDP are provided in Section 7.2.

3.3 REMEDIAL ACTION

Upon approval of the IRDP by the EPA and completion of other applicable FEMP administrative actions, remedial activities can begin. This remedial action discussion is divided into three elements: 1) implementation of construction, excavation, and material-handling activities; 2) precertification activities; and 3) demonstration of attainment of remediation goals. Excavation activities are the principal actions executed during the remedial action, with precertification activities providing the verification that the actions were executed properly. An important closing aspect of the remediation is demonstrating that attainment of remediation goals and disposal constraints have been met.

3.3.1 Implementation of Construction, Excavation, and Material-Handling Activities

Figure 3-5 summarizes the soil excavation, segregation, and disposal process. After the site is prepared and surface water controls have been established, an excavation hierarchy is implemented to segregate soil types for the appropriate disposal option. Excavation begins with removal of soil containing technetium-99 above its FRL, then proceeds through the various combinations of TCLP/WAC excavations to FRL/ALARA excavations. Finally, each excavation type is traced to the appropriate treatment and disposal options.

3.3.1.1 Site Preparation

Following submission and approval of the IRDP, site-preparation activities will commence. Site boundaries, access controls, support areas, and excavation staging areas will be established. Wheel wash and decontamination facilities will be installed and isolated from stormwater. Stormwater

controls will conform to applicable rainwater and land-development guidelines. Appendix F.2 provides a comprehensive discussion of site preparation procedures, with a summary of pertinent information given below.

A surface water management system will be installed to control runoff/runon and soil erosion. Runoff/runon controls will consider the layout of support areas within the remediation area and the natural drainage pattern when integrating the drainage of local areas with sitewide drainage channels. Conditions in the FEMP National Pollutant Discharge Elimination System (NPDES) Permit (EPA Permit No. 1IO00004*ED) lead to the development of the FEMP Stormwater Pollution Prevention Plan (SWPPP) (DOE 1996c). The SWPPP identifies potential pollution sources, practices that will be employed to reduce pollutant discharges, and provisions of the inspection program that will be implemented to ensure compliance with the requirements of the NPDES Permit. Section 5.1.3 provides additional details on implementation of these controls.

If excavation activities involve removal of soil from perched water zones, an appropriate area will be established for the pumping equipment and holding tanks required to remove and store (as needed) the perched water prior to treatment at the AWWT facility.

Following the establishment of support areas and surface water control, final surveying will be conducted to determine the excavation layout and monitoring design. In general the layout will delineate the excavation types in the hierarchy illustrated on Figure 3-5. However, if applicable, this survey will also consider removal of at- and below-grade structures, special material areas, and excavation of impacted material. The survey will also identify the appropriate areas for project-specific environmental monitoring stations to ensure that excavation activities will not destroy monitoring equipment.

3.3.1.2 Excavation Hierarchy

The conceptual excavation hierarchy shown on Figure 3-5 follows a step-by-step approach to illustrate the need to segregate soil piles based on the type and concentration of ASCOCs. Figure 3-5 is for illustrative purposes only and is not intended to imply that all technetium-99 soil must be removed before non-technetium, above-WAC soil is excavated. In large excavation areas, specialized crews

may be used in a sequential manner; where a technetium-99 crew begins excavation and as it proceeds through the excavation area, it is followed by a non-technetium above-WAC crew. In this fashion, various excavation types will be performed simultaneously, when possible.

Excavation begins with the removal and segregation of any identified soil containing technetium-99 above its FRL/WAC (29.1 pCi/g). If the excavation of soil containing technetium-99 above its FRL/WAC includes soil that has failed the TCLP test, the excavated technetium-99 soil will be segregated into non-treatment and treatment containers, as needed, and stored at an approved RCRA storage facility. If on-site treatment of toxicity characteristic waste is selected, the treatment will be performed and the soil will be given to WPM for off-site disposal. RCRA-regulated soil designated for off-site treatment and disposal will be given to WPM for proper packaging and shipment to the designated facility.

After technetium-99 excavations are completed, excavation areas delineated as above WAC and failing TCLP will be excavated and segregated in containers for storage at an approved RCRA storage facility. Stabilization of this material will be required prior to disposal. Removal of above-WAC soil that fails the TCLP test is followed by removal of soil that is below the WAC but fails the TCLP test. If on-site treatment of toxicity characteristic waste is selected, the treatment will be performed and the soil will be given to WPM for decisions on final off-site disposal, based on the pretreatment concentrations of radiological COCs. Soil designated for off-site treatment will be given to WPM for proper packaging and decisions on locations for treatment and final disposal. A final, above-WAC excavation will then be performed on all soil not exhibiting the toxicity characteristic.

Following removal of all above-WAC and toxicity-characteristic soil, soil delineated as above the FRLs of ASCOCs driving the excavation will be removed and passed to Waste Acceptance Operations (WAO) for disposal in the OSDF. For excavations driven by uranium FRLs, excavation will take place to within the area-specific uranium FRL, with consideration given to the ALARA concept (Section 3.3.1.4).

All large debris (i.e., larger than 12 inches), USTs, and special materials encountered during excavation activities will be removed and segregated from the staged soil piles. Debris will be handled as Category 2, 3, 4, or 5 materials (Section 3.6.4.1), whereas tanks, pipes and associated pumping are

considered special materials (Section 3.3.2.2). All special materials encountered during excavation activities will be handled, tracked, treated (as needed), and disposed in accordance with the WAO procedures described in Section 3.6 and Appendix F.

3.3.1.3 Treatment, Special Handling, and Disposal Options

Treatment will be required for all soil from the seven identified RCRA areas that fails the TCLP test and becomes classified as RCRA toxicity characteristic waste (Figure 3-6). Soil failing the TCLP test and containing technetium-99 or other radiological COCs above their WAC will be given to WPM for decisions on treatment and final off-site disposal. For soil below the radiological WAC that fails the TCLP test, a decision will be made by WAO and WPM to treat and dispose of the soil on site or off site. An example of the decision process is provided in Figure 3-7 for the proposed remediation strategy at the former Trap Range. Regardless of where the material is treated, the lead bullets and associated toxic soil from the South Field Firing Range and treated material with pretreatment radionuclide concentrations above WAC will not be placed in the OSDF.

Above-WAC material designated for off-site treatment will be segregated and treated based on its classification as a listed waste (i.e., from within a HWMU) or a RCRA toxicity characteristic waste (i.e., soil from one of the seven areas that fails the TCLP) (Figure 3-6). RCRA F-listed wastes mixed with above-WAC radionuclides will be treated for organic COCs and then evaluated and treated, as needed, for RCRA organic and inorganic COCs prior to mixed waste disposal. If the above-WAC waste is not listed, it will be evaluated and treated, as needed, for RCRA organic and inorganic COCs prior to low-level waste disposal (i.e., the hazardous component has been removed through treatment).

Any RCRA toxicity characteristic waste excavated from six of the seven identified RCRA areas (the South Field Firing Range is excluded, as noted above) may undergo low-temperature thermal desorption treatment if organic COCs are present and/or cement stabilization if inorganic COCs are present (Figure 3-6). The treated material will than be placed in the OSDF. In all cases, decisions regarding soil disposition at the OSDF will follow the WAO procedures summarized in Appendix F.5, or future revisions to the program as approved by the EPA.

000157

3.3.1.4 ALARA Implementation

Implementing the ALARA philosophy requires executing a reasonable excavation approach that will strive to achieve the release criteria in each remediation area as set forth during the CERCLA process. In addition to this goal, ALARA advocates removal of any additional contaminated material present that is easily discernible and reasonably accessible during the excavation. This application of ALARA only serves to modify the extent of excavations that are scheduled to occur because COC soil concentrations in an area exceed the appropriate FRL. ALARA will not serve as a generic justification to initiate remediation of an area that does not require excavation or to conduct further excavation in areas that meet FRL attainment criteria (Section 2.1.5.3).

3.3.1.5 Reuse of Soil During Remedial Actions

Remedial actions may include the use of FEMP soil as borrow material for OSDF construction and/or the building of roadbeds. If nonimpacted soil is needed as borrow material for construction, the identified area will first be certified according to the normal process. When a temporary roadbed needs to be constructed through a contaminated area (e.g., the OSDF Haul Road in Area 3), impacted soil may be used from the area traversed by the road as long as COCs do not exceed the chemical WAC and the soil does not come from any of the six areas potentially containing RCRA hazardous constituents. The impacted soil will be excavated before final certification of the area. If a designated borrow area is intended to serve as a sediment basin for contaminated runoff, it will be certified at a later date after the fill is removed and the basin is no longer needed. This process is defined as "characterization for reuse," which is different from certification. Reuse areas will be delineated and separated as special CUs during certification.

3.3.2 Impacted Materials Handling and Tracking

Impacted materials are defined as all soil and debris that can be dispositioned to the OSDF (i.e., meeting all applicable radiological, chemical, and physical WAC). These materials will be handled and tracked by WAO and their program will be implemented and integrated with the SCEP excavation operations, as defined in the WAC Attainment Plan (DOE 1998b). Protocols for disposition of excavated soil and waste materials currently in place are summarized in Appendix F.5. Programmatic controls begin with waste planning during the predesign investigation, at which time volume estimates per matrix and source location will be prepared, characterization protocols are specified, treatment options noted, and tentative interim and final disposition identified.

3.3.2.1 Disposition Categories

During excavation, waste streams are segregated by disposition categories and managed in the context of the following characterization, storage, and disposal options:

- Bulk Waste Streams: On-Site Disposition
  - Physical matrix allows bulk management
  - Meets the OSDF chemical, radiological, and physical WAC
- Bulk Waste Streams: Off-Site Disposition
  - Physical matrix allows bulk management
  - Exceeds the OSDF radionuclide WAC (rail transport)
  - Exceeds the OSDF chemical WAC (truck transport)
- Containerized Waste Streams: Off-Site Disposition
  - Exceeds OSDF chemical, radiological, or physical WAC
  - Cannot be processed to meet OSDF WACs
- Containerized Waste Streams: On-site Disposition
  - Physical matrix or nature of waste does not allow bulk management
  - Requires processing in a controlled area, to meet OSDF WAC
  - Requires confirmatory sampling for OSDF WAC
  - Special Material that meets the OSDF WAC, but requires special handling for health and safety concerns.

Chemical and radiological requirements for the OSDF WAC are summarized in Table 2-4. Note that some of the RCRA constituents identified in Table 2-4 apply only to the six areas identified in the Operable Unit 5 ROD (DOE 1996e) as suspect RCRA toxicity characteristic areas with cost-effective treatment opportunities. The OSDF physical WAC are presented in Table 2-5. The WAC Attainment Plan (DOE 1998b) provides additional detail on the chemical, radiological, and physical requirements for the OSDF WAC.

Protocols specific to containerized special materials are provided in Appendix F.5. Containers will be managed in an interim storage area pending completion of characterization, treatment, WAC confirmation, and other activities specific to the selected on- or off-site facility. If on-site treatment options are developed, off-site designated waste streams will be reevaluated to allow on-site treatment of selected off-site designated materials. The waste disposition program will also be updated accordingly.

3.3.2.2 Special Materials

When excavation activities encounter special materials or unexpected high levels of contamination, contingency plans may be implemented to address pertinent health and safety concerns. Special materials are defined as:

- Asbestos
- Nonpressurized containers (e.g., drums)
- Pressurized containers
- Piping and pumps
- Non-soil residues
- Transformers
- Lead acid batteries
- Uranium metal
- Medical/infectious waste
- Miscellaneous debris
- Tires
- Brick, including acid brick.

Portions of these waste streams will be eligible for OSDF disposition after physical processing, sampling and analysis, or interim containerization. Materials that do not meet OSDF WAC will be evaluated for off-site disposition. Protocols currently in place for identifying, managing, and tracking special materials are provided in Section 3.6 and Appendix F.

3.3.3 Precertification Activities

The general activities to be followed during precertification of a remediation area are outlined on Figure 3-8. Large-volume NaI detectors and portable HPGe instruments will be used to survey as much of the remediation area as possible. This area survey will be used to estimate the residual pattern of uranium, radium, and thorium distribution. Survey results will be used with historical knowledge, RI/FS data, and an understanding of the physical conditions of the area to determine the location of CU boundaries and the appropriate size of the CUs that will subdivide the remediation area.

After the CU grid has been established for the remediation area, CU-specific ASCOCs will be identified and HPGe measurements will be taken above areas designated as elevated by the NaI survey. If HPGe measurements indicate any single location to be above the hot spot criterion or the average concentration of individual ASCOCs is likely to exceed their FRL, additional excavation, scanning, and measurements will be conducted until each CU in the remediation area is considered to be ready

for certification (i.e., a high possibility for success is indicated). A CDL will be issued prior to conducting final certification sampling and analysis to present the EPA with the rationale used for final selection of the boundaries of each CU, the list of CU-specific COCs to be evaluated, and the certification sampling approach.

3.3.3.1 Field Survey to Evaluate Residual Radionuclide Distributions

Following excavation of all areas to established FRL depths, a scanning survey will be conducted on the excavated surfaces to establish the distribution pattern of residual uranium, thorium, and radium. This survey will be conducted with a large-volume NaI detector. Vehicle-mounted detectors like the RTRAK may be used in areas where excavations are not deep and the excavation depth is uniform over a large area. A large-volume NaI detector mounted on a cart (i.e., the RSS) may be used when the excavation depth is not uniform over a large area and surveying is required for each excavation layer. Regardless of the configuration used, the selected equipment configuration should have the sensitivity to provide a threshold response to radioactivity from soil containing uranium, thorium, or radium at concentrations exceeding three times the FRL.

The scanning survey will cover as much of the excavated and unexcavated areas as possible, with the understanding that some densely-wooded areas and steep slopes may not be suitable for surveying with the instruments. Areas will be marked with paint, chalk, flags, or other appropriate method when instrument readings indicate uranium thorium, or radium is present above a value corresponding to three times its FRL. Where possible, a rough estimate of the areal extent of the residual affected area will be delineated in the field to facilitate follow-up measurements with the HPGe instrument, to meet applicable health and safety protocol, and to identify potential access control areas. The presence and location of these areas will be recorded in precertification field notebooks and reported to appropriate management and oversight personnel. The area-wide radiological activity pattern will be contoured using scanning results and the GIS.

3.3.3.2 Determination of CU Size, Area-Wide CU Delineation, and CU-Specific COCs

FEMP remediation areas are classified as either impacted or nonimpacted areas using historical knowledge and RI/FS data. Impacted areas (i.e., areas that contain known and/or expected hot spots) primarily include the former production area, waste storage/management areas (e.g.,Waste Pits, Silos, Flyash Piles, etc.), and other localized areas with known or potential significant contamination (e.g.,

Sewage Treatment Plant, Fire Training Facility, other HWMUs, and USTs). Nonimpacted areas (i.e., areas where hot spots are believed to be absent) are outside the impacted areas and include the area west of Paddys Run (Remediation Area 8), the wooded area north of the production area (Remediation Area 1, Phase III), and much of the area south of the Former Production Area (Remediation Area 1, Phase II and Remediation Area 2, Phase III). However, some of the nonimpacted areas may require local excavation in order to satisfy the certification requirements.

The size of the CU will be determined by the type of area in which it is located. Impacted areas are expected to have a greater diversity of COCs, a higher reported residual concentration or activity, and/or a greater variability in reported concentrations than nonimpacted areas. Experience has shown that these areas have a higher potential to exhibit a complex distribution of contamination. This, in turn, requires CUs located in impacted areas to have a greater number of sample locations per unit area than areas with a more homogeneous distribution of contamination. To reflect the need for a more detailed characterization of these areas, the initial CU size in impacted areas will be smaller than those in nonimpacted areas. The nominal CU size for impacted areas will be no greater than 250' by 250' (62,500 ft^2) and referred to as a Group 1 CU. For nonimpacted areas, a maximum CU size of 500' by 500' (250,000 ft^2) will be defined as a Group 2 CU.

In general, the CU boundary in a remediated area will be delineated considering both the preremediation and postremediation conditions (i.e., physical and chemical conditions). To ensure that residual contamination within a CU is reasonably homogenous, the CU boundaries will be delineated using the pattern of total radioactivity that is generated during the precertification scan. Within each CU, the range of residual total radioactivity is expected to be within one order of magnitude. To the extent practical, a CU will cover an area with similar physical and chemical conditions to ensure valid statistical assumptions apply to the sampling and data reduction calculations used to make the certification decision. The CU delineations will also need to consider efficient access control and prevention of cross- and re-contamination during the certification process. Also, the number of CUs and physical samples must be manageable in order to facilitate an efficient remediation and certification process. The initial CU delineation, sampling locations, and rationale (e.g., RI/FS and precertification data) will be presented in an area-specific CDL for regulatory review and approval before certification sampling is initiated.

Group 1 CUs will be defined in areas that, generally, have COC concentrations above their respective FRL before remediation, with the nominal CU size up to 250' by 250'. Local area-specific conditions and COC distributions will determine the individual Group 1 CU size. Factors to be considered for reducing the Group 1 CU size from the nominal 250' by 250' dimension include: previous hot spot and above-WAC boundaries, HWMU boundaries, boundaries of areas containing toxicity characteristic soil, storage pile foot prints, previous building foundations, drainage features (e.g., ditch or basin), road ways, former production area fence line, property lines, and previous major site pipe lines.

Group 2 CUs will be defined in areas that, generally, have COC concentrations below their respective FRL prior to remediation, with the nominal size up to 500' by 500'. Factors to be considered for reducing the Group 2 CU size from the nominal 500' by 500' dimension include: storage pile foot prints, drainage features (e.g., ditch or basin), road ways, property lines, farm land boundaries, and previous major site pipe lines.

HWMUs will be defined as special CUs to isolate their footprint for closure activities discussed in Section 2.2.5. Each HWMU will be designated as a special CU, the exception being multiple HWMUs within a single building footprint can be grouped into a single special CU.

CU boundaries are delineated after the precertification survey and/or sampling activities and any additional excavations so that the landscape physiography and the most updated information about the distribution of residual COCs are used in delineation. CU design should take into account drainage patterns, with boundaries established to follow the drainage rather than strict northings and eastings. Based on the most current data on COC distribution, CU boundaries will be delineated in a manner that minimizes the number of COCs that must be certified in each area. For example, if the residual distribution of arsenic is limited to 50,000 ft^2 in a remediation area, this area will be contained within a single CU to minimize the number of CUs that must be certified for arsenic. In this way, each CU may have a subset of the entire set of ASCOCs distributed throughout the remediation area. Additionally, an area that has been designated as a reuse area (Section 3.3.1.5) will be delineated as a separate CU or multiple CUs. Reuse areas will not be mixed with areas designated for certification.

The delineated CU boundaries, list of CU-specific COCs, and certification sampling approach will be stated in the Certification Design Letter. CU boundaries will be field checked to ensure that fixed

000163

boundaries can be established for the duration of the certification process (e.g., no road surfaces, surface-water impoundments). Following EPA review and approval of the CDL, CU boundaries will not be reconfigured without concurrence from the EPA.

3.3.3.3 Final Field Measurements and Excavation, As Needed

After establishing the CU boundaries and specifying the CU-specific COCs, HPGe measurements will be made over areas designated as elevated by the NaI scan. If the HPGe measurements indicate that uranium, radium, and thorium concentrations in soil exceed three times the FRL or the average concentration of a COC in the CU is above its FRL, additional excavation will take place to remove the elevated material. The contamination can be removed by re-excavating the entire CU or by excavating the elevated areas (i.e., hot spots). If the entire CU is excavated, the CU will be resurveyed with NaI detectors. If the excavation is selective in nature, excavation will continue until the HPGe measurements indicate that the certification criteria have been met.

If nonradiological COCs are driving the excavation in a CU, field screening will be conducted and the decision may be made to collect discrete samples for laboratory analysis of metal or organic COCs. Field screening for inorganic and organic COCs will be carried out as described in Section 2.4 and Appendix H. Should discrete sampling and analysis be conducted, the samples will be collected in a manner that will allow them to be used for final certification in the event that the laboratory analysis confirms the COCs are below CU release criteria.

Upon completion of all HPGe measurements, additional excavations, and optional sampling activities, a CDL will be issued prior to conducting final sampling and analysis activities for certification. The CDL will contain figures depicting the boundaries of the CU proposed for certification, the basis for delineating the boundaries shown on the figures, the list of CU-specific COCs that will be analyzed to demonstrate certification, and the certification sampling approach. CU boundaries are delineated in the CDL rather than in the IRDP to allow use of precertification data to optimize the location of boundary lines. Submittal of the CDL will indicate that the CU is ready for final sampling and analysis activities to commence. Upon EPA review and approval of the CDL, certification sampling activities will be initiated.

3.3.4 Attainment of Remediation Goals

The remediation goals established for soil excavation activities at the FEMP include: 1) WAC attainment, 2) FRL attainment, 3) hot spot attainment, 4) RCRA-characteristic-waste compliance, 5) HWMU closure, and 6) UST closure. These goals are discussed in detail in Section 2.2 and are expected to be met when the CDL is submitted and will be shown to be met when the Certification Report is issued.

3.4 CERTIFICATION

The general sampling strategy and procedures proposed for certification of remediation areas are illustrated on Figures 3-9 and 3-10. Figure 3-9 summarizes the classification and delineation of CUs and the range in the number of samples to be collected and submitted for analysis. The general certification process is outlined on Figure 3-10, and this process will begin after the CDL has been approved by EPA and OEPA. Discrete physical samples will be collected for laboratory analysis (ASL D) of all CU-specific COCs[1]. During certification sampling, the sidewalls, side slope, benches and bottom of deep excavation areas will all be included in the CDL and subject to random sampling.

Analytical results will be reviewed and validated prior to conducting the statistical test used to make the pass/fail decision for each CU. If there is an analytical problem identified during data review or validation, it will be corrected with additional sample analysis or other appropriate action. Validated data are placed in the SED and used to perform the appropriate statistical test needed to make the pass/fail decision for each CU. When all CUs within a remediation area pass certification, a Certification Report is issued to EPA for concurrence. In the event a CU fails, one of three conditions must be evaluated: 1) high variability in the data set (fail a *posteriori* test); 2) widespread contamination (fail UCL-on-the-mean test); or 3) localized contamination (fail hot spot criterion). These conditions are discussed in Section 3.4.5.

Elements of the certification process (Figures 3-9 and 3-10) that warrant further discussion in this section include: 1) classification and delineation of CUs; 2) sampling design; 3) statistical analysis; 4)

[1]At some future date, EPA may approve the use of HPGe measurements for certifying uranium, thorium, and/or radium.

criteria for attainment of certification; 5) procedures for nonattainment scenarios; and 6) submittal of the Certification Report. Additional certification design rationale is provided in Appendix G.

3.4.1 Classification and Delineation of CUs

The CUs will be classified and delineated after the precertification survey has been completed. To simplify data management and decision making processes, only two nominal CU sizes and a HWMU specific, special CU size will be used in the certification process (Section 3.3.3.2). No COC-specific CU delineation will be performed.

3.4.2 Sampling Design

The soil sampling design requires subdividing the remediated area into Group 1 or Group 2 CUs, with each CU containing 16 cells. Sixteen random soil sampling locations will be selected for each CU (one random location within each cell), regardless of its group classification (Figure 3-9). Depending on the CU-specific COCs and the group classification, 8 to 16 samples will be submitted for laboratory analysis (ASL D) of all CU-specific COCs. QA/QC samples will be collected per the guidelines in the Sitewide CERCLA Quality Assurance Plan (SCQ) and Appendix E. In Group 1 and Group 2 CUs, all 16 sample locations will be measured with the HPGe to collect comparability data for future decisions on the use of HPGe measurements for certification of uranium, thorium, and radium.

As Group 1 CUs lie in impacted areas known to or suspected to contain hot spots, 12 to 16 of the samples will be selected for analysis of primary COCs (i.e., uranium, thorium, and radium), and 8 to 12 samples will be analyzed for secondary COCs. In Group 2 CUs there are no known and/or suspected hot spots (i.e., no radiological risk drivers); therefore, 8 to 12 samples will be selected for analysis of all CU-specific COCs. Appendix G provides additional justification for the range of 8 to 16 analyses per CU. The justification is based on results obtained from conducting statistical tests with data representative of expected sitewide residual COC conditions, with a 20 percent increase in the statistical result to account for possible problems associated with sample preparation and analysis.

3.4.2.1 Soil Sampling Locations

Sampling locations in Group 1 and Group 2 CUs will be determined randomly within each of the 16 cells of the CU. To prevent clumping of the sampling locations in one small area of the CU, two criteria must be met before the sampling locations are used. The first criterion requires that four

points must be located in each quadrant of the CU. The second criterion requires that the distance between any two adjacent points will be limited to some maximum distance determined by the CU size and shape. If the first randomly generated sampling grid fails to meet these criteria it will be discarded and a new one generated. Once a grid that satisfies these criteria is generated, the sample locations must be verified by a field check to ensure that samples can be obtained (e.g., a sample location does not correspond with a large tree trunk). Once sample locations have been confirmed as accessible for soil collection they may not be moved without prior consent of the EPA and OEPA. The sample locations will be tied into the global positioning system (GPS) or appropriate site survey system.

Minimum Distance Criterion

After sample locations have been randomly selected, each location must pass a minimum distance criterion. Occasionally, during the process of sample point generation two or more random sample locations may be very close, or clustered. When sample locations are clustered in one or more area(s), that area becomes overemphasized in the overall average and UCL calculations. Conversely, when sample locations are clustered in one or more area(s) this will almost necessitate that other areas are underemphasized. In order to avoid clustering of data locations, the following minimum distance criterion will be applied to all randomly selected sample locations within the CU.

The equation used as a Minimum Distance Criterion is as follows:

$$\frac{\sqrt{Area_{CU}}}{\left(\sqrt{16} \times 2\right)} = \frac{\sqrt{Area_{CU}}}{8}$$

The equation used to determine the distance between two sample locations is

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

where

x_1 = easting coordinate for the first sample location,

x_2 = easting coordinate for the second sample location,

y_1 = northing coordinate for the first sample location, and

y_2 = northing coordinate for the second sample location.

000767

If any two or more sample locations fail the Minimum Distance Criterion these locations are rejected and alternate random sample locations are generated. This process is repeated until all sample locations within a CU meet the criterion.

3.4.2.2 In Situ Soil Measurements for Gamma Emitters

In situ HPGe is the preferred method of certification for gamma-emitting radionuclides because of its rapid response time and relatively large field of view. However, the measurements will only be used for comparability purposes until EPA and OEPA approval of the method is received. A recent comparability study (DOE 1997f) has demonstrated that HPGe measurements meet ASL B requirements for total uranium and thorium-232. Currently, radium-226 measurements do not meet these requirements, but ongoing research is focusing on method modifications that may allow radium-226 measurement to meet ASL B criteria. This capability will be documented in a follow-up submittal to the EPA and OEPA.

For both Group 1 and Group 2 CUs, HPGe measurements will be made at all sampling locations defined in the CU. The measurements will be taken in accordance with the established protocol in the User's Manual (DOE 1998c). As ongoing work with the comparability of in situ HPGe measurements to laboratory measurements is completed, an addendum will be developed and provided to EPA for review. When EPA and OEPA approval is obtained, HPGe measurements will be incorporated into the certification process.

3.4.2.3 Laboratory Analysis

For Group 1 CUs (Figure 3-9), three of the four samples in each quadrant of the CU (i.e., 12 per CU) will be selected randomly and submitted to a laboratory for an ASL D analysis of all primary CU-specific COCs. If conditions warrant additional analysis of samples, all 16 collected samples may be submitted for analysis. For all secondary CU-specific COCs, two or three of the four samples in each quadrant of the CU (i.e., eight or twelve samples per CU) will be selected randomly and submitted to a laboratory for the appropriate analysis (e.g., metals, volatile organic compounds, technetium-99, etc). The remaining samples will be archived until the holding times have been exceeded for their CU-specific COCs, or until the unit is certified as released. Duplicates will be collected and submitted in accordance with established protocol in the SCQ.

For Group 2 CUs (Figure 3-9), two or three of the four samples in each quadrant of the CU (i.e., 8 or 12 samples per CU) will be selected randomly and submitted for an ASL D analysis of all CU-specific COCs. The remaining samples will be archived until the holding times have been exceeded for their COCs, or until the unit is certified as released. Duplicates will be collected and submitted in accordance with established protocol in the SCQ.

Samples collected from the CUs and submitted for laboratory analysis will meet the quality assurance/quality control requirements listed in the SCQ and Appendix E. All analytical results will be reported and verified as ASL D, with 90 percent of the results validated to ASL B, and 10 percent validated to ASL D.

3.4.2.4 Special Considerations for Off-property Certification

The soil located outside of the eastern FEMP boundary (off-property) is identified as Remediation Area 9. Based on existing data, soil contamination has only been demonstrated in isolated portions of Area 9 that are adjacent to the east FEMP fence line. Therefore, DOE proposes to conduct soil certification off-property along portions of the eastern FEMP boundary, along portions of the eastern FEMP boundary, along the length of the outfall pipe between the FEMP and the Great Miami River and in the vicinity of the old outfall along the Great Miami River to certify this soil as attaining all off-property FRLs. The off-property soil north, west and south of the FEMP will be certified if adjacent on-property contamination is found during remediation and/or certification of those areas.

For certification purposes, Area 9 has been divided into three phases. Area 9, Phase I is the area adjacent to and east of Area 1, Phase I (Figure 1-3), and this area will be certified in its entirety. Area 9, Phase II is adjacent to and east of Area 1, Phase II, and the portion of Area 9, Phase II north of the FEMP outfall line that borders excavated areas in Area I, Phase II will be targeted for certification. The remaining portions of Area 9, Phase II that border Area 1, Phase II do not require excavation and will not be targeted for certification. Area 9, Phase III is defined as the soil along the length of the outfall pipeline between the FEMP and the Great Miami River and the soil along the Great Miami River in the vicinity of the old outfall, and this area will be certified in its entirety. The extent of soil to be certified within each phased area and the depth of soil for certification will be determined based on existing data, precertification data and the current land use scenario.

For example, the property owner's consent will need to be obtained and consideration must be given to farming activities, structures, trees, and other obstacles. Cultivated areas imply the soil is disturbed to deeper levels, which will limit the usefulness of real-time instruments in precertifying the area. Therefore, some physical sampling may be required and the depth of sampling in during precertification and certification activities will be greater than the standard 6-inch depth proposed for certification samples. The depth of the samples collected in cultivated areas will be determined in the area-specific PSPs.

Due to the identification and removal of a total uranium hot spot in CU O-20 of Area 1, Phase I, a Group 1 CU will be located off-property immediately north of this CU to determine if contamination extends beyond the FEMP boundary. This CU will be included in the scope of work carried out for Area 9, Phase I. A similar strategy will be implemented to certify other localized off-property areas north, west and south of the FEMP when above-FRL contamination is identified at an adjacent on-site location.

The schedule for off-property certification has been outlined in the proposed addendum to the Operable Unit 5 Remedial Design Work Plan. The schedule has been developed so that precertification and certification activities can be carried out in consecutive winters in cultivated lands to minimize the disruption of agricultural use of the land. Efforts will be made, however, to accomplish precertification and certification in the same winter, if arrangements can be made with the landowner. Performing this work in the winter will ensure that field activities do not disturb the planting schedules of the landowners.

In the event that above-FRL contamination is discovered during precertification or certification activities, an IRDP will be submitted for regulatory review and approval. The schedule would then be modified, if necessary, to allow time for excavation before submittal of the CDL.

3.4.3 Statistical Analysis

A statistical analysis will be conducted with the validated analytical data to determine the distribution of the data set (e.g., normal or lognormal) and to establish whether the CU passes the certification criteria at the specified confidence level. If the data set, or a log transformation of the data set, exhibits a normal distribution, the Student's t-Test will be used to establish the pass or fail decision for

the CU. A distribution that is not normal will result in using a nonparametric approach to determine the pass or fail decision for the CU. Regardless of the distribution and test used, the Type I error probability (α) will be set at 0.05 for primary COCs and 0.1 for secondary COCs. This states that there is less than a 5 percent chance that the CU will pass certification for primary COCs when it should have failed; the chance increases to less than 10 percent for secondary COCs. Details on the statistical approach and proposed tests are provided in Appendix G.

3.4.4 Criteria for Attainment of Certification

A statistical analysis will be performed on the validated analytical results obtained from the certification samples to establish whether the CU passes the certification criteria at the specified confidence level. Two criteria must be met for the CU to be certified as passing. The first criterion is that each individual sample within a CU must show each of the three primary radiological COCs (i.e., uranium, thorium, and radium) to be below a value of two times its FRL. If the data distribution is normal or lognormal, the second criterion compares the 95 percent upper confidence level (UCL) of the mean of each primary COC to its FRL and the 90 percent UCL of each secondary COC to its FRL to make a pass/fail decision. When the UCL of the mean (normal or lognormal distribution) of each COC is less than its FRL, the CU is certified as passing the second criterion. For the special case when a HWMU is the CU or part of the CU, all COCs pertinent to the HWMU are considered secondary COCs, and the 95 percent UCL of the mean will be compared to the respective FRL to make the closure decision. If the data distribution is not normal or lognormal, the appropriate nonparametric approach will be used to evaluate the second criterion. Both criteria must be met for the CU to be certified. Appendix G provides additional details on the statistical analysis and tests applied to certification.

3.4.5 Procedures for Nonattainment Scenarios

Both certification criteria defined in Section 3.4.4 must be met for a CU to pass certification. In the event a CU fails certification, one of three conditions must be evaluated: 1) high variability in the data set; 2) widespread contamination; or 3) localized contamination.

Condition 1 (High Variability). High variability in the data set is evaluated with the a *posteriori* test to determine the pass/fail decision for the data set (Figure 3-10). If this test fails due to high variability of a single sample, the decision may be made to rerun the sample to check for laboratory

000171

inconsistency. Alternatively, if the confidence in the laboratory results is high, the high variability resulting from a single sample may be traced to localized contamination that is identified as a hot spot (Condition 3). For high variability arising from a wide range in CU-specific COC concentrations, widespread contamination may be indicated (Condition 2).

Condition 2 (Widespread Contamination). Widespread contamination indicates the UCL mean test has failed (Figure 3-10). When this condition occurs for Group 1 CUs, further excavation is needed and the CU requires another complete round of sampling and analysis (i.e., 16 random samples are collected and 12 of the 16 are selected randomly for laboratory analysis). For Group 2 CUs, the CU is repartitioned into four Group 1 CUs and each of the newly-formed Group 1 CUs is evaluated to determine if sampling and analysis will result in a pass decision. If it appears unlikely that sampling and analysis will provide the data needed for a pass decision on the CU, each of the CUs will be excavated and undergo a new round of sampling and analysis. In contrast, if the newly formed Group 1 CUs are likely to pass certification by repeating the sampling and analysis without excavation, samples are collected and analyzed to perform the statistical evaluation and to reassess the certification of each Group 1 CU (Figure 3-10).

Condition 3 (Localized Contamination). Localized contamination indicates the CU has failed the hot spot criterion, and the sample location that has failed is re-excavated until the anomaly is removed. The footprint is than sampled and the soil submitted for analysis to demonstrate removal of the hot spot. Hot spot criteria and implementation strategies are depicted in Figure 3-11.

When the CU fails certification under Condition 1, archived samples may be analyzed. Archived samples may be used to supplement the original submission to the lab for two reasons. First, if transportation, holding times, and/or events at the laboratory invalidate the sample, the archived sample from the relevant CU quadrant can be sent as a replacement. Second, if the statistical analysis of the data indicates the mean of the COC concentration is below its FRL, but the UCL of the mean is above the FRL, then the option to analyze the available archived samples will be exercised to better estimate the average contaminant levels within the CU. In the case of a Group 2 CU, archived samples exist for all CU-specific COCs, whereas a Group 1 CU may have archived samples for only secondary CU-specific COCs. In all cases, the holding times of archived samples must be assessed prior to analysis to determine if they meet quality assurance protocols.

3.4.6 Implementation Strategy for the Hot Spot Criteria

Figure 3-11 summarized the hot spot criteria to be evaluated during precertification and certification activities. The hot spot criteria will be implemented during these activities using real-time measurements, field instruments, and laboratory analysis of physical samples for each CU-specific primary and secondary COCs and analysis of physical samples for the primary radiological COCs (i.e., uranium, thorium, and radium).

During precertification scanning, two-point averages will be calculated from RTRAK measurements for the primary COCs and the averages will be compared to values corresponding to 3 times the FRL to make the hot spot decision. When the uranium FRL is less than 82 mg/kg, the RTRAK scan will acquire data as total gross activity and the areas of highest total gross activity will be measured with the HPGe to establish the total gross activity measurement that corresponds to three times the uranium FRL. If the RTRAK MDA is less than three times the FRL, a total activity contour map will be produced and activity areas that exceed three times the FRL or areas that are contoured based on total gross activity will be surveyed with the HPGe. Areas that exceed three times the FRL will be scanned again with the HPGe instrument to confirm and delineate the hot spot area. For either case, if the HPGe measurements confirm the existence of a hot spot (i.e., three times the FRL), the hot spot will be excavated and the scanning will be repeated until the area is precertified as free of hot spots.

During the certification activities, several hot-spot criteria are evaluated when any individual laboratory sample result indicates a COC is greater than two times its FRL, after the other statistical criteria are met (i.e., Conditions 1 and 2 in Figures 3-10 and 3-11). First, HPGe measurements are taken above the sample location and surrounding area to delineate the hot spot area. If these measurements indicate any primary COC has exceeded 30 times its FRL, the hot spot is excavated. When this initial evaluation is passed, the hot spot is evaluated with respect to the area represented by the HPGe measurement. If the area is less than $10m^2$ and any primary COC exceeds a value of three times the FRL, the delineated hot-spot area will be excavated. When the area is greater than $10\ m^2$, the hot-spot criterion is defined as greater than two times the FRL. Failure of any of the above criteria will result in excavation of the hot spot followed by an additional round of sampling and analysis to demonstrate all certification criteria have been met.

000173

Secondary COC hot spots will be evaluated based on physical samples collected during the certification process. When a secondary COC concentration exceeds two times its FRL (Condition 3 on Figure 3-11) the hot spot associated with the secondary COC will be further delineated using a combination of field techniques, sampling, and laboratory analysis. In agreement with the hot spot criteria for primary COCs, if the area of the secondary hot spot is less than 10 m^2, measurements of the COC corresponding to the hot spot must exceed a value of three times its FRL before excavation will take place. In general, a decision on the need for further excavation of secondary COCs will be made with regulatory concurrence on a case-by-case basis.

3.4.7 Certification Report

Certification reports will be used to demonstrate progression of the remedial action, although the report is not required in accordance with EPA guidance or the Amended Consent Agreement (EPA 1991). The intent behind submitting a Certification Report for each phase of a remediation area is to receive acknowledgment that the pertinent operable unit remedial actions were achieved. This report will allow natural resource restoration to proceed as rapidly as possible. Upon completion of all certification activities within a remediation area, a formal certification report will be issued for the entire remediation area. Interim grading activities will commence after EPA and OEPA approval of the Certification Report.

A Certification Report will be prepared for individual or several remediation areas, and this report is the final area-specific remediation deliverable. The primary objectives of this report are to 1) document the remedial actions that occurred; 2) describe the certification process; 3) present all data supporting the certification that area-specific COCs do not exceed FRLs specified in the relevant RODs; 4) demonstrate that Federal and State of Ohio closure regulations have been met for HWMUs and/or USTs; 5) summarize data necessary to demonstrate WAC attainment; and 6) describe access controls implemented to prevent recontamination. Section 7.4 presents additional information on the content and preparation of Certification Reports.

3.5 POSTREMEDIATION ACTION

Once excavation at the FEMP is complete and the results of the certification activities have been documented, the area will be developed into the final land use specified by the Natural Resource Restoration Plan (NRRP). For many areas, this can be done immediately after certification. However, for some areas, final development must wait until other remediation projects at the site are complete. Therefore, postremedial activities can be divided into two categories: 1) interim actions taken to maintain the area and 2) actions taken to develop the area into its final land use. A general discussion follows with details provided in Appendix F.7.

3.5.1 Interim Actions

Interim actions are taken to stabilize the unit after certification, to prevent recontamination, and to maintain it until the unit can be developed into its final land use. Stabilization activities should be initiated upon the completion of construction activities or upon a decision to suspend construction for more than 45 days. The three stabilization categories are defined and described in Appendix F.7. Additional interim actions are discussed below.

3.5.1.1 Access Controls

Physical hazards from traffic and construction work will exist during interim actions. In addition, the certification unit will have to be secured from trespass. For these reasons, the certification unit will be treated as a Category II controlled area (Appendix F.2) during the interim between certification and conversion to final land use. For such an area, access is restricted to authorized personnel, and no personnel or material monitoring is required to exit the area. A certification unit's access controls will be maintained at the same level as surrounding certification units until the entire area has been converted to its final land use.

3.5.1.2 Surface Stabilization After Certification

Interim grading activities will be performed after each certification unit is certified. Interim grading will be performed to flatten slopes (for stability), control water drainage, and begin the process of grading the certification unit in accordance with the restoration concept. Where possible, the certification unit will be graded to the final grade level according to the sitewide restoration strategy. Regardless of the level of interim grading, all temporary ground cover will be stabilized to hold the soil in place until the final grading and development begins (Appendix F.7.1).

3.5.1.3 Interim Monitoring

Interim monitoring of a certified unit will be limited to verifying that contamination for unremediated areas is not spreading back to the certified unit through uncontrolled runoff. Section 5.2 discusses the monitoring that will be implemented to demonstrate the needed control.

3.5.1.4 Runoff Control

Runoff controls will be implemented as described in Appendix F.2. Regular inspections of the certification unit will be made to verify that it is properly drained and that runoff does not adversely affect surrounding areas and stream quality. If it is determined that either of these conditions is not the case, remedial action will be taken to correct the drainage problem.

3.5.2 Final Land Use Development

The current commitment for final land use is an undeveloped park. Deep excavations will be allowed to develop into ponds and will be backfilled only to the extent necessary to hold water or provide adequate surface drainage. Vegetation will be established on barren excavation surfaces. Final land use for all excavation areas will be described in the NRRP; designs will be developed for each area individually.

3.5.2.1 Final Grading

Final grading will include construction of drainage features, placement of topsoil, seeding, and other steps necessary to properly grade the area. This may include bringing in additional soil from other areas to restore the site (Appendix F.7).

3.5.2.2 Access Controls

During the final phase of site restoration, physical hazards from traffic and construction work will exist. For this reason, the entire remediation area unit will be treated as a Category II controlled area (Appendix F.2) until the unit is released to its final land use. Consequently, access is restricted to authorized personnel, and no personnel or material monitoring is required to exit the area.

3.5.3 Final Land Use

The NRRP will dictate the final land use and future habitats for the remediation area. Specific design criteria for the design and development of these habitats will be identified in relevant IRDPs. After

final grading is complete, vegetation will be established for the specific habitat desired using seeding, tree planting, and other methods as appropriate for the habitat. The following general guidelines were developed for wetlands, open water areas, woodlands, riparian, and grasslands. These habitats have been identified as the feasible natural environments at the FEMP.

3.5.3.1 Wetlands

Wetlands require very specific environmental conditions that are affected by saturation, slopes, water depth, and other mitigating factors. Gradual shoreline slopes of 6:1 or flatter to a depth of 1 to 3 feet will encourage plant species diversity and feeding areas. Poorly drained soil types are essential to supply an impermeable substrate for holding water. For a wetland to be functional, it must have adequate amounts of water during appropriate times of the year. Subsurface tile drains must be broken or removed if they are identified in a proposed wetlands location.

3.5.3.2 Open Water Areas

Requirements for open water areas will be provided in the NRRP and subsequent design documents (i.e., area-specific NRRDPs).

3.5.3.3 Woodlands

A woodlands habitat can be located in any area on the FEMP that is well drained.

3.5.3.4 Riparian Areas

Soil conditions that would support a riparian habitat would have to be located along a linear, topographically low area that receives surface water runoff from the surrounding area. Paddys Run currently supports the only naturally occurring riparian environment at the FEMP.

3.5.3.5 Grasslands

Grassland habitat would require poorly drained soil conditions and could be located in a wide range of areas on the FEMP property.

3.5.3.6 Postremediation/Postclosure Care and Inspection

Postclosure maintenance of remediation areas (other than the footprint of the OSDF) will be addressed within the NRRP as part of the site's restoration activities. Postclosure maintenance of the OSDF is

000177

specifically addressed within the Post-Closure Care and Inspection Plan, On-Site Disposal Facility (DOE 1997b).

3.6 RECORD KEEPING AND INFORMATION MANAGEMENT

Management of existing and newly-generated information is essential to economically completing a successful remediation of the FEMP. This information will be used by remediation projects for a variety of applications and consequently must be available sitewide, retrievable in diverse formats, and require minimal turn-around time to access.

The guidelines provided in this section are intended to promote consistent record keeping and information management associated with all excavation activities, regardless of the on-site or off-site disposition of the material. The electronic Integrated Information Management System (IIMS) described below will facilitate information records management and reporting, including compliance-based record keeping and reporting requirements. Information management objectives identified in Section 3.6.1 must be met throughout remediation. These objectives will ensure the integrity of the information used for completion of remediation under the SCEP.

3.6.1 Information Management Objectives

Information management and retrieval systems at the FEMP function as a central information repository that can be used in all facets of the remediation. So that this information can be readily available to all potential users, a uniform system of record keeping and information management has been adopted. The primary information management objective of the SEP is to ensure that the people planning, performing, surveying, and documenting remediation will have access to this centralized repository of information about the site in a timely and efficient manner.

Table 3-1 summarizes the types of analytical information that will be generated by following the general remediation process. Other excavation information needs can be grouped into four major types:

1. Planning information
2. Excavation control, status, and general management information
3. Material control and handling information
4. Documentation of cleanup.

To meet these needs, the information management system employed will:

- Maintain a central repository for geological, topographical, engineering, and analytical data from all available sources in a format that promotes multiple uses
- Receive and store new information and relate it to existing information
- Provide current information simultaneously to all ongoing excavation projects at the FEMP
- Allow tracking of interim and final disposition of excavated materials
- Comply with record keeping requirements that safeguard the analytical data used to demonstrate certification and remedial action completion.

As remediation progresses, additional needs will be assessed and methodologies refined accordingly.

3.6.2 Integrated Information Management System

Bulk waste stream information for the FEMP will be managed in the IIMS database. Relationships between IIMS and other site databases are depicted on Figure 3-12. The IIMS is designed to accommodate fast-track, bulk waste stream characterization, OSDF WAC attainment demonstration, and OSDF manifesting by using site characterization data. The system interfaces with the SED through a grid system to retain connections to RI/FS, historical, and newly generated data when excavated material is moved from the source location. The system also interfaces with the Sitewide Waste Information Forecasting and Tracking System (SWIFTS) to allow electronic transfer of bulk waste inventory to the container management system, when containerization is required.

3.6.3 Operational Documents

Operational documents for the FEMP will be generated during remediation activities. Such documents include construction drawings, field logs, analytical data, manifests, and specialized waste handling documents. Figure 3-13 summarizes these documents as the communication links between the functional organizations of the SCEP. Management of each category of documents is presented in the following subsection. Quality assurance controls for these documents are discussed in the (Appendix E).

3.6.3.1 Construction Drawings and Associated Field Logs

Construction drawings and associated field logs will be maintained by Engineering/Construction Document Control. These items will be used on an evolving basis in the Geographic Information System (GIS) and, at site closeout, will reflect final as-built drawings.

3.6.3.2 Analytical Data and Associated Field Logs

Analytical data will be entered into the SED as it is generated. Hard-copy analytical reports and field scan/measurement print-out records, as well as associated field logs, will be maintained in active project files until completion of each phase of field work. At that time, these items will be turned over to Engineering / Construction Document Control. The required format and content of the field logs will be specified in the IRDP and CDL.

3.6.3.3 Miscellaneous Field Logs

Other types of field logs will be maintained in active project files until completion of each phase of field work. At that time, they will be turned over to Engineering / Construction Document Control.

3.6.3.4 Manifest-Type Documents

Field tracking logs (FTLs) used by WAO to document the movement of materials from the initial excavation to interim and final locations will be stored in the site operating record. Information from the FTL will be entered into the IIMS database, which allows retrieval of analytical data to support WAC determinations, provides an up to date record of the types and volumes of bulk material in interim staging locations, and provides a cumulative record of types and volumes of material placed in the OSDF.

3.6.3.5 Specialized Waste Handling Documents

FTLs used by WAO to document transfer of materials to interim storage for off site disposition will be managed as described in Section 3.6.3.4. Subsequent documentation used for waste streams dispositioned off site will be maintained as part of the site operating record. Key information from these documents will be stored in SWIFTs.

3.6.4 Field Documentation and Information Management Activities

Records and information will be generated in various forms based on the nature of the technical task, as previously discussed in this section. Field information will be collected using GPS, field logs, sampling programs, as-built construction drawings, and a tracking system. In addition to becoming part of the operation documents produced during the course of excavation planning and implementation, this information will be used to prepare the deliverable documents described in Section 7.0. Appendix E provides additional information on QA protocols related to information management activities.

3.6.4.1 Tracking System for Waste Stream Categories

Field information for input to IIMS will be collected on the FTLs, with information subsequently entered to IIMS. Key information elements that are recorded on the FTLs are listed below:

- Project number and name
- Source Material Tracking Location (MTL)
- Interim or final disposition MTL
- Estimated volume of material
- Material matrix (interim movements) or profile number (final disposition movements)
- Generation date
- WAO signature.

Figure 3-14 shows the FTLs which will be generated between material destinations and organizational hand-off points.

MTLs are defined on the FTLs and tracked electronically in the IIMS using the grid system. During the development of the excavation design, analytical data in the SED (newly generated and RI/FS) are reviewed and contiguous areas with similar COCs are identified as unique MTLs. Each MTL comprises an in situ waste stream that is identified on project drawings. When the FTL is entered into the IIMS, SED data for the specified MTL are tied to excavated soil volumes that have been moved to either an interim location (above-WAC or below-WAC stockpiles and/or containers) or final disposition at the OSDF. IIMS maintains transaction histories to provide cumulative analytical data for soil that is moved more than one time. The main types of MTLs include WAC attainment areas (i.e., controlled areas for storing above-WAC material) and stockpiles.

The following profiles are assigned to each of the five primary waste streams designated for OSDF disposal:

Profile # 91,000	OSDF Category 1	Soil and soil-like material
Profile # 92,000	OSDF Category 2	Debris for en masse placement
Profile # 93,000	OSDF Category 3	Debris for individual placement
Profile # 94,000	OSDF Category 4	High organic content (humus and vegetation)
Profile # 95,000	OSDF Category 5	Double-bagged asbestos, sludge, and special case-by-case approval.

Numeric extensions (e.g., 91,001...95,999) are used to facilitate further delineation of waste streams on an as-needed basis. The numeric extension profiles include information in common with the FTLs to facilitate electronic information retrieval, as well as material descriptions and data group identifiers for newly generated data.

All wastes dispositioned to the OSDF will be covered under a waste stream profile. OSDF manifests are prepared in IIMS by accessing information entered from the tracking logs and profiles. The manifest number facilitates retrieval of electronic characterization information from IIMS, if required, to support a determination of "meets WAC." Information recorded on the hard-copy manifest will comply with requirements of the OSDF Impacted Materials Placement Plan (DOE 1998a).

3.6.4.2 Other Field Data

Other field data will include information on sample collection, attainment of excavation design, maps, and surveys in either electronic or hard-copy format. Field-generated analytical data will include precertification, certification, and WAC attainment; additional analyses may be generated in conjunction with special material activities described in Appendix F. Anticipated field instruments include, but are not limited to, the RTRAK and the HPGe. Field activity documentation requirements of the SCQ will be met. Field logs will be submitted daily to the Project Manager with approval signatures from the Construction Manager, the Project Manager, and Subcontractor. As-built drawings will be completed in accordance with applicable site procedures.

TABLE 3-1

SUMMARY OF SAMPLING TASKS AND ANALYTES

Stage	Drivers	Analytes[a]
Predesign Investigation	Extent of excavation for: technetium-99, RCRA characteristic waste, above WAC, and above FRL	Area-specific COCs, technetium-99, and TCLP
Excavation	Non-technetium-99 WAC attainment	Uranium and organic vapor
Precertification	CU delineation, FRL attainment, and hot-spot screening	Area specific gamma-emitting radionuclides
Certification	FRL attainment, HWMU closure, and UST closure	Area specific COCs, HWMU and UST COCs

Note: [a] See Table 2-8 for the applicable analytical methods.

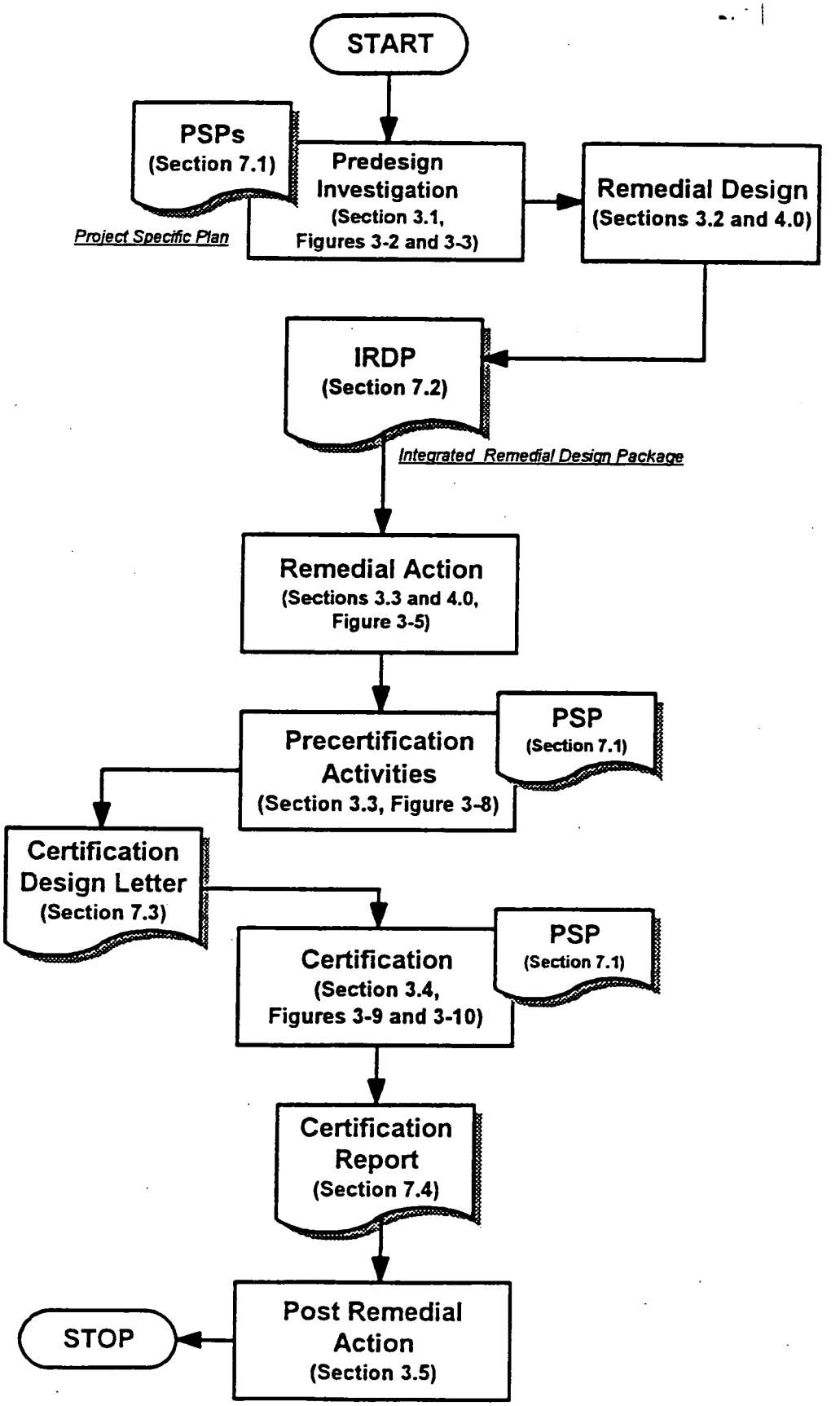


FIGURE 3-1 GENERAL SOIL REMEDIATION PROCESS

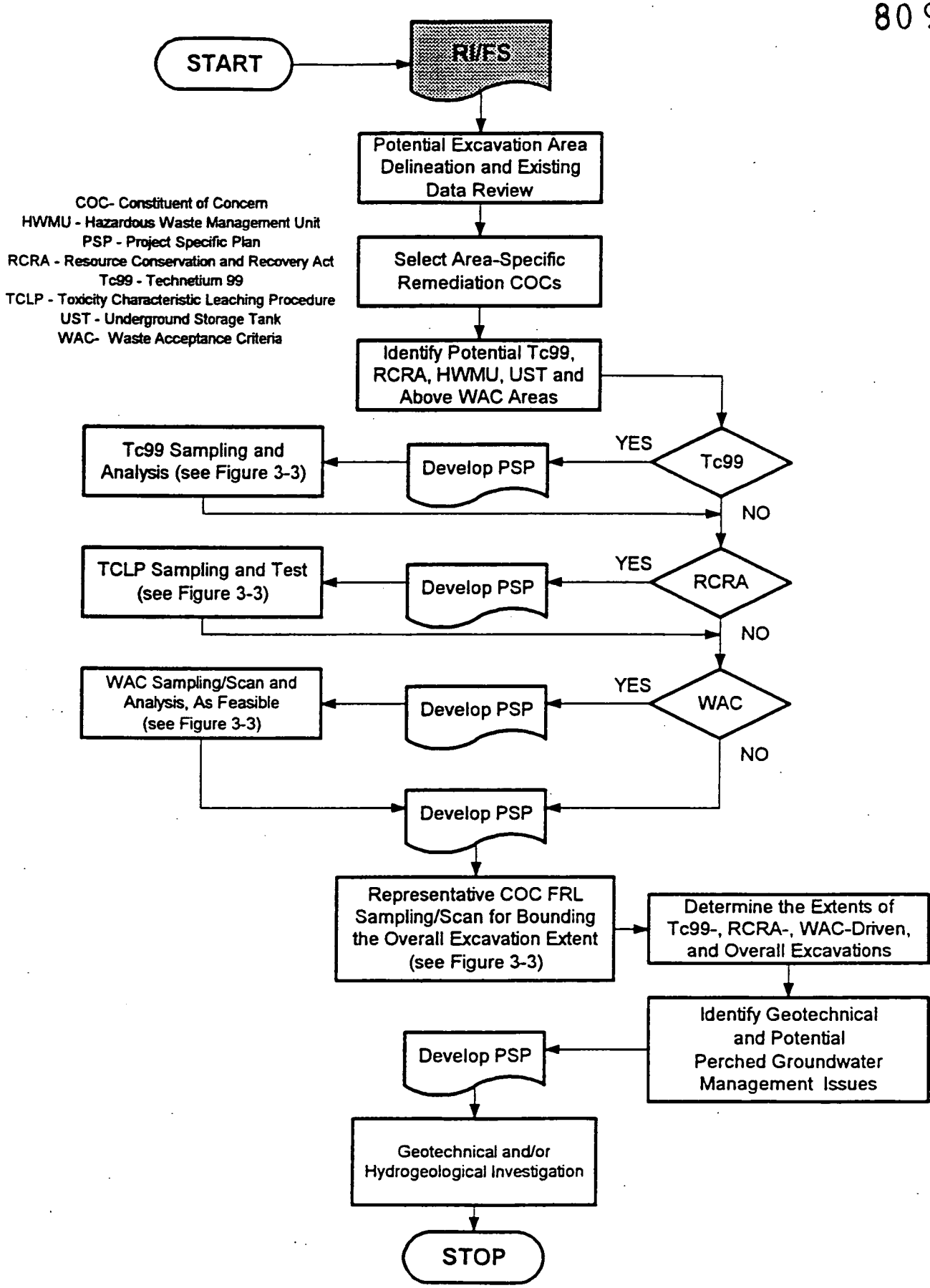


FIGURE 3-2 GENERAL PREDESIGN INVESTIGATION PROCESS

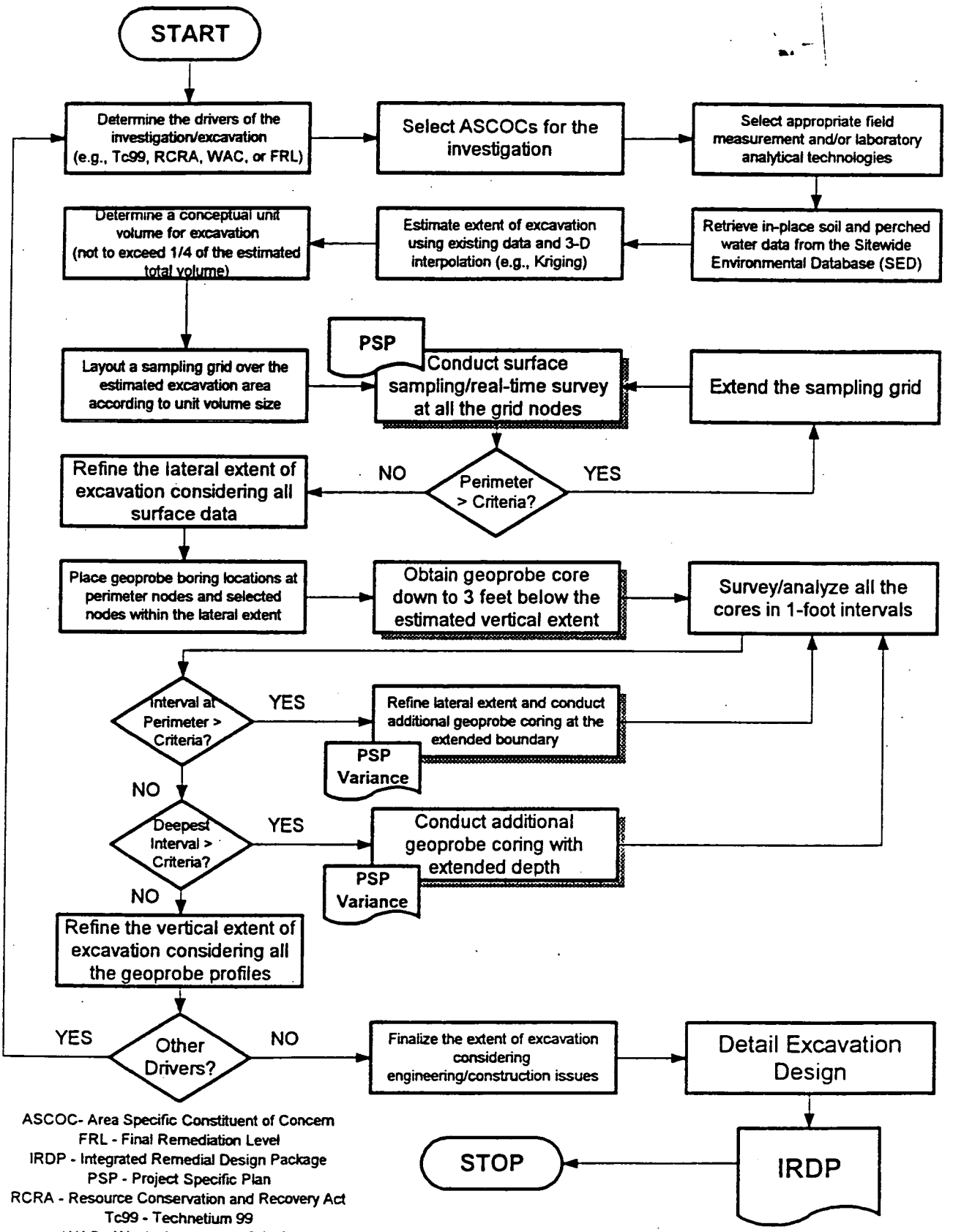
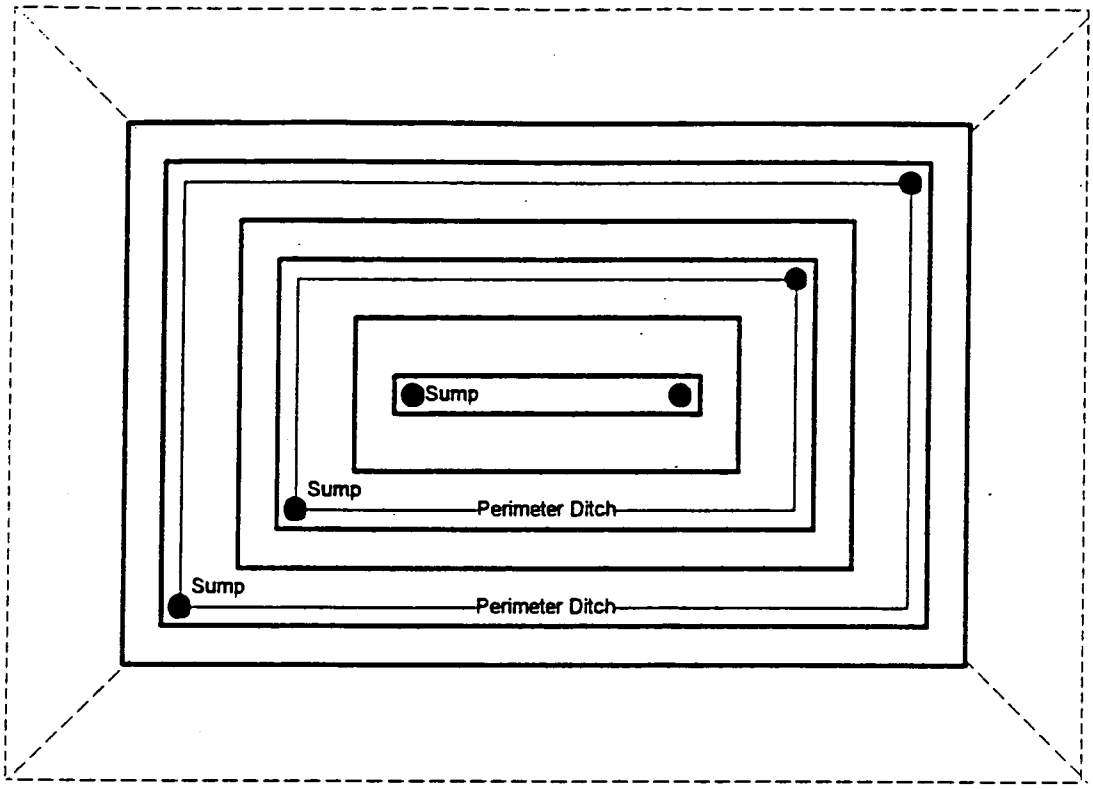


FIGURE 3-3 ESTABLISH EXTENT OF EXCAVATION



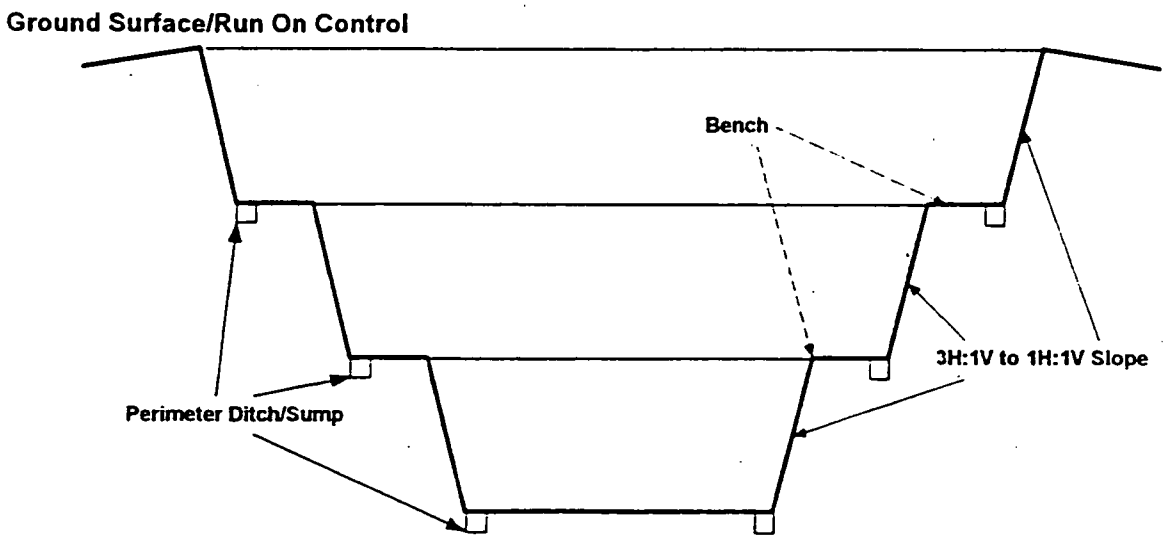


FIGURE 3-4 CONCEPTUAL SIDE SLOPE CONFIGURATION FOR DEEP EXCAVATION

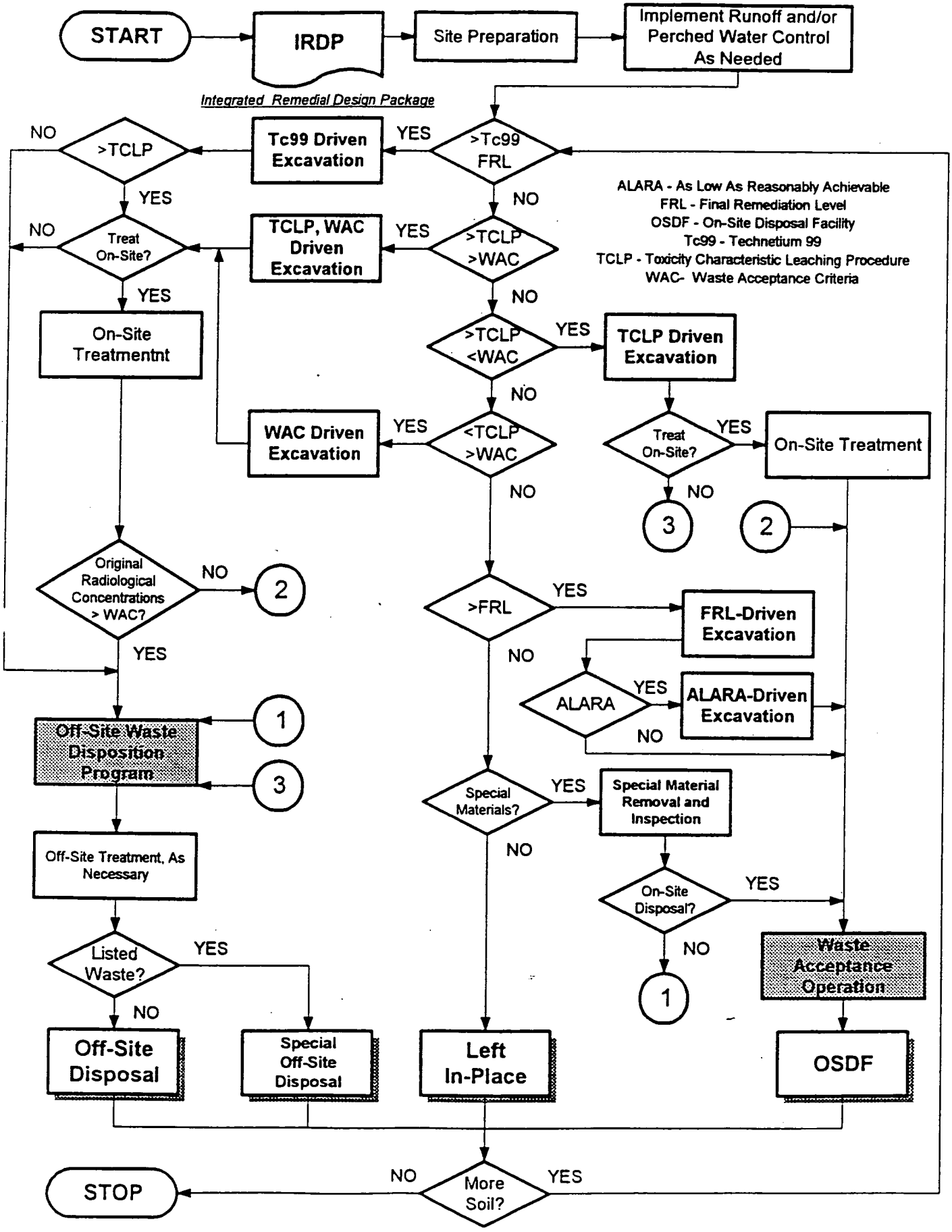


FIGURE 3-5 GENERAL SOIL SEGREGATION/DISPOSAL PROCESS

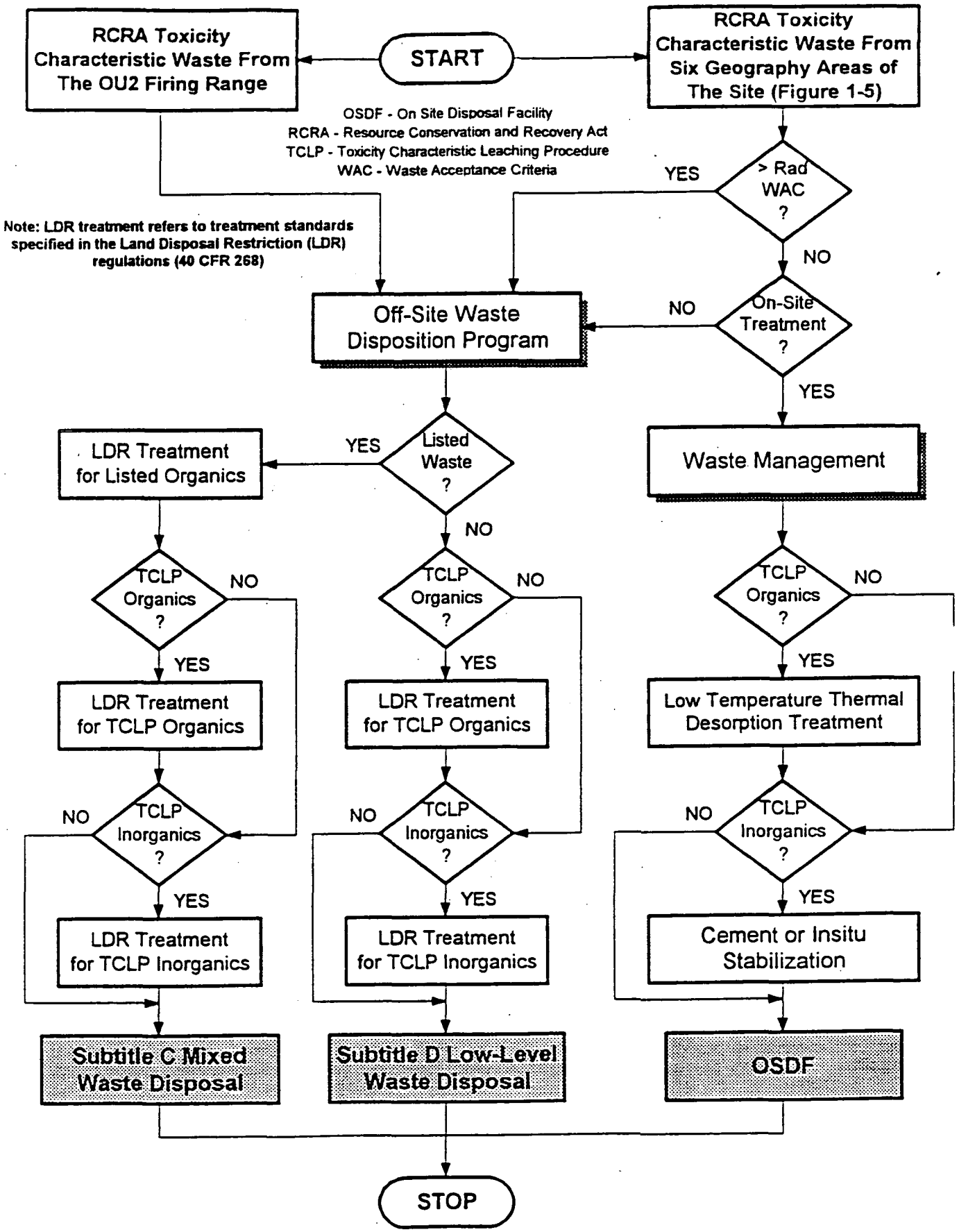


FIGURE 3-6 RCRA-REGULATED SOIL TREATMENT AND DISPOSAL REQUIREMENTS

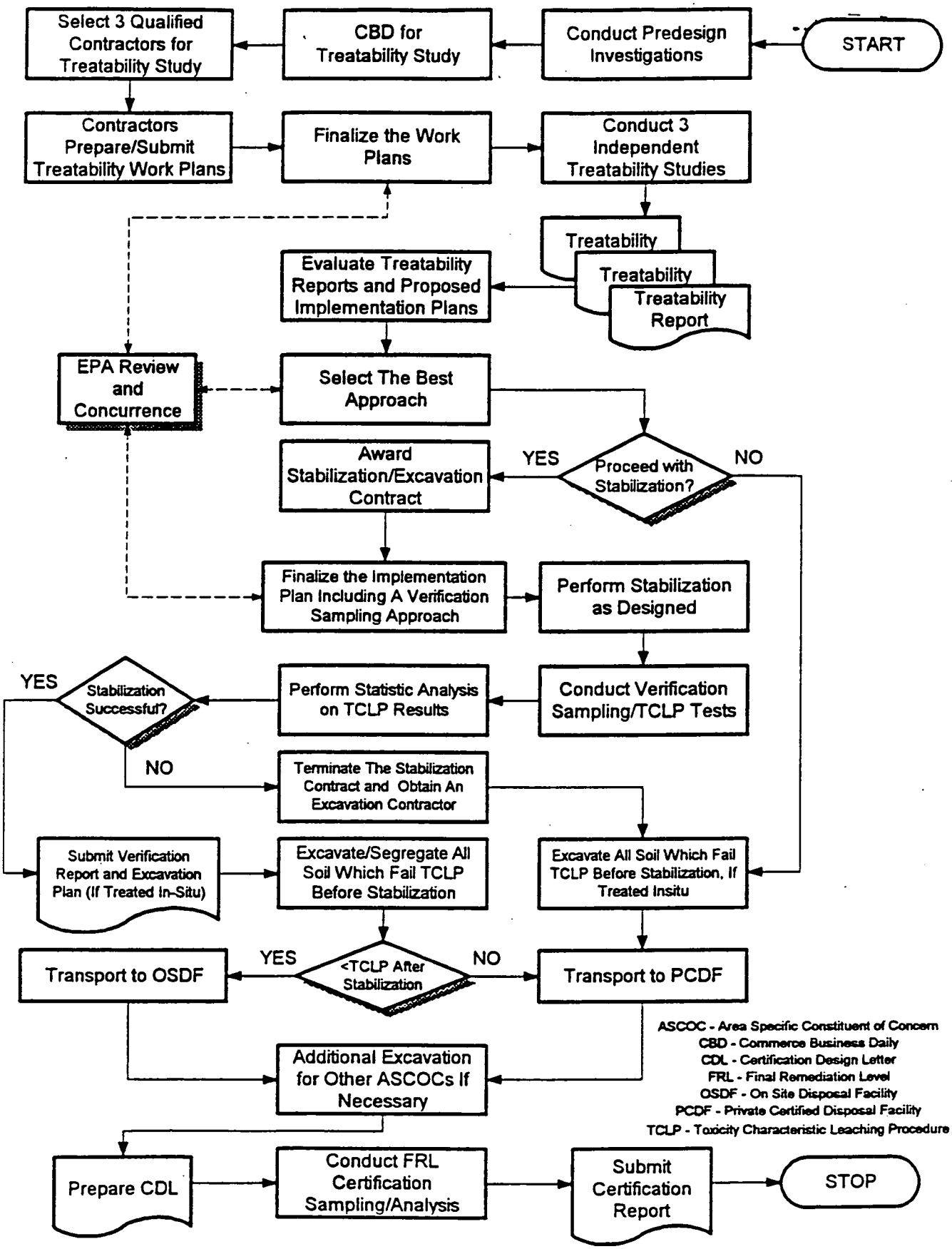


FIGURE 3-7 PROPOSED TRAP RANGE REMEDIATION STRATEGY

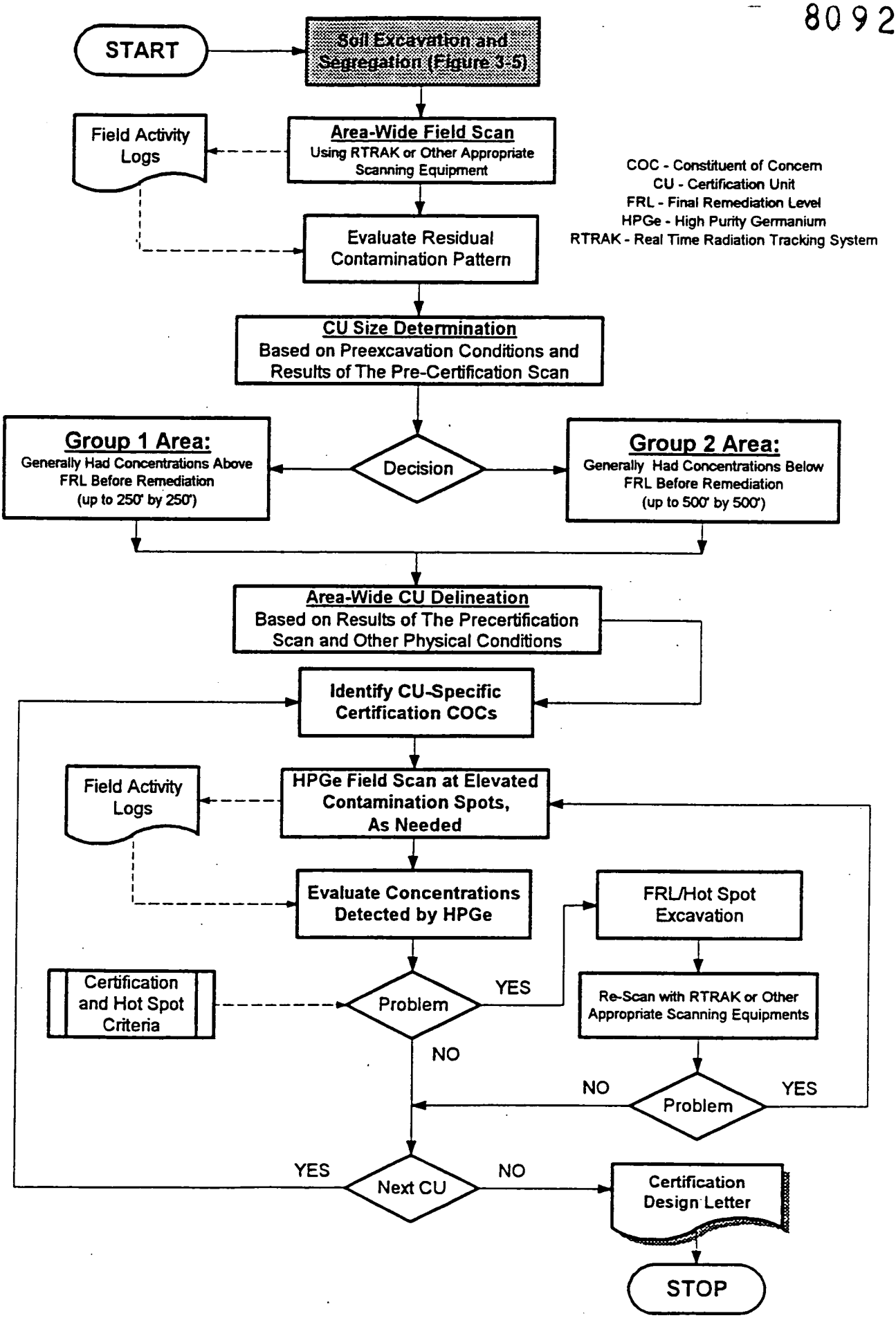


FIGURE 3-8 GENERAL PRECERTIFICATION ACTIVITIES

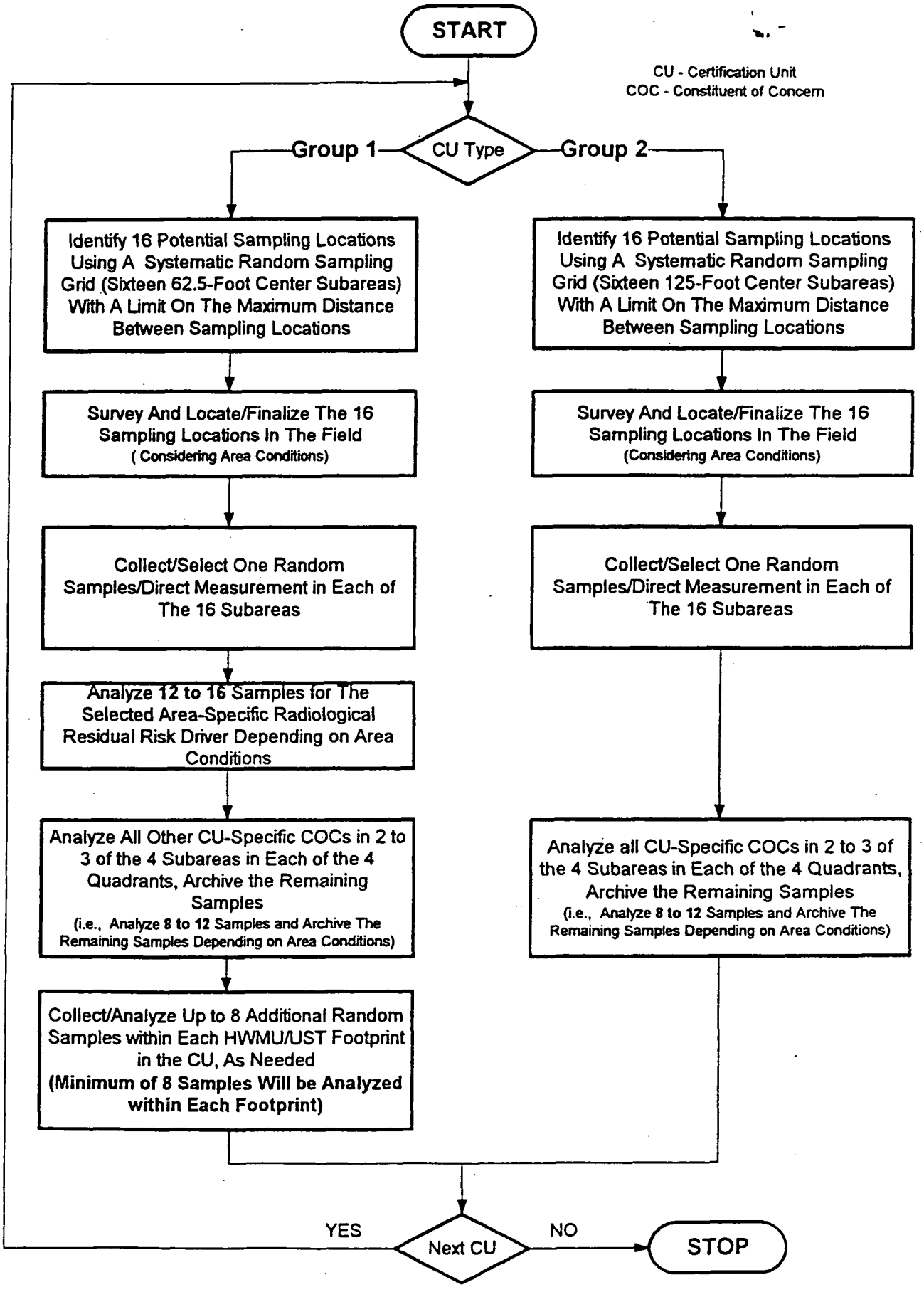


FIGURE 3-9 GENERAL CERTIFICATION SAMPLING STRATEGY

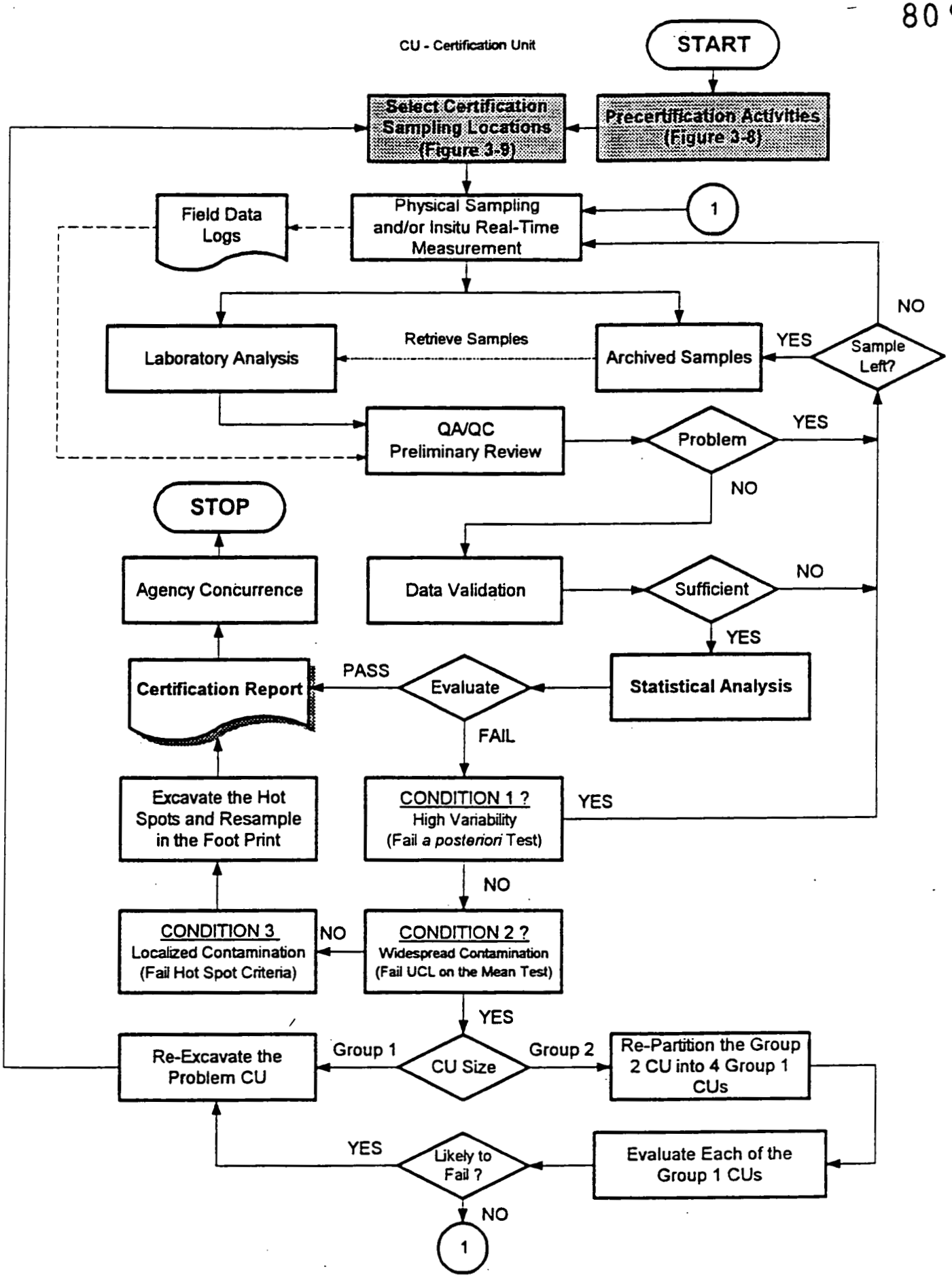


FIGURE 3-10 GENERAL CERTIFICATION PROCEDURE

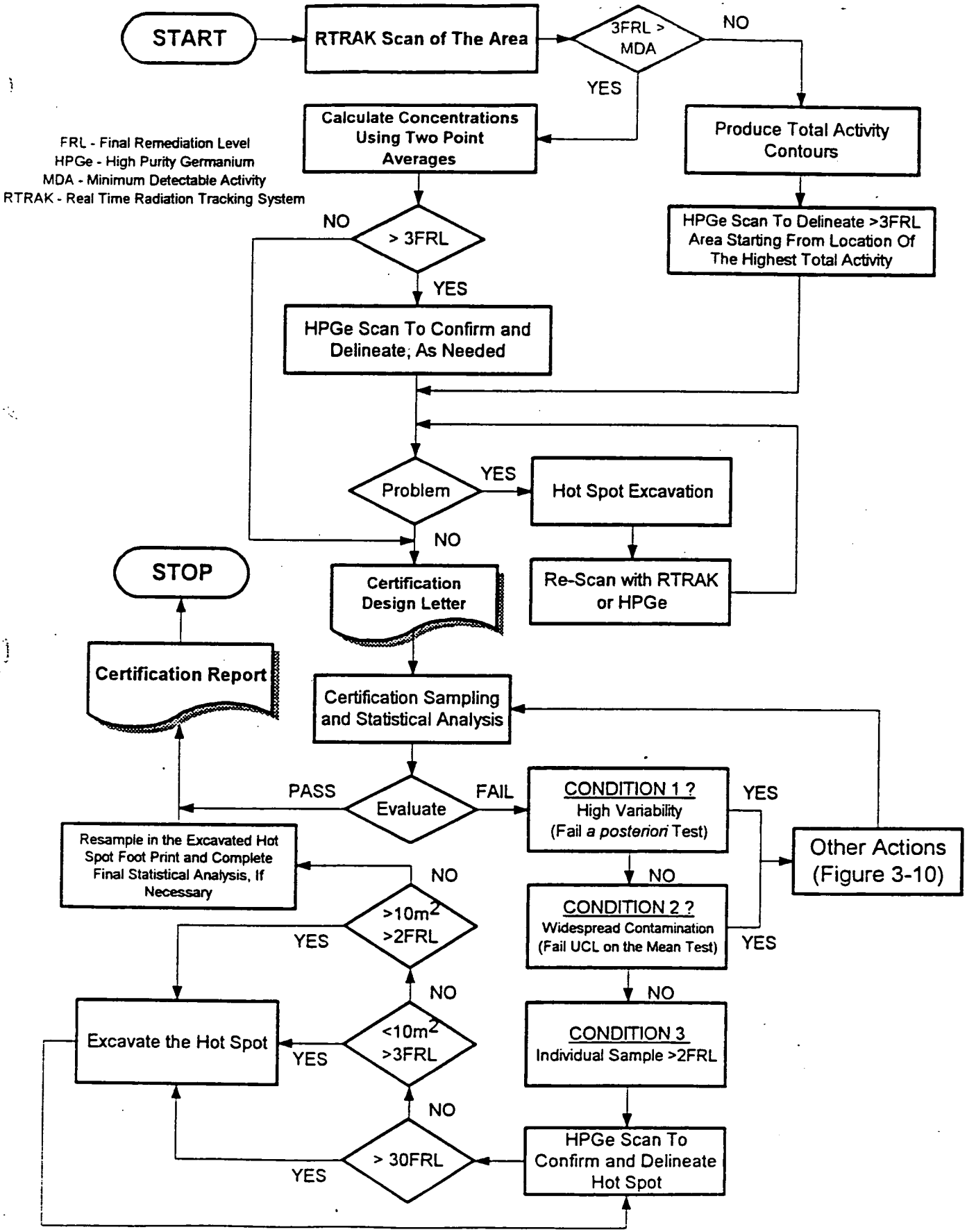
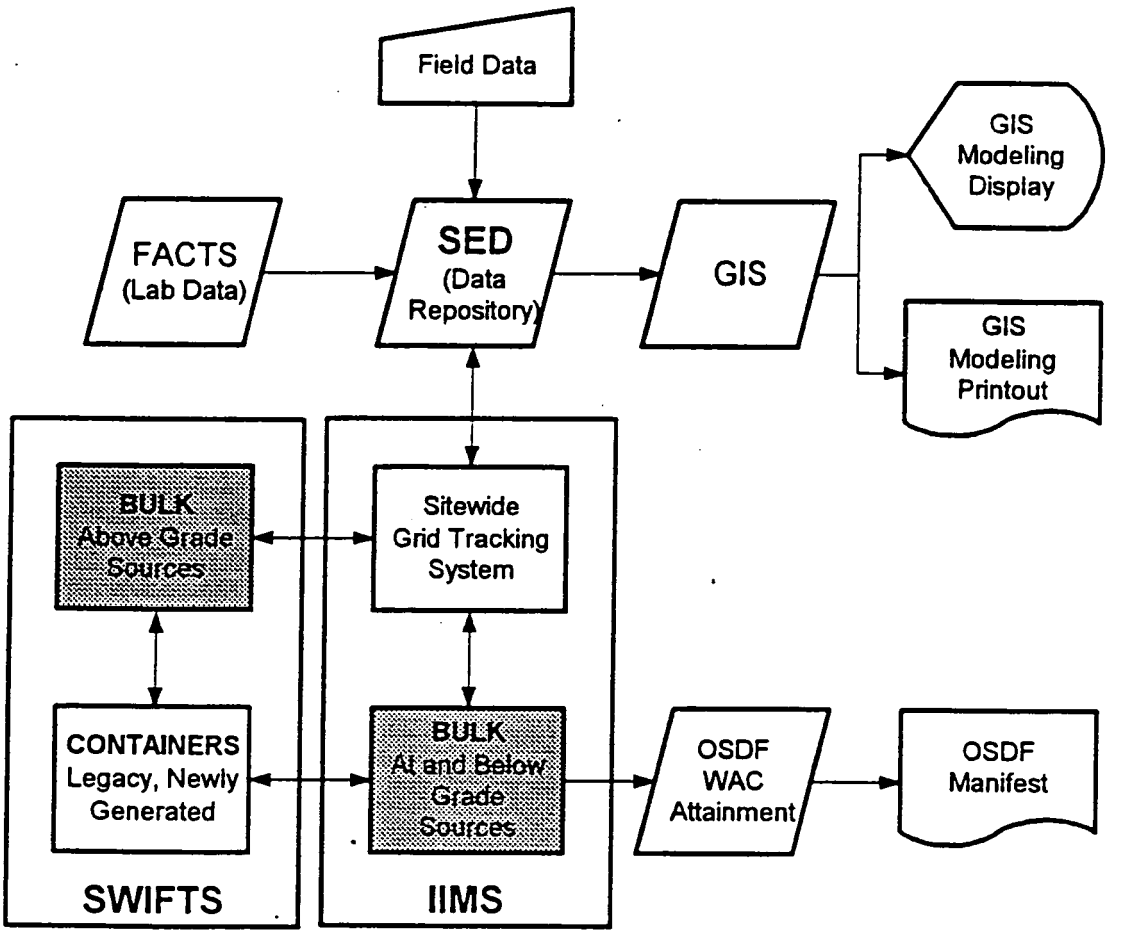


FIGURE 3-11 HOT SPOT CRITERIA AND IMPLEMENTATION STRATEGY



FACTS: Fernald Analytical Computerized Tracking System
GIS: Geographical Information System
IIMS: Integrated Information Management System
OSDF: On-Site Disposal Facility
SED: Sitewide Environmental Database
SWIFTS: Sitewide Waste Information Forecasting and Tracking System

FIGURE 3-12 SITE DATABASE RELATIONSHIPS

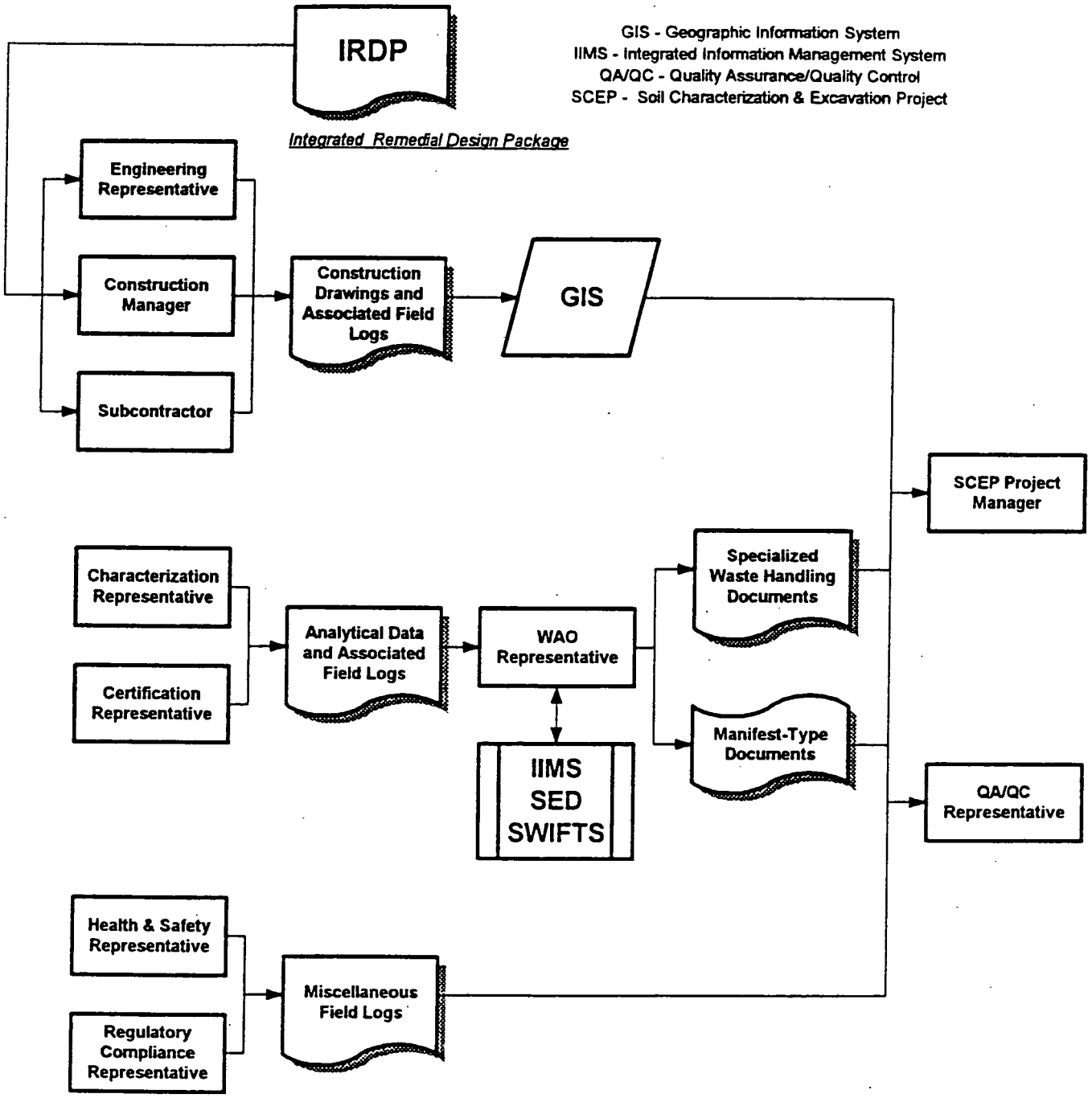
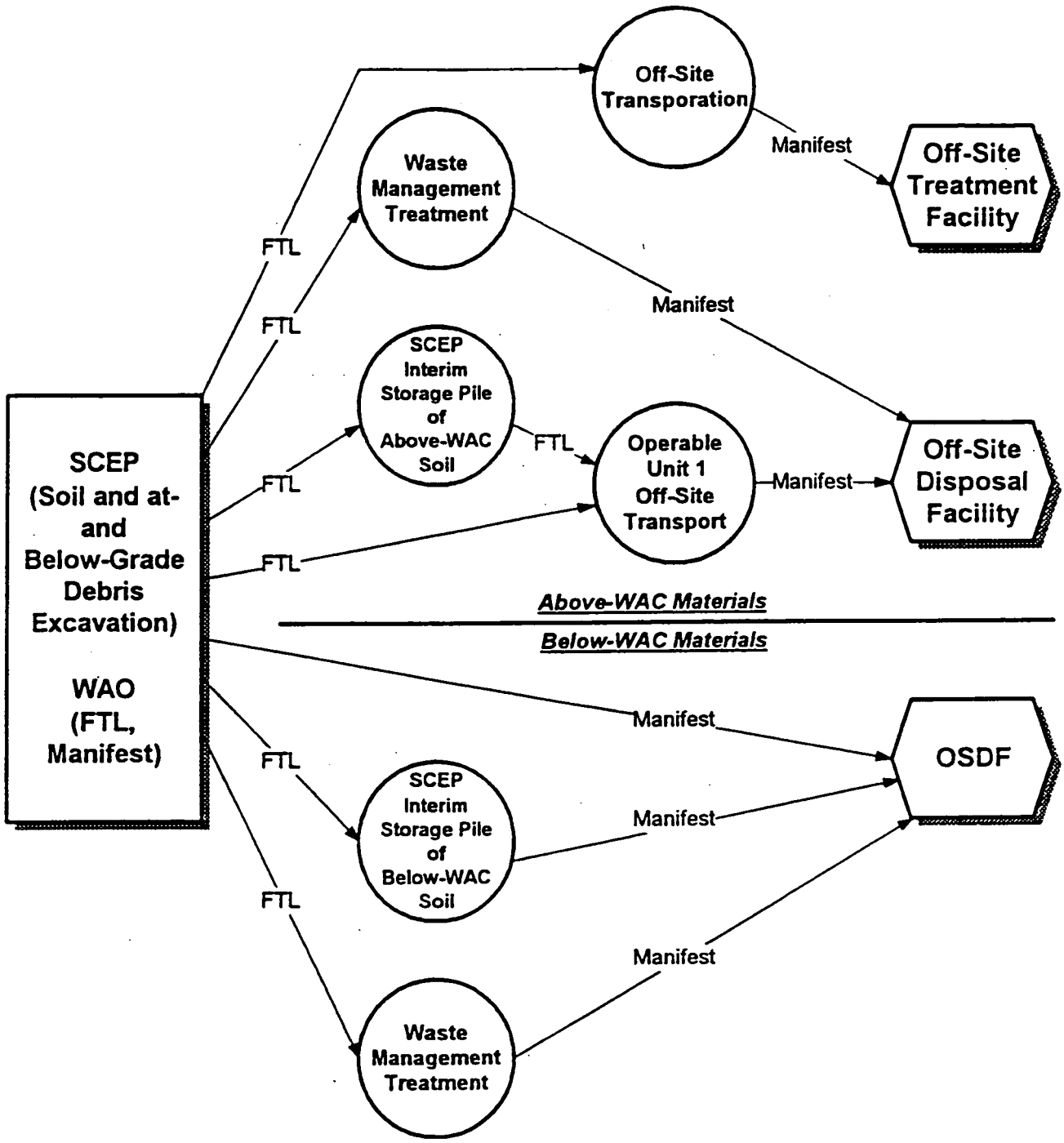


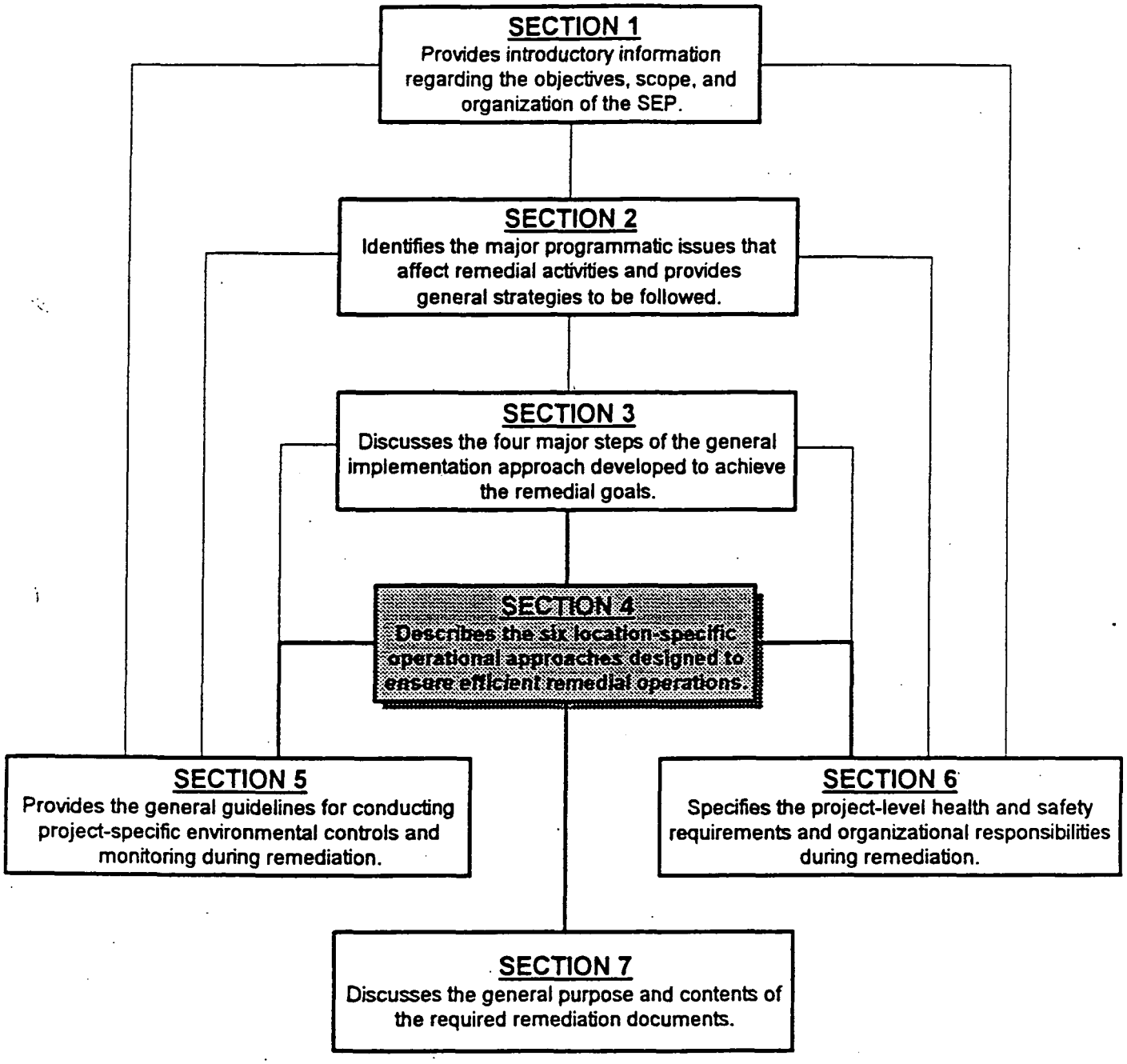
FIGURE 3-13 OPERATIONAL DOCUMENTS AND SCEP FUNCTIONAL ORGANIZATIONS



FTL: Field Transfer Logs
OSDF: On-Site Disposal Facility
SCEP: Soil Characterization and Excavation
WAO: Waste Acceptance Operation

FIGURE 3-14 MATERIAL DESTINATION DECISIONS AND ORGANIZATIONAL HAND-OFF

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

4.0 LOCATION-SPECIFIC EXCAVATION APPROACHES

Because of the wide range of physical conditions at the Fernald Environmental Management Project (FEMP), location-specific conceptual excavation approaches are needed to meet the various remediation challenges described in Sections 2.0 and 3.0. The conceptual area-specific approaches outlined in this section will incorporate the general guidelines discussed in Section 3.0 (Figure 3-1). Soil excavation conducted in impacted areas surrounding the FEMP will be relatively simple when compared to the logistics of soil excavation in the Former Production Area. Perimeter areas of the FEMP may have localized surface contamination that can be removed using shallow excavation procedures. However, within the Former Production Area, deep excavations of soil must be coordinated with decontamination and dismantlement (D&D) activities, removal of at- and below-grade structures, (e.g., building foundations and pipelines), and removal and closure of hazardous waste management units (HWMUs), underground storage tanks (USTs), and non-homogenous stockpiles. This section will present and discuss six location-specific soil excavation approaches to deal with the diverse nature of the soil remediation scenarios.

The six location-specific excavation approaches that will be discussed are: A) shallow excavation of impacted on-property area outside the Former Production Area and other waste storage/management areas; B) Excavation in waste storage/management areas outside the Former Production Area; C) Excavation of existing stockpiles in the Former Production Area; D) Excavation following D&D in the Former Production Area and Sewage Treatment Plant; E) Off-property and nonimpacted on-property area certification; and F) Non-high density polyethylene pipeline excavation outside the Former Production Area. Major differences among the six approaches include: extent of the predesign investigation, excavation sequence, excavation control monitoring, perched water controls, and Waste Acceptance Criteria (WAC) attainment requirements. Environmental controls and monitoring for individual soil remediation projects are developed as an integral part of the planning and design of the project (Section 5.0). Table 4-1 summarizes the six location-specific approaches tied to nine sitewide remediation areas and one off-site area.

The nine sitewide remediation areas are numbered 1 through 8 and 10, with Remediation Area 10 representing the long term corridors. Remediation Area 1 contains the Sewage Treatment Plant, Remediation Area 3 includes the Lime Sludge Ponds, and Remediation Area 6 contains the Fire

Training Facility and Solid Waste Landfill. Remediation Area 9 is the off-site property adjacent to the eastern boundary of the FEMP site. Figure 4-1 shows the location of nine remediation areas, their associated phases, and the proposed division into subareas that correspond to the various excavation approaches (i.e., A, B, C, etc). Remediation Area 10, the long term corridors, is shown on Figure B-18 in Appendix B of the Sitewide Sequencing Plan for remediation areas. It has not been depicted on figures in Section 4.0 in the interest of maintaining a clear picture of the principal remediation areas.

Table 4-2 summarizes the proposed excavation approaches in each remediation area. For example, Remediation Area 5 is in the Former Production Area and contains an existing soil stockpile; therefore, Excavation Approaches C and D apply to Remediation Area 5. This example is important to keep in mind because remediation will be implemented within a remediation area or subarea rather than within a single excavation-approach area (i.e., remediation of all areas designated as Excavation Approach A will not take place simultaneously).

The Sitewide Sequencing Plan for remediation areas (Appendix B) and the general remediation process presented on Figure 3-1 is followed in each of the location-specific excavation approaches, with individual variances noted in the subsections below. Principal steps in each excavation approach are 1) development and implementation of project specific plans (PSPs) to support the predesign investigation and remedial integrated design package; 2) soil excavation and segregation; 3) precertification activities; 4) certification and preparation of certification report; and 5) interim grading and restoration. Within each remediation step, distinct tasks are performed that are specific to each excavation approach. These tasks are tied to each excavation approach in Table 4-3 to provide a cross-comparison among the area-specific approaches. For example, 11 tasks comprise Remediation Step 1, 4 of which are common to all excavation approaches.

The remainder of Section 4.0 covers each of the six conceptual excavation approaches and provides a detailed discussion comparing the similarities and differences of the approaches in each remediation area (Table 4-3). Each excavation approach is discussed with respect to the rationale for its approach, a general description of the approach, special considerations for implementing the approach, and the implementation details of the tasks. Area-specific PSPs (Section 7.1) and IRDPs (Section 7.2) will reflect the conceptual approaches described in this section.

4.1 EXCAVATION APPROACH A-SHALLOW EXCAVATION OF IMPACTED ON-PROPERTY AREA OUTSIDE THE FORMER PRODUCTION AREA AND OTHER WASTE STORAGE/MANAGEMENT AREAS

Excavation Approach A is designed to handle shallow soil excavation that takes place in impacted areas (i.e., hot spots potentially present) which surround the Former Production Area. The nature and extent of Constituents of Concern (COCs) in areas proposed for Excavation Approach A is generally limited to a few COCs in localized areas of contamination restricted to the top few feet of soil. Most of the excavation area within the boundary of the FEMP is expected to follow Excavation Approach A.

Excavation Approach A will be applied to Remediation Areas 1, 2, 6, and 7 (Tables 4-1 and 4-2; Figures 4-1 and 4-2). Remediation Areas 1 and 2 encompass most of the perimeter of the FEMP, where soil exceeding final remediation levels (FRLs) has been documented through the collection of Remedial Investigation/Feasibility Study (RI/FS) characterization data. In Remediation Areas 6 and 7, Excavation Approach A will be applied to the areas between waste storage units and the Former Production Area. The list of potential area-specific COCs for these remediation areas is provided in Table 2-7.

4.1.1 General Description

Excavation Approach A follows the general soil remediation process discussed in Section 3.0. The soil remediation process begins by identifying area-specific constituents of concern (ASCOCs), preparing PSPs for the predesign investigation, estimating the extent of the excavation, and performing pre-excavation surveys and sampling activities. Radiological survey results and laboratory analytical data will be forwarded to the remedial design to delineate the extent of soil excavation for all applicable technetium-99, Resource Conservation and Recovery Act (RCRA) characteristic waste (within the seven locations shown on Figure 1-5), above-WAC, and above-FRL areas. This information will be incorporated into an IRDP and submitted to the U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (OEPA) for approval. After the IRDP has been approved, soil excavation will begin and materials delineated as technetium-99, RCRA toxicity characteristic, and above WAC will be segregated for treatment, if required, and disposal.

Upon completion of all excavation types, a precertification survey and/or sampling activities will commence, and the Certification Unit (CU) boundaries will be delineated to subdivide the remediated area for final certification. This information will be given to the EPA and OEPA as a Certification

Design Letter (CDL), which will establish the boundaries of the CUs, the list of CU-specific COCs requiring certification sampling, and the certification sampling approach. Certification sampling and analysis will follow and the results will be evaluated against the certification criteria to demonstrate that the CU can be released. Sampling locations, analytical results, statistical methods, and certification criteria used to pass the CUs in the remediated area will be summarized in the Certification Report. Following approval of the Certification Report of EPA and OEPA, interim or final grading and restoration activities will take place.

4.1.2 Special Considerations

Special considerations for implementing Excavation Approach A are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, and attainment of WAC.

4.1.2.1 Nature and Extent of Contamination

Excavation Approach A will be implemented in Remediation Area 1 (Figures 4-1 & 4-2) in areas that have not been remediated under the Area 1, Phase I project, which was completed prior to release of the final Soil Excavation Plan (SEP). Soil in Remediation Area 1 has been affected primarily by air deposition of uranium particles. This mode of deposition results in a relatively homogenous distribution of material over the land surface, and shallow excavations are expected to remove the contamination. Exceptions to this approach may be encountered in Remediation Area 1 along the north central boundary of the FEMP, where topographic data indicate thicknesses of fill in excess of 20 feet. RI/FS data collected on surface soil samples indicate the top 6 inches of the fill are not contaminated. However, if excavation activities are conducted in this portion of Remediation Area 1, additional radiological scans will be conducted on exposed excavation surfaces to assess the presence or absence of primary radiological COCs in the fill material.

In Remediation Area 2, Phase II operations will use Excavation Approach A to remove identified surface contamination. The Phase II operations will be implemented after Phase I work has removed the Flyash Piles and associated debris (Excavation Approach B, Section 4.2). In a similar fashion, Excavation Approach A will be applied to portions of Remediation Areas 6 and 7 after excavation of their respective waste storage units is complete (Section 4.2). Local excavation sequencing will be

developed in the IRDP to minimize the potential of recontamination and/or cross-contamination of remediated or nonimpacted areas.

4.1.2.2 Radiological Scanning and Field Measurements

Much of the area designated for remediation under Excavation Approach A is open field terrain that is amendable to radiological scanning using a large volume sodium iodide (NaI) detector mounted to a tractor (i.e., the RTRAK equipment). However, the northeast corner of Remediation Area 1 contains a stand of conifers that prevents use of the RTRAK for radiological scans. Therefore, in the forested portion of Remediation Area 1 and other locations that preclude the use of the RTRAK, radiological surveys may be conducted with a single, large-volume NaI detector mounted on a tri-wheel stroller (i.e., the RSS) that is pushed by personnel conducting the traverses. Alternatively, the in situ high purity germanium (HPGe) detector may be used to obtain information on the activity of gamma-emitting nuclides in the remediation area. Additional details on these instruments are provided in the Users Manual (DOE 1998c).

The time required to remediate areas designated as Excavation Approach A will be dependent on the number and types of COCs detected within the remediation areas and the type of radiological scanning equipment that can access the terrain. In Remediation Areas 2, 6, and 7, the presence of metal and organic COCs in waste storage areas dictates that volatile organic compound (VOC) monitoring with the photo-ionization detector (PID) and additional sampling and analysis may be required during the implementation of Excavation Approach A. These activities will be conducted independent of radiological scanning, resulting in an increase in the time required to excavate the soil. Additionally, radiological scanning of a unit soil area is likely to take longer in Remediation Areas 6 and 7 because access problems may limit the scanning to the RSS equipment rather than the RTRAK.

4.1.2.3 Attainment of Waste Acceptance Criteria

To assure that a high level of confidence is achieved in the ability to screen and segregate above-WAC material from material that can be placed in the OSDF, several independent methods will be used to demonstrate WAC attainment. RI/FS data will be used to focus PSPs and pre-excavation investigations on areas known to contain above-WAC materials. Above-WAC areas will be delineated for excavation by establishing the areal extent using real-time, large-volume NaI detectors. Radiological boundaries established by NaI detectors will be verified for uranium by obtaining field measurements with the

HPGe instrument and/or by the collection of physical samples. The WAC boundaries established by uranium will be used as a starting point for field and sampling activities that will establish the extent of above-WAC secondary ASCOCs (e.g., technetium-99 and metals). Discrete surface and subsurface soil samples will be collected to establish the extent of above-WAC secondary ASCOCs, as described in Section 3.1.3. The samples will be submitted for laboratory analysis (ASL B) of secondary ASCOCs to determine the extent of above-WAC material. All available field and laboratory data will be used to support the demonstration of WAC attainment.

4.1.3 Excavation Details

Figure 4-3 presents the logic flow for conducting Excavation Approach A. Each of the 23 tasks identified for this type of excavation is discussed in detail and tied to material presented in Sections 3.0 and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is provided in Table 4-3.

Task 1 - Potential Excavation Area Delineation and Data Review

This task is carried out as discussed in Section 3.1.1. The potential areas requiring Excavation Approach A have been defined using RI/FS data collected for uranium and are shown on Figure 4-2.

Task 2 - Select COCs and Identify Potential Technetium-99, RCRA, and Above-WAC Areas

The preliminary COC lists for Remediation Areas 1, 2, 6, and 7 are summarized in Table 2-7. These lists are derived from RI/FS characterization data and are divided into primary and secondary ASCOCs (Section 2.1.3.1). The ASCOCs will be finalized in the area-specific IRDPs.

Technetium-99 has been measured above the FRL in Remediation Area 6 near the eastern boundary with Remediation Area 3 (Figure 4-2).

The Trap Range is a potential RCRA area (i.e., the potential exists for soil to exhibit the toxicity characteristic) in the southern portion of Remediation Area 1, directly southeast of Remediation Area 5 (Figure 4-2). Soil removed from this potential RCRA area will be subjected to the Toxicity Characteristic Leaching Procedure (TCLP) tests to determine whether treatment is required prior to disposal.

000204

Based on the RI/FS characterization data for uranium, there are four known areas within the proposed Excavation Approach A boundaries with the potential to exceed established WAC levels for uranium (Figure 4-2). Above-WAC areas for uranium have been identified along the northern boundary of the Sewage Treatment Plant (Remediation Area 1), around the northwest perimeter of the Inactive Flyash Pile (Remediation Area 2), surrounding the south and east perimeter of the potential technetium-99 area in Remediation Area 6, and along the southern boundary of the Fire Training Facility in Remediation Area 6.

Task 3 - Pre-excavation Surveys and Sampling

Pre-excavation surveys and depth profile sampling discussed in area-specific PSPs (Section 7.1) will be implemented during the predesign investigation using the conceptual approach discussed in Section 3.1.2. Radiological field surveys will be carried out in accordance with the in situ gamma Users Manual (DOE 1998c) and the selection and use of laboratory analytical techniques are discussed in Appendix H. In general, the concentrations of uranium, thorium, and radium (i.e., primary constituents in Table 2-7) in surface and subsurface soil will drive the excavation. Initially, radionuclide activities will be established using RI/FS data, PSP data, surveys with NaI detectors, and/or by discrete measurements with HPGe field instruments. After the extent of radionuclide distribution is established with RI/FS, PSP, and survey data, additional discrete soil samples will be taken for laboratory analysis, as needed. In the event metal or organic ASCOC concentrations drive the soil excavation, field x-ray fluorescence (XRF), PID, or laboratory analysis may be used to characterize the discrete soil samples (Appendix H).

To establish the area extent of ASCOCs, RI/FS data will be used to minimize the number of samples collected during pre-excavation survey and sampling activities implemented via PSPs. In general, survey and sampling activities will be carried out by placing a grid with appropriate cell dimensions over the estimated excavation area and executing a systematic surface survey and/or sampling protocol. After establishing the area extent of excavation, applicable RI/FS and PSP data will be reviewed to determine the location and number of geoprobe borings. Geoprobe borings will be placed on the established perimeter of the excavation and within the delineated excavation area to determine the depth of excavation. Section 3.1.3 and Figure 3-3 provide details on the methods and protocols proposed for establishing the extent of excavation.

Task 4 - Delineate Excavation Extent Due to Technetium-99 Contamination

The extent of soil excavation needed to remove technetium-99 will be determined using RI/FS data and by implementing a PSP to obtain discrete samples from surface and subsurface locations, as needed. The number of additional sample locations will be determined by the adequacy of the RI/FS data, the cell dimensions of the surface grid, and the number of geoprobe borings needed to define the depth of excavation for soil containing technetium-99 above its FRL (Section 3.1.3). Samples will undergo laboratory analysis by liquid-scintillation or gas-proportional counting techniques to quantify the technetium-99 activity (Appendix H). Sample collection and handling procedures, laboratory protocols and methods, and instrument detection limits are presented in Appendices E and H.

Task 5 - TCLP Test and Delineate Characteristic Waste Extent

The extent of soil excavation needed to remove potential toxicity characteristic ASCOCs in the potential RCRA area identified as the former Trap Range in Remediation Area 1 (Figure 4-2) will be determined by obtaining discrete samples from the surface and subsurface locations. The number of sample locations will be established by the adequacy of RI/FS data, the cell dimensions of the surface grid, and the number of geoprobe borings needed to define the depth where COCs are below their FRLs (Section 3.1.3). Samples will undergo TCLP testing to determine what portions, if any, of the potential RCRA area exhibits the toxicity characteristic. If soil is identified as exhibiting the toxicity characteristic, it will be delineated as such to indicate that treatment is required prior to disposal.

Task 6 - Determine Remaining Excavation Extent

After excavation volumes for technetium-99 and identified toxicity characteristic COCs have been delineated, the excavation volumes for non-technetium-99, above-WAC soil, and soil above the FRLs for primary ASCOCs will be determined. If above-WAC soil is present in the four above-WAC areas identified on Figure 4-2, the excavation extent will be determined as described in Section 3.1.3. The entire footprint for the delineated above-WAC soil area will be excavated to the depth corresponding to WAC attainment. After the delineation of all above-WAC areas, soil remaining above the FRLs of the ASCOCs will be delineated for excavation.

Task 7 - Prepare Area-Specific IRDP

An area-specific IRDP (i.e., a remedial design) will be prepared as presented and discussed in Sections 3.2 and 7.2. The IRDP must be approved by the EPA and OEPA prior to beginning excavation activities.

Task 8 - Prepare Excavation Site

Prior to and during excavation, a number of institutional and constructional measures will be implemented to control access to the area, prepare staging areas, prevent the spread of contaminated soil, and dispose of cleared shrubs and trees, as needed. Section 3.3.1.1 and Appendix F.2 further discuss site preparation activities.

Task 9 - Implement Run-off Control, As Needed

Based on the levels of contamination and the extent of excavation, an appropriate surface water management system will be implemented to ensure that water and sediment run-off/run-on is maintained and erosion is controlled to prevent cross-contamination of remediation areas during excavation. This system will conform to the FEMP National Pollution Discharge Elimination System (NPDES) Permit requirements through implementation of the FEMP Storm Water Pollution Prevention Plan (SWPPP) (DOE 1996c). Sections 3.3.1.1 and 5.1.3 discuss additional details of the run-off control measures.

Task 10 - Technetium-99 - Driven Excavation

Soil delineated as at or above the FRL for technetium-99 in Remediation Area 6 (Figure 4-2) will be excavated and staged prior to packaging and shipment to an off-site disposal facility. This excavation may be coordinated with removal of soil having non-technetium-99 ASCOCs above the WAC if the excavation volumes overlap. That is, if ASCOCs other than technetium-99 are above the WAC and present in the soil volume designated for technetium-99 excavation, they will be removed and segregated with the technetium-99 soil rather than with the non-technetium-99, above-WAC soil. Additionally, if the technetium-99 excavation overlaps with the excavation of soil that has failed the TCLP test, the excavated technetium-99 and toxicity characteristic soil will be treated prior to disposal. Additional information on excavation and disposal protocols is provided in Sections 3.3.1.2 and 3.3.1.3, and procedures to be followed for excavated material management are covered in Appendix F.5.

Task 11 - Characteristic Waste-Driven Excavation and Treatment

RCRA areas containing soil that exhibits the toxicity characteristic will be treated in situ then excavated or will be excavated and staged until Waste Management Programs (WMP) establishes the treatment and disposal options. If the toxicity characteristic soil contains radiological COCs above the WAC (e.g., uranium), the above-WAC soil will be excavated and staged for treatment prior to removing the above-FRL soil. Additional excavation and disposal information is provided in Sections 3.3.1.2 and 3.3.1.3, and procedures to be followed for excavated material management are covered in Appendix F.5.

Task 12 - Non-Technetium-99, WAC-Driven Excavation/Confirmation

There are 4 known soil areas in Remediation Areas 1, 2, and 6 that have the potential to exceed the established WAC levels (Figure 4-2). If RI/FS data and surveying and sample analysis carried out to define the excavation volumes indicates ASCOC concentrations above the WAC, the extent will be delineated with respect to non-technetium-99, above-WAC soil. The above-WAC soil will be excavated and segregated to isolate the above-WAC material prior to off-site disposal. Additional excavation and disposal information is provided in Sections 3.3.1.2 and 3.3.1.3.

Task 13 - FRL-Driven Excavation

After completing the excavations to remove soil containing technetium-99 above its FRL/WAC, soil exhibiting the toxicity characteristic (i.e., potential RCRA area), and soil exceeding the WAC, any remaining soil with uranium, thorium, radium, metal ASCOCs, and/or organic ASCOCs above their respective FRL will be excavated and staged (if needed) prior to placement in the OSDF. WAC attainment will be demonstrated for the excavated material placed in the OSDF using the field and analytical methods discussed in Section 4.1.2 and Appendix H. Additional excavation and disposal information is provided in Section 3.3.1 and Appendix F.

Task 14 - Precertification Scan

Upon completion of excavation activities within the remediation area, the area will be prepared for a precertification survey. The radiation survey will be conducted with NaI detectors and/or by discrete measurements with field instruments containing an HPGe detector. Precertification will be based on the residual activity of primary radioactive ASCOCs in the soil, except in areas where technetium-99, metal ASCOCs, and/or organic ASCOCs drive the excavations. For these exceptions, discrete samples

may be collected to supplement the pre-excavation data, as needed. Additional details, on precertification activities are presented in Section 3.3.3.

Task 15 - CU Delineation/Classification

As part of the precertification survey, the excavated remediation area will be divided into certification units (CUs) and CU footprints will be defined. CUs will be up to 500 ft by 500 ft (Group 2 CU) in Remediation Areas 1 and 2 and up to 250 ft by 250 ft (Group 1 CU) in Remediation Areas 6 and 7. A Group 1 classification in Remediation Areas 6 and 7 has been selected to provide denser sample coverage in areas containing waste storage units. Section 3.4.1 contains additional details on the delineation and classification of CUs.

Task 16 - Evaluate Precertification Scan Results

RI/FS data and results from the precertification scan and/or supplemental sampling and analysis will be reviewed to assess the residual pattern of primary ASCOCs across the excavated area. FRL attainment for radiological, metal, and organic ASCOCs will be evaluated with RI/FS data and samples collected via PSPs during pre-excavation characterization and/or supplemental sampling and analysis, as needed. Additional assurance will be provided for the radiological ASCOCs by conducting HPGe measurements above designated certification sample locations prior to obtaining certification samples. Section 3.3.4 provides additional details on the attainment of remediation goals prior to conducting certification activities.

Task 17 - Hot-Spot/FRL Excavation/Confirmation

Hot spots delineated by the precertification scan in Task 14 (i.e., any of the primary radiological COCs in Table 2.6 that is greater than three times its FRL) will be reexcavated, and the precertification scan will be repeated on the re-excavated areas to confirm removal of radiological ASCOCs. This step will be reiterated as needed until the CU is determined to be ready for formal certification.

Task 18 - Prepare Certification Design Letter

When the CU is determined to be ready for certification, a CDL will be prepared to detail the CU delineation and the certification sampling approach and locations (Section 7.3). The CDL will be submitted to EPA and OEPA for review and approval. Upon approval of the CDL by EPA and

OEPA, the sample locations will be considered fixed and they may not be moved without review and concurrence by EPA and OEPA.

Task 19 - CU-Specific Certification Sampling

Based on the Data Quality Objectives (DQOs) and CU-specific sampling needs, a sufficient number of samples (generally 12 to 16) will be collected from each CU to certify all CU COCs. HPGe measurements may be collected for uranium, thorium, and radium for data comparison with physical sampling results. Section 3.4.2 provides additional details on the certification sampling design.

Task 20 - Certification/Recertification

A statistical analysis will be performed on the validated analytical results obtained from the certification samples to establish whether the CU passes the certification criteria at the specified level of uncertainty. Two criteria must be met for the CU to be certified as passing. The first criterion is that each individual sample within a CU must show each primary, CU-specific COC to be below a value of two times its FRL. When the data distribution is normal or lognormal, the second criterion compares the 95 percent upper confidence level (UCL) of the mean of each primary CU-specific COC and the 90 percent UCL of the mean of each secondary CU-specific COC to the appropriate FRL to make a pass/fail decision. In the event the data distribution is nonparametric, the pass/fail decision for the second criterion will follow the statistical protocol given in Appendix G. When the UCL of the mean (normal or lognormal distribution) of each CU-specific COC is less than its FRL or the appropriate nonparametric test is passed (Appendix G), the CU is certified as passing the second criterion. Both criteria must be met for the CU to be certified.

Task 21 - Additional Hot Spot/FRL Excavation/Confirmation

In the event either one of the two criteria fails in Task 19, additional excavation, field screening and surveying, sampling, and analysis will be conducted until the CU passes certification. The nonattainment scenarios that pertain to additional excavation and sampling activities are discussed in Section 3.4.5.

Task 22 - Prepare Certification Report

After both certification criteria are shown to pass the evaluation, individual CUs will be considered certified. As each CU is demonstrated to pass certification, analytical data will be communicated to

the EPA through the posting of data results and information via a web site. A Certification Report will be issued for each remediation area after all CUs within the remediation area have been shown to pass the certification criteria. Further discussion on the content of this report is provided in Section 7.4..

Task 23 - Area-Wide Interim Grading and Restoration

After the Certification Report has been approved by the EPA, interim grading and restoration will be implemented to stabilize the excavation slopes prior to final sitewide grading and restoration. Interim grading and restoration activities are described in Appendix F.6.

4.2 EXCAVATION APPROACH B - EXCAVATION IN WASTE STORAGE/MANAGEMENT AREAS OUTSIDE THE FORMER PRODUCTION AREA

Excavation Approach B is designed to handle moderate to deep excavation of Operable Unit 2 waste units and of soil that underlies current waste storage/management area in Operable Units 1, 2, and 4. Soil underlying the waste storage/management areas is expected to be adversely affected by contaminants. The list of potential ASCOCs in the soil areas proposed for Excavation Approach B (Table 2-7) is expected to reflect RI/FS data on the waste presently stored in the remediation areas. However, the distribution of COCs in soil under the waste storage/management areas cannot be fully established until waste has been removed from the remediation areas.

Excavation Approach B will be applied to the Operable Unit 2 waste units and soil underlying waste storage areas in Remediation Areas 2, 3, 6, and 7 (Tables 4-1 and 4-2; Figures 4-1 and 4-4). Remediation Areas 2, 3, 6, and 7 encompass the waste storage areas of Operable Units 1, 2, and 4. The waste storage areas include the Southern Waste Units (a.k.a. the Inactive and Active Flyash Piles and South Field area) in Remediation Area 2, the Lime Sludge Ponds in Remediation Area 3, the Operable Unit 1 waste pits and Solid Waste Landfill in Remediation Area 6, and Operable Unit 4 silos housing the K-65 and metal-oxide material (Remediation Area 7).

4.2.1 General Description

Excavation Approach B follows the general soil remediation process discussed in Section 3.0. The soil remediation process in Remediation Areas 2, 3, and 6 is coupled with the removal of materials in the Southern Waste Units, Lime Sludge Ponds, and Solid Waste Landfill because all these materials will go to the OSDF if the WAC are met. In Remediation Areas 6 and 7, the soil remediation process

begins after waste materials have been removed because the Operable Units 1 and 4 waste materials will be shipped off site for disposal.

A predesign investigation will be conducted to estimate the extent of the excavation and above-WAC material using RI/FS data, pre-excavation surveys, and additional sampling activities, as dictated by PSPs. Radiological survey results and laboratory analytical data are forwarded to the remedial design- to delineate the extent of soil excavation for technetium-99, RCRA (within the seven locations shown on Figure 1-5), HWMUs, and above-WAC and above-FRL areas. This information will be incorporated into an IRDP and submitted to the EPA and OEPA for approval.

After the IRDP has been approved, waste and soil excavation will begin and materials delineated as technetium-99, RCRA toxicity characteristic, and above WAC will be segregated for treatment, if required, and disposal. Because moderate to deep soil excavations are expected within the waste storage footprints, excavation will proceed in layers or lifts, with each layer being surveyed with a large-volume NaI detector and/or an HPGe instrument to demonstrate WAC attainment for primary radiological COCs. The specification of lift thickness for radiological scanning under Excavation Approach B will be defined for EPA and OEPA approval as part of the detailed design documentation. If special materials (Section 3.3.2.2) are encountered during the excavations, the materials will be handled, treated (as needed), and disposed of in accordance with the procedures outlined in Appendix F.5.

Upon completion of all excavation activities, the precertification survey, sampling activities, delineation of CU boundaries, and final certification effort follow the general approach discussed in Section 4.1.1.

4.2.2 Special Considerations

Special considerations for implementing Excavation Approach B are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, attainment of WAC, and logistics.

000212

4.2.2.1 Nature and Extent of Contamination

Contamination associated with Excavation Approach B areas is tied to waste storage/management areas in Operable Units 1, 2, and 4. The nature of contamination at the Southern Waste Units, Lime Sludge Pond, and Solid Waste Landfill (placed in Remediation Areas 2, 3, and 6) includes radiological, metal, and organic ASCOCs (Table 2-7), with contamination expected to extend to moderate to deep levels below the surface. RI/FS data indicate the potential for technetium-99 and uranium to be above the WAC in the Southern Waste Units. Characterization of the waste materials will be limited to delineation and removal of above WAC material for off-site disposal, with all remaining material sent to the OSDF. RI/FS data will be used to determine whether additional characterization data are needed to delineate above-WAC waste material.

Waste materials will be removed from the waste units associated with Operable Units 1 and 4 prior to completing ASCOC characterization of underlying soil. In general, the nature of soil contamination below the waste units is expected to follow the COCs associated with the waste materials, with the extent of soil contamination established by PSPs during the pre-excavation investigation. The potential above-WAC technetium-99 zones associated with Waste Pit 5 in Remediation Area 6 and the western part of the slurry line near Silos 1 and 2 in Remediation Area 7 indicate the potential for soil underlying these waste units to be contaminated with technetium-99.

4.2.2.2 Radiological Scanning and Field Measurements

In Remediation Areas 2, 3, and 6, the Southern Waste Units, Lime Sludge Ponds, and Solid Waste Landfill will be characterized, as needed, and excavated as part of Excavation Approach B. The nature of contamination in these waste units will require radiological scanning of the waste materials, field measurements with the HPGe to detect gamma-emitting radionuclides, and VOC monitoring using PID meters.

A layer-by-layer radiological scan with a large-volume NaI detector will be conducted on the waste material and if above-WAC material is identified, HPGe measurements may be taken to identify gamma-emitting radionuclides and/or a geoprobe sample may be taken for characterization of pertinent ASCOCs. In the Solid Waste Landfill, field measurements or scanning for organic vapors will be conducted in addition to the radiological scans. However, the following special circumstances may limit the field activities.

The rheology of Lime Sludge Ponds material may not allow loading of the surface, which would eliminate walk-over radiation surveys and systematic sampling efforts. Under these conditions, materials will be screened and sampled after excavation. Similar consideration must be given to the heterogeneity of materials expected to be found in the Solid Waste Landfill when conducting radiation surveys and sampling activities. Excavation of the Solid Waste Landfill is not anticipated to result in the smooth surfaces expected for soil excavations. Therefore, the geometry of the surface must be considered when radiation scans and/or HPGe measurements are performed. The heterogeneity of materials expected to be found in the Solid Waste Landfill also creates unique problems with sampling efforts designed to identify metals above-WAC, as no real-time scanning instrument similar to NaI detectors and PID meters is available for metal COCs.

4.2.2.3 Attainment of Waste Acceptance Criteria

WAC attainment will be carried out using the general approach discussed in Section 4.1.2, with the following exceptions. The Southern Waste Units, Lime Sludge Ponds, and Southern Waste Landfill will undergo a layer-by-layer NaI scan on each lift surface during excavation, if possible, to identify material containing uranium above its WAC. Details on the execution of such scans and the level of radioactive that indicates potential WAC material are presented in the User's Manual (DOE 1998c). If an in situ scan is not possible, excavated material will be stockpiled and scanned to determine whether the uranium WAC is met. Secondary ASCOCs will be shown to comply with the WAC by sampling and analysis of in situ or stockpiled material, with the exception of the Southern Waste Landfill.

For the heterogeneous materials expected to be found in the Southern Waste Landfill, radiation surveys can demonstrate WAC attainment for uranium when scanning of the exposed surfaces in the Southern Waste Landfill is possible, but it is not feasible to sample 100 percent of the waste to demonstrate WAC attainment for other ASCOCs. Therefore, biased sampling, based on radiation and organic-vapor surveys during excavation will be coupled with random sampling during the predesign investigation to demonstrate WAC attainment.

4.2.2.4 Logistics

Soil characterization and excavation activities conducted in waste storage footprints associated with Remediation Areas 6 and 7 will proceed after the waste materials are removed. Removal of waste material and structures associated with the Operable Unit 1 Waste Pits (Remediation Area 6) will be

000214

carried out under the Waste Pits Remedial Action Project. Waste materials and structures associated with the Operable Unit 4 Silos (Remediation Area 7) will be removed under the Silos Project. Therefore, the source of radon in the Operable Unit 4 silos will be removed from the area prior to remediation of soils and there is no source present to emit radon-222 in sufficient concentration to exceed the 40 CFR 61 Subpart Q limit of 20 pCi/m2/sec. Required radon monitoring at the FEMP is addressed in the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997a).

The potential for deep excavations (i.e., greater than 20 ft) in the waste storage areas poses logistical problems as well as health and safety concerns. Excavation of soil, layer by layer, will be slow because of continual radiation scanning of the excavation surfaces for primary ASCOCs, the dewatering of perched water zones, and the need to construct soil ramps or retaining walls to achieve the target depth of excavation. Additionally, radiological scanning of successively deeper layers is likely to take longer than initial surface scans because access problems may limit the scanning to hand-held instruments rather than the RTRAK.

In addition to the challenges posed by deep excavations, the presence of metal and organic COCs in the waste storage areas dictates that VOC monitoring and additional sampling and analysis may be required during the implementation of Excavation Approach B. These activities will be conducted independently of radiological scanning, resulting in an increase in the time required to excavate the soil.

4.2.3 Excavation Details

Figure 4-5 presents the logic flow for conducting Excavation Approach B. Each of the 25 tasks identified for this type of excavation is discussed in detail and tied to material presented in Sections 3.0, 4.0, and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is provided in Table 4-3.

Task 1 - Potential Excavation Area Delineation and Data Review

This task is carried out in the general manner outlined in Section 3.1.1. The potential areas requiring Excavation Approach B are shown on Figure 4-4 and have been defined where RI/FS data for uranium are available. However, much of the potential excavation area will not be defined rigorously until

waste is removed from the waste storage units and the extent of ASCOCs in the underlying soil is determined.

Task 2 - Select COCs and Identify Potential Technetium-99, RCRA, HWMU, and Above-WAC Areas

The preliminary COC lists for Remediation Areas 2, 3, 6, and 7 are summarized in Table 2-7. These lists are derived from RI characterization data and divided into primary and secondary ASCOCs (Section 2.1.3.1). The ASCOCs will be finalized in the area-specific IRDPs.

Technetium-99 has been measured above the FRL in three of the four remediation areas designated for Excavation Approach B: near the northwest corner of the Southern Waste Units in Remediation Area 2, in the northeast corner of Waste Pit 5 (Remediation Area 6), and surrounding the west portion of the slurry line in Remediation Area 7 (Figure 4-4). Most of the technetium-99 material in Remediation Areas 6 and 7 is likely to be removed with the waste materials prior to conducting soil excavation activities. However, the material in the Southern Waste Units and soil underlying the waste storage areas will be investigated for potential technetium-99 removal under this excavation approach.

There are two potential RCRA areas (i.e., potential for soil to exhibit the toxicity characteristic) in areas covered by Excavation Approach B: Remediation Area 7, directly west of the waste storage units that comprise Silos 1 and 2, and the South Field Firing Range in Remediation Area 2 (Figure 4-4). Soil and material from the South Field Firing Range that exhibits the toxicity characteristic will be shipped off site for disposal.

Two HWMUs are located in Remediation Area 6: HWMU #27 - Waste Pit 4 and -HWMU #42 - Waste Pit 5 (Table 2-1; Figure 4-4). The characterization and excavation of soil underlying waste materials in these HWMUs and the closure of the HWMUs will be covered under this excavation approach.

Based on the RI/FS characterization data for uranium, there are two known areas within the proposed Excavation Approach B boundaries with the potential to exceed established WAC levels (Figure 4-4). Above-WAC areas for uranium have been identified along the eastern margin of the waste pit area in Remediation Area 6 and along the northwest margin of the Southern Waste Units in Remediation Area 2. It is likely that much of the above-WAC material in Remediation Area 6 will be removed

when the waste materials are removed. However, underlying soil will be sampled and analyzed to determine whether above-WAC soil exists. All above-WAC material in Operable Unit 2 waste units and above-WAC soil underlying all waste units will be excavated and handled under this approach.

Task 3 - Pre-excavation Surveys and Sampling

Pre-excavation surveys and sampling will be carried out as described under Task 3 in Section 4.1.3, with the exception of the following scenarios. The rheology of material in the Lime Sludge Ponds may not permit loading of the surface, and walk-over radiation surveys and systematic in situ sampling may not be possible. Under these conditions, radiological scanning and sampling will take place on excavated material that has been stockpiled. A second potential scenario that varies from standard protocol is the sampling of heterogenous material in the Solid Waste Landfill. Although radiation surveys can demonstrate WAC attainment for primary radiological COCs by scanning of accessible exposed surfaces in the Solid Waste Landfill, it is not feasible to sample 100 percent of the waste to demonstrate WAC attainment for other COCs. Therefore, biased sampling, based on radiation and organic-vapor surveys, will be coupled with random sampling to demonstrate WAC attainment.

Task 4 - Delineate Excavation Extent Due to Technetium-99 Contamination

Delineation of the extent of technetium-99 will be carried out as described under Task 4 in Section 4.1.3, with the exception of the following scenario. Waste material in the northwest corner of the Southern Waste Units that contains technetium-99 above its FRL (i.e., the Inactive Flyash Pile) will be delineated for excavation in addition to potential technetium-99 soil areas.

Task 5 - TCLP Test and Delineate Characteristic Waste Extent

The extent of soil excavation needed to remove potential toxicity characteristic ASCOCs in the RCRA area west of Silos 1 and 2 will be determined by obtaining discrete samples from surface and subsurface locations. The sampling and analysis protocol to delineate potential toxicity characteristic soil will be carried out as described under Task 5 in Section 4.1.3.

Task 6 - Determine Remaining Excavation Extent

After excavation volumes for technetium-99 and identified toxicity characteristic ASCOCs have been delineated, the excavation volumes for non-technetium-99, above-WAC soil and soil above the FRLs for ASCOCs will be determined. If above-WAC soil is present in the two above-WAC areas identified

on Figure 4-4, the area will be delineated and excavated as described under Task 6 in Section 4.1.3. The general approach for determining the excavation extent of soil containing ASCOCs above the FRL is described in Section 3.1.3.

Task 7 - Prepare Area-Specific IRDP

The area-specific IRDP will be prepared as discussed under Task 7 in Section 4.1.3.

Task 8 - Prepare Excavation Site

The excavation site will be prepared as discussed under Task 8 in Section 4.1.3.

Task 9 - Implement Run-off Control As Needed

Run-off control will be implemented as discussed under Task 9 in Section 4.1.3.

Task 10 - Technetium-99-Driven Excavation

Soil delineated as at or above the FRL for technetium-99 (Figure 4-4) will be excavated and staged prior to packaging and shipment to an off-site disposal facility. This excavation will be carried out as discussed under Task 10 in Section 4.1.3.

Task 11 - Characteristic Waste-Driven Excavation and Treatment

Excavation and treatment of identified RCRA toxicity characteristic soil will be carried out as discussed under Task 11 in Section 4.1.3.

Task 12 - Implement Perched Water Control, As Needed

If excavation activities encounter uncontaminated perched water, controls will be implemented to pump and contain the perched water prior to discharge. In the event perched water is recovered from a zone identified to contain RCRA characteristic waste, sampling and analysis will be carried out to determine whether toxicity characteristic COCs are present in sufficient concentration to warrant sending the water to the AWWT facility for treatment. The perched water control actions are presented in Section 2.5.4.

Task 13 - Layer-Specific, Pre-excavation, Non-Technetium-99 WAC Scan

During moderate to deep excavations, soil will be removed in layers. As each layer is stripped away, a gamma scan will be conducted on the exposed soil to determine whether uranium is present above the WAC level. This survey will be conducted with the radiation scanning system (RSS) or hand-held NaI detectors and/or by discrete measurements with a field instrument containing a HPGe crystal. When a radiological scan indicates uranium is above the WAC, a geoprobe boring will be extended to collect samples and determine the vertical extent of above-WAC material for all pertinent ASCOCs.

In the event material cannot be surveyed in situ (e.g., Lime Sludge Ponds material), the radiological scan for WAC attainment will be conducted on excavated material staged for disposal. If ASCOCs associated with identified RCRA toxicity characteristic soil and HWMUs drive the soil excavation, field XRF, PID, or laboratory analysis may be used to delineate ASCOCs that are above the WAC levels when pre-excavation data are not sufficient to assess WAC attainment.

Task 14 - Non-Technetium-99, WAC-Driven Excavation/Confirmation

There are two known soil areas that have the potential to exceed the established uranium WAC level in Remediation Areas 2 and 6 (Figure 4-4). However, the potential also exists for soil to exceed the WAC under the waste storage units, HWMUs, and other areas within the remediation areas. If soil containing ASCOCs at or above the WAC is determined to exist through review of RI/FS data and pre-excavation characterization activities, the extent will be delineated with respect to non-technetium-99, above-WAC soil exhibiting toxicity characteristic ASCOCs (treatment required) and non-technetium-99, above-WAC soil. These above-WAC soil types will be excavated and segregated to isolate the above-WAC material requiring treatment. All above-WAC material will be shipped off site for disposal. Additional excavation and disposal information is provided in Sections 3.3.1.2 and 3.3.1.3.

Task 15 - FRL-Driven Excavation

The FRL-driven excavation will be carried out as described under Task 13 in Section 4.1.3. WAC attainment will be demonstrated for the excavated material placed in the OSDF using the field and laboratory analytical methods described in Section 4.2.2 and Appendix H.

Task 16 - Precertification Scan

The precertification scan will be carried out as discussed under Task 14 in Section 4.1.3.

Task 17 - CU and HWMU Footprint Delineation/Classification

As part of the precertification survey, the excavated remediation areas will be divided into CUs, and CU footprints will be defined. Group 1 CUs (up to 250 ft by 250 ft) will be established after Excavation Approach B has been executed. Each HWMU footprint in Remediation Area 6 (i.e., Waste Pits 4 and 5) will be delineated as a specific, special CU and will be certified for closure independent of the nominal CUs that surround them. Section 3.3.3.2 contains additional details on the delineation and classification of CUs and HWMUs.

Task 18 - Evaluated Precertification Scan Results

Evaluation of the precertification scan results will be carried out as described under Task 16 in Section 4.1.3.

Task 19 - Hot-Spot/FRL Excavation/Confirmation

Hot-spot evaluation will be carried out as discussed under Task 17 in Section 4.1.3.

Task 20 - Prepare Certification Design Letter

When the CU is determined to be ready for certification, a CDL will be prepared to detail the sampling approach and locations (Section 7.3). The CDL will be submitted to EPA and OEPA for review and approval. Upon approval of the CDL by EPA and OEPA, the sample locations will be considered fixed and they may not be moved without review and concurrence by EPA and OEPA.

Task 21 - CU-Specific Certification Sampling

Certification sampling will be conducted as presented under Task 19 in Section 4.1.3, with the exception of evaluating HWMU closure.

Task 22 - Certification/Recertification

Certification will be evaluated as discussed under Task 20 in Section 4.1.3, with the exception of evaluating HWMU closure.

For closure of the HWMUs, analytical results will be reviewed and closure will be complete if the average concentration of each COC is below its respective FRL. Additionally, the HWMU closure will meet all substantive requirements of the RCRA and Ohio hazardous waste closure regulations (Section 2.2.5).

Task 23 - Additional Hot-Spot/FRL Excavation/Confirmation

Additional hot-spot evaluation will be carried out as discussed under Task 21 in Section 4.1.3, with the exception of HWMU closures.

If the HWMU fails the closure test, the HWMU will be reexcavated to remove the anomalies, and sampling, analysis, and statistical tests will be repeated until closure meets all substantive requirements of the RCRA and Ohio hazardous waste closure regulations.

Task 24 - Prepare Certification Report

The Certification Report will be prepared after the completion of excavation in the remediation area, as presented under Task 22 in Section 4.1.3. HWMU closure will be reported as part of the Certification Report. Additionally, in accordance with the OEPA Director's Final Findings and Orders (OEPA 1996), HWMU closures will be documented in the Remedial Action Reports submitted for the former operable units and the SCEP.

Task 25 - Area-Wide Interim Grading and Restoration

Interim grading and restoration activities will be carried out as described under Task 23 in Section 4.1.3.

4.3 EXCAVATION APPROACH C - EXCAVATION OF EXISTING SOIL STOCKPILES AND MANAGEMENT OF CONTAINERIZED SOIL IN THE FORMER PRODUCTION AREA AND REMEDIATION AREA 1, PHASE I

Excavation Approach C is designed to remove existing soil stockpiles in the Former Production Area (a.k.a. Removal Action 17) and in Remediation Area 1, Phase I. Most of these stockpiles are distinct from intermittent, characterized stockpiles created during remedial actions because little to no characterization data are available to trace the soil to a source. For soil stockpiles in the Former Production Area, this approach will apply only to delineation and removal of the soil stockpile, with the underlying soil evaluated for removal by Excavation Approach D (Section 4.4). The purpose for

handing the underlying soil to Excavation Approach D is to allow the soil in the entire Former Production Area to be remediated at one time; following removal of all buildings, structures, and stockpiles. The soil stockpiles in Remediation Area 1, Phase I will be removed to the former, initial grade surface with the former footprint of the piles to be addressed as part of Area 1, Phase II under Excavation Approach A. When necessary, this approach will also be applied to other soil stockpiles which may require characterization before being excavated. A list of potential primary and secondary ASCOCs for Excavation Approach C (Table 2-7) areas will be based on the COC list for the remediation areas that contain the piles (i.e., Remediation Areas 1, 3, and 5).

Excavation Approach C will be applied to the six existing soil stockpiles in Remediation Areas 1, 3, and 5 (Tables 4-1 and 4-2; Figures 4-1 and 4-6). Two of the stockpiles are located northwest of the Sewage Treatment Plant in the eastern corridor of Remediation Area 1 and four of the soil stockpiles are located in the northwest portion of Remediation Area 3. This approach is not likely to be applied to future, temporary stockpiles that may be generated during remediation activities because the material in such piles will be characterized before the temporary stockpile is formed.

Containerized soil will also be addressed under this excavation approach. DOE will prepare a PSP for EPA and OEPA review and approval that will present the required sampling and analysis and the disposition strategy for the containerized soil. No additional containerized soil will be bulked until this PSP is approved.

4.3.1 General Description

Excavation Approach C follows the first half of the general soil remediation process discussed in Section 3.0. This approach terminates when the soil stockpiles have been removed. For stockpiles in the Former Production Area, the stockpile footprint and the certification process are forwarded to Excavation Approach D (Section 4.4). The purpose for handing the underlying soil to Excavation Approach D is to allow the soil in the entire Former Production Area to be remediated at one time, after all buildings, structures, and stockpiles have been removed. After removal of the two stockpiles in Remediation Area 1, Phase I, to the former, initial grade surface, WAC attainment sampling will be conducted on the top six inches of soil prior to final sampling and analysis for certification.

Characterization of the soil stockpiles will begin by conducting a predesign investigation to delineate the soil stockpile to be removed, identify COCs, and perform pre-excavation surveys and sampling activities. Where the soil stockpile origin history is not known, the predesign characterization step will include an evaluation for RCRA toxicity characteristics using the "20 times rule" and/or TCLP sampling. This pile sampling will follow EPA SW-846 sampling strategies and OSWER Directive 9938.4-03 RCRA Waste Characterization Objectives. The remaining sampling activities will be carried out to achieve a density of surface and subsurface sampling points similar to the RI/FS sampling density in the Former Production Area or in the vicinity of the stockpile. For the eastern and western stockpile in Remediation Area 1, Phase I (Figure 4-6), sample density will be determined in the PSPs developed for the stockpiles. Radiological survey results and laboratory analytical data will be forwarded to the remedial design to delineate the extent of excavation for technetium-99, RCRA (within the seven locations shown on Figure 1-5), above-WAC, and above-FRL areas. This information will be incorporated into an excavation work plan and submitted to the EPA and OEPA for approval.

After the excavation work plan has been approved, removal of the soil stockpiles will begin and soil delineated as technetium-99, RCRA toxicity characteristic, and above WAC will be segregated for treatment, if required, and disposal. Because of the potential for heterogeneity within the stockpiles, excavation may proceed in layers, with each layer being surveyed by a large-volume NaI detector for attainment of uranium WAC. The excavation lift thickness will be specified in the follow up design documentation for the stockpile of interest. If special materials are encountered during the removal activities (Section 3.3.2.2), the materials will be handled, treated (as needed), and disposed of in accordance to the procedures outlined in Appendix F.5. Upon removal of the stockpiles in the Former Production Area, the soil footprint will be remediated and certified under Excavation Approach D.

4.3.2 Special Considerations

Special considerations for Excavation Approach C are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, and attainment of WAC.

4.3.2.1 Nature and Extent of Contamination

The origin of soil and material placed in the five stockpiles located in the Former Production Area (Figure 4-6) is largely unknown. Therefore, characterization and excavation activities will proceed in a systematic and controlled manner to ensure health and safety protocol is met and all materials are identified correctly. These activities will be coordinated with D&D operations in the Former Production Area to ensure access corridors and staging areas can be developed where they are needed. Characterization activities will be carried out according to the area-specific PSP, which will generally propose to generate a sample point density that is equivalent to RI/FS sample point density in the Former Production Area. Based on the characterization data, excavation may proceed layer by layer with real-time scanning of each layer for gamma activity and organic vapors.

4.3.2.2 Radiological Scanning and Field Measurements

Radiological scanning and field measurements will be carried out using the instruments and approach summarized in Section 4.1.2, with the following exceptions. In situ HPGe measurements may not be possible if the pile geometry (e.g., a conical form) prevents acquisition of a representative spectra. Although RCRA listed or characteristic organic waste is not expected to be present in the stockpiles, monitoring for organic vapors will be conducted during excavation activities.

4.3.2.3 Attainment of Waste Acceptance Criteria

WAC attainment will be demonstrated using a combination of data obtained from NaI surveys and HPGe measurements (if possible) as well as sampling and analysis carried out via area-specific PSPs. Scans with NaI detectors will be used on each excavation layer within the pile, if possible, or on the unit volume removed by the excavation equipment during remediation. If radiological scans indicate uranium exceeds the WAC in zones not characterized by PSP sampling and analysis, additional sampling and analysis will be performed to determine whether secondary ASCOCs exceed the WAC. When additional assurance is needed to confirm the WAC scans, discrete samples may be collected for laboratory gamma spectroscopy analysis. Use of the HPGe instrument to establish WAC attainment may not be possible because of the geometry of the stockpiles.

4.3.3 Excavation Details

Figure 4-7 presents the logic flow for conducting Excavation Approach C. Each of the 15 tasks identified with this type of excavation is discussed in detail and tied to material presented in

Sections 3.0, 4.0, and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is provided in Table 4-3.

Task 1 - Stockpile Delineation and Data Review

The current estimated areas for the 6 soil stockpiles discussed under Excavation Approach C are shown on Figure 4-6. Additional data will be collected and reviewed, as necessary, to determine initial characterization aspects of the soil and final area boundaries prior to removal. If future remediation activities generate additional uncharacterized stockpiles that are to be remediated under Excavation Approach C, they will be delineated in a similar manner.

Task 2 - Select COCs and Identify Potential Technetium-99, RCRA, and Above-WAC Areas

The preliminary ASCOCs lists for Remediation Areas 1, 3, and 5 are summarized in Table 2-7. These lists are derived from RI/FS characterization data and are divided into primary and secondary ASCOCs (Section 2.1.3.1). The ASCOCs will be finalized in the area-specific IRDPs. In general, the full list of 18 numerical WAC constituents of concern will be utilized for existing stockpiles, where the original history of the stockpile does not support use of a defensible short list. The constituent of concern list will also include RCRA toxicity characteristic testing, for those situations where, as mentioned earlier, the origin history of the pile is not known. If an acceptable shortlist can be utilized for a particular stockpile based on pile history and/or followup supplemental sampling, it will be proposed for stockpile-specific EPA and OEPA acceptance through the PSP and design-level document review and approval process.

Technetium-99 has not been detected in past samples obtained from the current soil stockpiles. If PSP sampling and analysis initiated during the predesign investigation indicates technetium-99 is present above its FRL or if future stockpiles are generated which contain technetium-99, it will be excavated and segregated under this excavation approach.

The current soil stockpiles are not known to contain toxicity characteristic hazardous waste. However, sampling and analysis carried out under the area-specific PSP will address RCRA constituents that are known to be present in the remediation area. Additionally, organic-vapor monitoring will be conducted with a PID meter during excavation to screen for potential organic compounds that are regulated under RCRA.

Based on the RI characterization data for uranium, there are two known areas near the northwest corner of Soil Stockpiles 1 and 4 with the potential to exceed established uranium WAC levels (Figure 4-6). If pre-excavation characterization indicates the presence of soil with ASCOCs at or above the WAC here or in other stockpiles, it will be excavated and segregated under this approach.

Task 3 - Pre-excavation Surveys and Sampling

Pre-excavation surveys and depth profile sampling initiated by PSPs will follow the general protocol discussed under Task 3 in Section 4.1.3, with the addition of the specific details noted here.

In general, sample point density within the stockpiles will be similar to the sample point density of RI/FS data in the surrounding areas. The exact number of samples to be collected will be determined in the stockpile-specific PSP. Radiological scanning will be used to identify surface areas where primary ASCOCs are above the WAC. Any such identified areas will be investigated further using geoprobe borings. Geoprobe borings will also be placed near the established perimeter of the stockpile and within the stockpile at biased and/or random locations to determine whether technetium-99, RCRA toxicity characteristic, or above-WAC material is present. If available, RI/FS data will also be used to determine the extent of individual ASCOCs.

Task 4 - Delineate Excavation Extent Due to Technetium-99 Contamination

The presence or absence of technetium-99 has not been established for the soil stockpiles in the Former Production Area. Therefore, sampling and analysis will be conducted to determine whether technetium-99 is present in soil stockpiles in the Former Production Area. If present above its WAC/FRL, the extent of technetium-99 excavation will be delineated as discussed under Task 4 in Section 4.1.3. The PSP developed for sampling the western soil stockpile in Remediation Area 1, Phase I will indicate that a limited number of samples will be collected and characterized for technetium-99 to account for materials tied to Operable Unit 1 that may contain technetium-99.

Task 5 - TCLP Test and Delineate Characteristic Waste Extent

Based on current RI/FS data, toxicity characteristic hazardous waste is not present in the soil stockpiles. However, if the source(s) for the stockpile material can be identified, all RCRA COCs from the source area will be considered in the PSP characterization effort. Additionally, if the source is unknown, then all RCRA COCs on the WAC list will be considered in the sampling effort. If

RCRA COCs are found at values that exceed 20 times the TCLP limit, sampling and TCLP analysis will be performed to delineate the potential toxicity characteristic soil.

Task 6 - Determine Remaining Excavation Extent

Based on the RI/FS characterization data for uranium, the northwest corner of Soil Stockpiles 1 and 4 have the potential to exceed established uranium WAC levels (Figure 4-6). Pre-excavation characterization data will determine the extent of this and other potential above-WAC areas, and all soil above the WAC will be removed prior to excavation of the remaining soil. The remaining soil will be delineated as above or below the FRLs of applicable COCs.

Task 7 - Prepare Area-Specific IRDP

The area-specific IRDP will be prepared as discussed under Task 7 in Section 4.1.3.

Task 8 - Prepare Excavation Site

The excavation site will be prepared as discussed under Task 8 in Section 4.1.3.

Task 9 - Implement Run-off Control, As-Needed

Run-off control will be implemented as discussed under Task 9 in Section 4.1.3.

Task 10 - Technetium-99 Driven Excavation

If soil is delineated as being above the WAC/FRL for technetium-99, it will be excavated and staged prior to packaging and shipment to an off-site disposal facility. If needed, this excavation will be carried out as discussed under Task 10 in Section 4.1.3.

Task 11 - Characteristic Waste-Driven Excavation and Treatment

Based on the RI/FS data, neither TCLP tests nor excavations are planned for RCRA characteristic waste. However, if RCRA COCs are added to the analyte list at a future date (e.g., organic-vapor monitoring discovers materials suspected of being characteristic waste), a contingency plan will be implemented to assess and characterize the suspect materials. Based on the findings of the contingency actions, if soil should be delineated as exhibiting the toxicity characteristic, it will be excavated, staged, and given to the WMP to establish treatment and disposal options.

Task 12 - Layer-Specific, Pre-Excavation, Non-Technetium-99 WAC Scan

If the predesign characterization data indicate above-WAC material and heterogeneity in the size and types of materials in the stockpile, excavation will take place in layers. A gamma scan will be conducted on each layer or unit volume of material removed from the pile to determine whether the uranium WAC is exceeded before successive layers are removed. All identified above-WAC soil will be segregated for off-site disposal. Additional excavation and disposal information is provided in Sections 3.3.1.2 and 3.3.1.3.

Task 13 - Non-Technetium-99, WAC-Driven Excavation/Confirmation

If above-WAC soil is identified and removal can proceed as a bulk excavation rather than in layers, the above-WAC material will be delineated through pre-excavation surveys and/or sampling activities. All soil with ASCOCs above the WAC will be excavated and segregated to isolate the above-WAC material prior to shipment off site. Additional excavation and disposal information is provided in Sections 3.3.1.2 and 3.3.1.3.

Task 14 - FRL-Driven Excavation

After the excavations to remove any soil detected with ASCOCs above the WAC, remaining soil with uranium, thorium, radium, and other potential ASCOCs above their respective FRL will be excavated and staged prior to placement in the OSDF. WAC attainment will be demonstrated for materials to be placed in the OSDF using the field and laboratory analytical methods discussed in Section 4.3.2 and Appendix H. Additional excavation and disposal information is provided in Section 3.3.1 and Appendix F.

Task 15 - Remediate/Certify the Footprint as Part of the Former Production Area With Excavation Approach D

After the removal of soil stockpiles in the Former Production Area and Remediation Area I, Phase I, the stockpile footprints will be established and final remediation and certification will be carried out under Excavation Approach D (Section 4.4).

4.4 EXCAVATION APPROACH D - EXCAVATION FOLLOWING D&D IN THE FORMER PRODUCTION AREA, STP, AND FTF

Excavation Approach D is designed to handle shallow to deep soil excavations that take place after buildings, above-grade structures, and soil stockpiles (Excavation Approach C) have been removed

from the Former Production Area, the Sewage Treatment Plant, and the Fire Training Facility. Soil underlying buildings, structures, and stockpiles is anticipated to be affected by contaminants. The list of potential ASCOCs for proposed Excavation Approach D areas (Table 2-7) is expected to reflect the production history of process materials and RI/FS data on soil samples collected around the perimeter of buildings and structures. However, the distribution of ASCOCs under the buildings, structures, and stockpiles cannot be established completely until preliminary, above-grade D&D activities in the Former Production Area, Sewage Treatment Plant, and Fire Training Facility are completed.

Excavation Approach D will be applied in the following remediation areas: Remediation Area 1, Phase II - soil underlying the Sewage Treatment Plant on the eastern border of the FEMP; Remediation Areas 3, 4A, 4B, 5, and 7 - soil and at- and below-grade structures and debris associated with the Former Production Area; and Remediation Area 6 - soil underlying the Fire Training Facility. The preliminary extent of excavations requiring Approach D are shown on Figure 4-8. A comparison of Excavation Approach D with other excavation approaches is provided in Table 4-3.

4.4.1 General Description

Excavation Approach D follows most of the general soil remediation process discussed throughout Section 3.0. It deviates from the general approach in Section 3.0 with respect to coordinating pre-excavation characterization with above-grade D&D activities and in dealing with the disposition of at- and below-grade construction debris. The remediation process will begin by conducting a data review to estimate the potential extent of the excavation using RI/FS data and to identify ASCOCs. After initial, above-grade D&D activities have removed equipment, piping, and all other ancillary materials from the buildings and structures, pre-excavation surveys and sampling activities inside the remaining structure will commence to refine the list of ASCOCs, as needed. Similar to the other approaches, the supplementary surveying and sampling conducted as part of the pre-excavation activity will be conducted under the direction of a PSP prepared for the effort. Upon completion of the pre-excavation surveys and sampling activities, final, above-grade D&D activities will be initiated and completed. Existing data, radiological survey results and laboratory analytical data will be forwarded to the remedial design to delineate the extent of soil excavation for technetium-99, RCRA toxicity characteristic (within the seven locations shown on Figure 1-5), HWMUs, USTs, above-WAC, and above-FRL areas. This information will be incorporated into an IRDP and submitted to the EPA and OEPA for approval.

000229

After the IRDP has been approved by the EPA and OEPA, at- and below-grade structures will be removed and staged for disposal assessment by the WAO. Soil excavation will begin after the structures are removed and materials delineated as technetium-99, RCRA toxicity characteristic, HWMU, UST, and above WAC will be segregated for treatment, if required, and disposal. Because deep soil excavations are expected below some of the buildings, excavations in these areas will proceed in layers with each layer being surveyed for WAC attainment of primary radiological ASCOCs prior to excavating the next. The specified lift thickness will be defined for EPA and OEPA approval as part of the follow up design documentation. Additionally, because of the expected heterogeneity of contamination within the Former Production Area, real-time monitoring of the active excavation will be conducted for WAC attainment purposes. If special materials (Section 3.3.2.2) are encountered during the excavations, the materials will be handled, treated (as needed), and disposed of in accordance with the procedures outlined in the Waste Disposition Program.

Upon completion of all excavation activities, precertification surveys, delineation of CU boundaries, and certification sampling activities will take place as described in Section 4.1.1. Additionally, soil samples will be collected and analyzed to obtain the necessary closure data for identified HWMUs and USTs within the CUs.

4.4.2 Special Considerations

Special considerations that apply to Excavation Approach D are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, attainment of WAC, and logistics.

4.4.2.1 Nature and Extent of Contamination

The diversity and concentration of ASCOCs within the Former Production Area dictates that remediation activities will progress slowly, because of additional monitoring, sampling, and analysis and the possibility of encountering special materials and perched water. Sampling and analysis conducted prior to above-grade demolition may not be sufficient to delineate completely the excavation zones for technetium-99, RCRA toxicity characteristic, above-WAC, and above-FRL soil or to identify all areas containing special materials. When excavation zones need to be delineated further, additional

sampling and analysis will need to be coordinated with removal of at- and below-grade structures or conducted during excavation. If special materials (Section 3.3.2.2) are encountered during excavation activities, additional monitoring, sampling, and analysis may be necessary to characterize the materials.

HWMUs and USTs will be excavated and closed during remediation activities carried out in the Former Production Area. Care must be taken to ensure that sampling and analysis plans will account for the HWMUs and USTs and that the needed analyte lists are submitted with samples collected for HWMU and UST COCs as well as certification of CUs. For example, HWMUs and USTs must have a minimum of eight samples collected and analyzed from within their footprint and sidewall (if applicable). The HWMU and UST analyte list may be different from the list of COCs in surrounding CUs.

4.4.2.2 Radiological Scanning and Field Measurements

Because of access controls and limited equipment maneuverability in the Former Production Area, real-time monitoring for WAC attainment with the large-volume NaI detector will be restricted to the BTRAK or hand-held instruments. When conducting real-time monitoring in deep excavations with the NaI detector, the geometry of the excavation and the presence of saturated conditions from perched water zones may affect the instrument reading. The real-time monitoring will be an integral part of the excavations in the Former Production Area, and the geometry of the excavations and implementation of perched-water controls will place additional time constraints on this monitoring, which must be considered when excavation plans and schedules are developed.

4.4.2.3 Attainment of WAC

A combination of radiological surveys and field and laboratory measurements will be used to demonstrate that soil placed in the OSDF meets the WAC. Initial radiological scans will identify above-WAC uranium zones, and additional sampling and analysis will be conducted to delineate these zones for all ASCOCs when RI/FS data are not sufficient to make the delineation. These surveys will be concentrated in zones identified by RI/FS data as highly contaminated with uranium and in areas where historical knowledge indicates process materials were spilled. However, because of the expected heterogeneous distribution of uranium in the soil, surveys with NaI detectors will also be conducted on each volume unit removed during active excavation and on the excavation layer prior to removing the next lift.

Where excavation takes place in zones of perched water, scanning techniques may need to be modified to obtain a reliable reading from saturated soil and/or delayed until the soil has been dried by placement in a stockpile. Above-WAC zones identified during these scans will be investigated for all ASCOCs, as needed or demonstrated by existing RI/FS and pre-excavation characterization data. The IRDPs will specify the details on how the real-time technologies will be applied for a given area, recognizing the heterogeneous conditions that may be encountered.

Debris associated with the removal of at- and below-grade structures will not undergo further characterization, other than the visual checks and response specified for debris in Section 5.0 of the OSDF WAC Attainment Plan, and the observations and/or scans necessary to address worker health and safety concerns for handling the materials.

4.4.2.4 Logistics

The coordination of D&D activities with soil characterization and remediation activities in the Former Production Area poses unique challenges in the way of logistics and health and safety requirements. Coordination of scanning, sampling, and analysis activities with D&D schedules, the removal of at- and below-grade structures in limited access areas, and the implementation of excavation activities in zones of perched water must be considered in the IRDPs prepared for remediation areas in the Former Production Area.

Initial sampling activities associated with soil underlying buildings will be scheduled after removal of production equipment and ancillary materials from the buildings, if possible. It is not desirable to conduct sampling activities coincident with the removal of equipment and ancillary materials because of the increased chance for cross-contamination of samples. When possible, the sampling will precede demolition of above-grade structures to allow proper selection and bias sampling locations and to allow sample analysis and evaluation to continue while building debris is removed.

The sequencing of building demolition will be considered from the perspective of achieving a continuous, large area where at- and below-grade remediation activities can commence without interfering with above-grade D&D activities. Access controls for personnel and vehicles will be designed to minimize traffic in areas of active excavation and demolition, where deep excavations (Section 3.1.3) and debris piles may pose health and safety concerns. Furthermore, access to at- and

000232

below-grade structures may be limited by debris piles produced from above-grade demolition activities. The debris piles may be present for extended periods of time as material is reduced in size and sorted and staged for disposal in the OSDF. Additional holding time for the debris piles may be incurred if the placement of the debris in the OSDF is dependent on soil to fill void space and sufficient soil is unavailable.

Perched water (Section 2.5.4) will be encountered during deep excavations within the Former Production Area. Access limitations constrained by rubble and soil piles from on-going D&D and remediation activities will be constrained further by the need to set up a staging area for tanks to hold the perched water prior to treatment at the AWWT facility. Alternatively, if perched water is to be pumped directly to the AWWT facility from the excavation, volumes will have to be coordinated with the treatment schedule at the AWWT facility to ensure that the system can handle the additional capacity.

4.4.3 Excavation Details

Figure 4-9 presents the logic flow for conducting Excavation Approach D. Each of the 26 tasks identified for this type of excavation is discussed in detail or tied to details presented in Sections 3.0, 4.0, and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is provided in Table 4-3.

Task 1 - Potential Excavation Area Delineation and Data Review

This task is carried out as outlined in Section 3.1.1. Potential areas expected to follow Excavation Approach D are shown on Figure 4-8. However, the final excavation area will change after the soil underlying structures and buildings are characterized for ASCOCs.

Task 2 - Select COCs and Identify Potential Technetium-99, RCRA, HWMU, UST, and Above-WAC Areas

The preliminary ASCOC lists for Remediation Areas 1, 3, 4a, 4b, 5, and 7 are summarized in Table 2-7. These lists are derived from RI/FS characterization data and divided into primary and secondary ASCOCs (Section 2.1.3.1). The ASCOCs will be finalized in the area-specific IRDPs.

Technetium-99 has been measured above the FRL in soil below Tension Support Structures 4 and 5, located in the southwest corner of Remediation Area 3; in the northeast corner of the Metal Fabrication Building, located in the northeast section of Remediation Area 4a; in the Sewage Treatment Plant and surrounding area, and along the west end of the slurry pipeline in Remediation Area 7 (Figure 4.8).

There are three potential RCRA areas in Remediation Area 3 and one in Remediation Area 4b (Figure 4.8). The largest is associated with the decontamination pad and is located in the northeast corner of the Remediation Area 3. A second is located along the northern boundary of Remediation Area 3 and is associated with the KC-2 warehouse (Building 63) and west pad. The third is associated with the lumber storage area (Building 12C) and maintenance warehouse (Building 12D) in Remediation Area 3. A fourth is in Remediation Area 4b and is associated with HWMU #22 - the abandoned sump west of the Pilot Plant Excavation. All of these potential toxicity characteristic soil areas will be dealt with under Excavation Approach D.

There are 25 HWMUs in the Former Production Area (Remediation Areas 3, 4a, 4b, and 5), one HWMU in Remediation Area 6 outside the production area (i.e., Fire Training Facility), and one HWMU in Remediation Area 1 (Sewage Treatment Plant). A list of the HWMUs is presented in Table 2-1. All of these HWMUs will be closed under the CERCLA/RCRA process, with most of these closures anticipated to be completed during the initial D&D activities associated with preparing the buildings and structures for demolition. Footprints remaining from the 14 HWMUs assigned to the SCEP for final closure will be evaluated for HWMU COC distribution under this excavation approach.

There are five UST sites in the Former Production Area (Table 2-2): UST-11 and UST-13, east of Plant 1 truck dock (Remediation Area 4b); UST-12, east of Building 31A (Remediation Area 5); UST-14, buried under the south end of Plant 6 (Remediation Area 4a); and UST-17, north of Building 46 (Remediation Area 5). Footprints remaining from the removal of USTs will be evaluated for UST COC distribution under this excavation approach.

Based on the RI/FS characterization data for uranium, eight known areas within the proposed Excavation Approach D boundaries have the potential to exceed established WAC levels for uranium (Figure 4-8). These areas are as follows: northeast of Soil Stockpile 1; west of Soil Stockpile 4; northeast of Quonset Hut #1; under Tension Structure #6; north of the Ore Refinery Plant; the

northeast corner of the Metals Fabrication Plant; the southwest and northwest corners of the analytical laboratory; and the southwest area associated with the Sewage Treatment Plant. Additional above-WAC areas may be delineated in soil underlying buildings and structures. All identified above-WAC soil in the Former Production Area will be excavated and segregated under this approach.

Task 3 - Initial D&D Activities

Initial D&D activities anticipated to be performed prior to pre-excavation surveying and sampling include removal of equipment and associated hardware, piping, and other materials from within buildings and structures. It is desirable to perform these D&D activities prior to sampling and analysis activities to eliminate cross-contamination of samples by concurrent D&D activities. Buildings and structures will be considered ready for pre-excavation sampling activities when their shells are ready for demolition, and such activities will be carried out prior to demolition when possible.

Task 4 - Pre-excavation Sampling and Refine COC List, As Needed

Above-grade D&D activities to be conducted by other FEMP projects will leave the at-grade slabs and underlying soil in place, but are likely to result in staging of resultant debris on the slab. Therefore, in order to access the soil contamination below the slabs in a timely fashion that will support the design process, some predesign sampling and analysis will be carried out prior to final D&D on above-grade buildings and structures, when possible.

Pre-excavation sampling will be executed to determine whether ASCOCs are present at above-WAC and above-FRL values in soil below building floors and foundations. Sampling holes may be drilled through concrete floors and foundations to access the presence of ASCOCs in underlying soil. In general, RI/FS data will be used to determine the number of additional samples to be collected near the perimeter and center of the building foundation and in areas where process knowledge and history indicate the potential for contamination to occur. When possible and as needed, geoprobe borings will be placed prior to demolition of the above-grade structures to determine the depth of ASCOCs above-WAC and above-FRL values.

In the event geoprobe borings cannot be placed prior to demolition of the above-grade structures (e.g., geoprobe equipment cannot fit into building or structure), the pre-excavation sampling event will investigate the presence of ASCOCs in the first 6 inches of soil underlying the concrete floors and

foundations. A comprehensive laboratory analysis of all ASCOCs applicable to the production area will be performed to establish the nature of contamination below the building structures. The initial ASCOC list will be modified, as needed, pending the results of the laboratory analyses. If ASCOCs are determined to be present above their respective FRL, the extent of the ASCOCs will be pursued after final D&D activities are completed (Task 8).

Task 5 - Delineate Excavation Extent Due to Technetium-99 Contamination

Delineation of the extent of soil containing technetium-99 will be carried out as described under Task 4 in Section 4.1.3.

Task 6 - TCLP Test and Delineate Characteristic Waste Extent

The extent of soil excavation needed to remove potential toxicity characteristic ASCOCs in the RCRA areas identified in Task 2 will be determined by obtaining discrete samples from surface and subsurface locations. The sampling and analysis protocol to delineate potential toxicity characteristic soil will be carried out as described under Task 5 in Section 4.1.3.

Task 7 - Determine Remaining Excavation Extent

After excavation volumes for technetium-99 and identified toxicity characteristic ASCOCs have been delineated, the excavation volumes for non-technetium-99, above-WAC soil and soil above the FRLs for ASCOCs will be determined. If above-WAC soil is present in the eight above-WAC areas identified on Figure 4-8, the excavation area will be delineated as described under Task 6 in Section 4.1.3.

Task 8 - Final, Above-Grade D&D Activities

Following the pre-excavation sampling event, demolition of the buildings and structures will take place and the above-grade debris will be removed and staged for sizing and proper disposition. Upon completion of these activities, additional surveys and sampling may be initiated, as needed, to determine the extent of soil excavation.

Task 9 - Prepare-Specific IRDP

The area-specific IRDP will be prepared as discussed under Task 7 in Section 4.1.3.

000236

Task 10 - Implement Run-off Control, As Needed

Run-off control will be implemented as discussed under Task 9 in Section 4.1.3.

Task 11 - Technetium-99-Driven Excavation

The technetium-99 excavations will be carried out as described under Task 10 in Section 4.1.3.

Task 12 - Characteristic Waste-Driven Excavation and Treatment

Any identified RCRA toxicity characteristic soil will be excavated as described under Task 11 in Section 4.1.3.

Task 13 - UST Excavation

The five UST sites in the Former Production Area (Table 2-2) will be excavated and removed to satisfy the relevant and appropriate regulatory requirements. If fluids and/or residue material are present in the UST, they will be sampled and analyzed prior to removal of the UST to determine appropriate handling and storage procedures as well as treatment options, if applicable.

After UST removal, underlying soil will be surveyed and/or sampled and analyzed to determine whether COCs (Table 2-2) have been released from the UST. If surface soil samples indicate COCs are present at or above their respective FRL, the depth of excavation will be determined by obtaining soil cores with geoprobe borings and performing surveys or sampling and analysis on the core material.

The level of effort placed in the soil survey and sample effort will be determined by the production history and knowledge of the contents of the UST, analytical information on the contents of the UST (if applicable and available), and the physical condition of the removed UST.

Task 14 - Implement Perched Water Control, As Needed

If excavation activities encounter perched water, controls will be implemented as discussed under Task 12 in Section 4.2.3.

Task 15 - Real-Time, Non-Technetium-99, WAC Monitoring and Excavation

Presently, there are eight known soil areas with the potential to exceed the established WAC levels in Remediation Areas 1, 3, 4a, 4b, and 5. If analytical characterization data indicate above-WAC soil is present, the delineated above-WAC areas will undergo real-time monitoring with NaI instruments during excavation to provide added assurance that above-WAC material does not enter the OSDF (Section 4.4.2). All above-WAC soil will be shipped off site for disposal. Additional details on the approach to real-time monitoring are provided in the in situ gamma Users Manual (DOE 1998c).

Task 16 - FRL-Driven Bulk Excavation of the Layer

Bulk excavation of soil exceeding FRLs will proceed as discussed under Task 13 in Section 4.1.3. WAC attainment will be demonstrated for all material placed in the OSDF in the manner presented in Section 4.4.2.

Task 17 - Precertification Scan

The precertification scan will be conducted as described under Task 14 in Section 4.1.3.

Task 18 - CU, HWMU, and UST Footprint Delineation/Classification

As part of the precertification survey, the excavated remediation areas will be divided into CUs, and CU footprints will be defined. Group 2 CUs will be established after Excavation Approach D has been executed. The footprint for HWMUs and USTs will be delineated and certified for closure independent of the CUs which contain them. Section 3.4.1 contains additional details on the delineation and classification of CUs, HWMUs, and USTs.

Task 19 - Evaluate Precertification Scan Results

Evaluation of precertification data will be carried out as described under Task 16 in Section 4.1.3.

Task 20 - Hot-Spot/FRL Excavation/Confirmation

Removal of hot spots will be evaluated as described under Task 17 in Section 4.1.3, with the exception of areas where the uranium FRL is 20 ppm. In these areas, hot-spot evaluation will be conducted with the HPGe instrument, as indicated under Task 17.

000238

Task 21 - Prepare Certification Design Letter

When the CU is determined to be ready for certification, a CDL will be prepared to detail the sampling approach and locations (Section 7.3). The CDL will be submitted to EPA and OEPA for review and approval. Upon approval of the CDL by EPA and OEPA, the sample locations will be considered fixed and they may not be moved without review and concurrence by EPA and OEPA.

Task 22 - CU/HWMU/UST-Specific Certification/Closure Sampling

The CU certification and HWMU closure will be demonstrated using the approach described under Task 21 in Section 4.2.3. UST closure will follow the protocol for HWMU closure, which is a minimum of eight random samples collected within the UST footprint. Sample locations will be established with the GPS or appropriate survey system, and the random samples will be submitted for laboratory analysis for all UST COCs which have an established soil FRL (Table 2-2).

Task 23 - Certification/Recertification

Certification and closure of the CUs and HWMUs will be established as outlined under Task 22 in Section 4.2.3. Closure of the UST sites will follow the HWMU closure protocol, which specifies that the average concentration of each UST COC must be below its respective FRL.

Task 24 - Additional Hot-Spot/FRL Excavation/Confirmation

Evaluation of the need to perform further excavation will be made as described under Task 23 in Section 4.2.3. UST closure will be evaluated in a manner analogous to HWMU closure.

Task 25 - Prepare Certification Report

Preparation of the Certification Report will follow the requirements summarized under Task 24 in Section 4.2.3.

Task 26 - Area-Wide Interim Grading and Restoration

Interim grading and restoration activities are described under Task 23 in Section 4.1.3.

4.5 EXCAVATION APPROACH E - OFF-PROPERTY AND NONIMPACTED ON-PROPERTY AREA CERTIFICATION

Excavation Approach E is designed to handle shallow soil excavations that take place in remediation areas which require a minimal amount of excavation prior to certification. In nonimpacted areas (i.e., no known hot spots), the need for excavation is unlikely, and radiological scans may be used to forward the area directly to certification. The nature and extent of COCs in areas proposed for Excavation Approach E is generally limited to a few COCs in the top 1 foot of soil. Soil excavations for technetium-99, RCRA characteristic waste, and above-WAC material are not expected. If these types of excavations are required, the area will be addressed by Excavation Approach A.

Excavation Approach E will be applied to Remediation Areas 1 (Phase III), 8, and 9 (off-property areas), where a potential for excavation may exist (Tables 4-1 and 4-2; Figures 4-1 and 4-10). Remediation Area 1, Phase III, encompasses most of the northern perimeter of the FEMP, where most areas along the perimeter have been shown by RI/FS characterization data to be nonimpacted. In Remediation Area 8, this approach will be applied throughout the area. In Remediation Area 9, the potential for remediation is limited to areas adjacent to the eastern fenceline and the corridor for the outfall pipeline.

4.5.1 General Description

Excavation Approach E follows a simplified version of the soil remediation process discussed throughout Section 3.0. The process will begin by screening existing data to identify whether excavation is needed. In most cases, excavation is not expected, and the area can be forwarded to the certification process. If excavation is needed, radiological survey results and laboratory analytical data may be collected and used in the remedial design to delineate the extent of soil excavation for above-FRL areas. The certification design is incorporated into a CDL and the pre-excavation investigation information is incorporated into an IRDP, if needed. These documents are submitted to the EPA and OEPA for review, and if an IRDP is submitted, it will be approved by the EPA and OEPA. After the necessary reviews and/or approvals have been obtained from EPA and OEPA, certification activities will begin along with any limited soil excavation which needs to take place. Soil delineated as above FRLs will be excavated and placed in the OSDF. Upon completion of excavation in above-FRL areas, a precertification survey and certification sampling activities will commence, as discussed in Section 4.1.1.

00240

4.5.2 Special Considerations

Special considerations for Excavation Approach E are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, and attainment of WAC.

4.5.2.1 Nature and Extent of Contamination

Concentrations of ASCOCs in the northern corridor associated with Remediation Area 1. Phase III and Remediation Areas 8 and 9 are expected to below established FRLs, and these areas are expected to be moved into the certification process without the need for excavation. If RI/FS data indicate the potential for contamination above established FRLs, pre-excavation surveys, HPGe measurements, and/or limited sampling and analysis will be conducted to delineate potential above-FRL zones. If the pre-excavation survey indicates the potential for above-WAC soil, the area will be remediated under Excavation Approach A.

4.5.2.2 Radiological Scanning and Field Measurements

Radiological scanning and HPGe measurements will be performed as a precertification activity to prepare the area for certification. Scanning with NaI detectors will be performed with the RTRAK when possible. However, trees and riparian vegetation along Paddys Run in Remediation Area 8 pose some constraints on the implementation of radiological surveys and sampling activities if minimal impact to environmental habitat is desired. Radiological scanning will be conducted with the BTRAK or hand-held instruments to obtain the best coverage possible.

4.5.2.3 Attainment of WAC

WAC attainment will not be relevant to most areas remediated under Excavation Approach E, as remediation will move immediately to certification without excavation. When excavation is needed to remove soil above established FRLs, WAC attainment will be demonstrated for uranium, using scans conducted with NaI detectors and/or HPGe measurements. RI/FS data and pre-excavation data (if collected) will be used to demonstrate that excavated soil placed in the OSDF has met the WAC for secondary ASCOCs.

4.5.3 Excavation Details

Figure 4-11 presents the logic flow for conducting Excavation Approach E. Each of the 17 tasks is discussed in detail and tied to material presented in Sections 3.0, 4.0, and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is provided in Table 4-3.

Task 1 - Potential Excavation Area Delineation and Data Review

This task is carried out as outlined in Section 3.1.1. Based on the RI/FS data, the only potential excavation areas are within the northern corridor of Remediation Area 1, Phase III, designated as Excavation Approach A/E on Figure 4-1. Excavation in Remediation Area 8 is not anticipated based on historic knowledge and RI/FS data. Radiological surveys and certification sampling activities will be conducted to confirm this preliminary decision.

Task 2 - Select COCs and Identify Potential Above-FRL Areas

The preliminary ASCOC lists for Remediation Areas 1 and 8 are summarized in Table 2-7. These lists are derived from RI/FS characterization data and divided into primary and secondary ASCOCs (Section 2.1.3.1). Note that there are no secondary ASCOCs established for Remediation Area 8. The ASCOCs will be finalized in the area-specific IRDPs.

Based on the RI/FS characterization data, the only known area within the proposed Excavation Approach E boundaries with the potential to exceed established FRL levels is Remediation Area 1, Phase III. Remediation Area 1, Phase III, could potentially contain soil above WAC levels in areas along the FEMP perimeter that are designated Excavation Approach A/E (Figure 4-1). If such areas are detected, they will be remediated under Excavation Approach A.

Task 3 - Pre-excavation Surveys and Sampling

Pre-excavation surveys and surface-soil sampling (a.k.a. predesign investigation) will be conducted, as needed, using field and laboratory analytical techniques identified in Appendix H. Activities will be carried out as indicated under Task 3 in Section 4.1.3.

Task 4 - Determine Excavation Extent

If excavation of above-FRL material is needed, excavation volumes will be defined by RI/FS data and pre-excavation survey and/or sampling results that indicate ASCOCs are present above their respective

FRL. Excavation Approach E will not deal with contamination present below the depth of 12 inches or with soil having ASCOCs above established WAC values. Therefore, the presence of ASCOCs above their respective FRL at depths greater than 12 inches or above their WAC will result in the area being remediated under Excavation Approach A. Soil with ASCOCs above their respective FRL but which meets the WAC will be excavated and disposed of in the OSDF.

Task 5 - Prepare Area-Specific IRDP

If needed, an area-specific IRDP (i.e., a remedial design) will be prepared as discussed under Task 7 in Section 4.1.3.

Task 6 - CU Delineation/Classification

For most of the area designated for remediation under Excavation Approach E, the remediation areas will be divided into CUs without prior excavation. The CUs established in areas designated as Excavation Approach E will be Group 2 CUs (up to 500 ft by 500 ft). Group 2 CUs are designated for Excavation Approach E because little to no contamination is expected in these areas. Section 3.4.1 contains additional details on the delineation and classification of CUs.

Task 7 - Implement Run-off Control, As Needed

Where excavation is required, run-off control will be implemented as discussed under Task 9 in Section 4.1.3.

Task 8 - FRL-Driven Excavation

In the limited areas where it is identified, soil with ASCOCs above their respective FRL will be excavated and staged prior to placement in the OSDF. RI/FS, pre-excavation characterization data, and HPGe measurements will be used to demonstrate that soil placed in the OSDF will meet the WAC. Section 2.2.1 provides additional details on demonstrating WAC attainment.

Task 9 - Precertification Scan

Most areas will progress to a precertification scan without requiring excavation. Areas that have been excavated will be precertified as discussed under Task 14 in Section 4.1.3.

Task 10 - Evaluate Precertification Scan Results

Evaluation of precertification results will follow the discussion under Task 16 in Section 4.1.3.

Task 11 - Hot-Spot/FRL Excavation/Confirmation

Hot-spots are not expected in areas remediated under Excavation Approach E, but a hot-spot evaluation will be carried out according to the protocol described under Task 17 in Section 4.1.3.

Task 12 - Prepare Certification Design Letter

When the CU is determined to be ready for certification, a CDL will be prepared to detail the sampling approach and locations (Section 7.3). The CDL will be submitted to EPA and OEPA for review and approval. Upon approval of the CDL by EPA and OEPA, the sample locations will be considered fixed and they may not be moved without review and concurrence by EPA and OEPA.

Task 13 - CU-Specific Certification Sampling

Certification sampling will be performed as discussed under Task 19 in Section 4.1.3.

Task 14 - Certification/Recertification

Certification will be evaluated as discussed under Task 20 in Section 4.1.3.

Task 15 - Additional Hot-Spot/FRL Excavation/Confirmation

Hot spots are not expected in areas remediated under Excavation Approach E. However, additional hot-spot evaluation will be carried out as discussed under Task 21 in Section 4.1.3.

Task 16 - Prepare Certification Report

A Certification Report will be prepared for each remediation area as described under Task 22 Section 4.1.3.

Task 17 - Area-Wide Interim Grading and Restoration

Interim grading and restoration activities will be carried out as described under Task 23 in Section 4.1.3.

4.6 EXCAVATION APPROACH F - NON-HDPE PIPELINE EXCAVATION OUTSIDE THE FORMER PRODUCTION AREA

Excavation Approach F is designed to handle non-high density polyethylene pipeline excavations outside the Former Production Area. High density polyethylene pipelines associated with the aquifer restoration activities and the AWWT will be left in place as part of the post-closure monitoring system in case that prolonged groundwater extraction is required. Excavation depths using this approach may be moderate to deep. The list of potential ASCOCs in areas proposed for Excavation Approach F is expected to reflect RI/FS data for the soils in the vicinity of the pipelines and process knowledge of materials handled by the pipelines. However, the distribution of ASCOCs under the pipelines will not be established until the pipelines are removed.

Excavation Approach F will be applied to the pipeline associated with the Sewage Treatment Plant and silo slurry line. The Sewage Treatment Plant pipeline extends from the Former Production Area to the Sewage Treatment Plant and offsite to the Great Miami River. Potentially contaminated soil and sediment along the Great Miami River that is associated with the Sewage Treatment Plant pipeline will also be remediated under this approach. The silo slurry line extends from the Former Production Area to the silos. Additional non-HDPE pipelines may be delineated upon completion of Excavation Approaches A through E.

4.6.1 General Description

Excavation Approach F will be implemented in Remediation Area 1, Phase II and Remediation Area 9 after Excavation Approaches A and E have been completed (Tables 4-1 and 4-2; Figures 4-1 and 4-12). The approach is modified slightly from the general soil remediation process discussed throughout Section 3.0. The process will begin by conducting a predesign investigation to delineate the extent of the Sewage Treatment Plant pipeline, identify potential ASCOCs, and perform pre-excavation surveys and sampling activities as needed. Radiological survey results and laboratory analytical data will be forwarded to the remedial design to delineate the extent of soil excavation and the removal sequencing of the pipeline sections. This information will be incorporated into an IRDP and submitted to the EPA and OEPA for approval. After the IRDP has been approved, soil excavation and removal of the pipe will begin. Upon completion of excavation and pipeline removal in sections, a precertification survey, CU delineation (as sections of the pipe), and certification sampling activities will commence as described in Section 4.1.1.

4.6.2 Special Considerations

Special considerations for Excavation Approach F are summarized under the following discussions of the nature and extent of contamination, radiological scanning and field measurements, attainment of WAC, and logistics.

4.6.2.1 Nature and Extent of Contamination

The nature of contamination associated with soil surrounding (primarily underlying) the Sewage Treatment Plant pipeline and silo slurry line is expected to be similar to Sewage Treatment Plant and silo COCs that have been established with RI/FS data. Pre-excavation and excavation characterization data will be needed to establish the extent of contamination surrounding the Sewage Treatment Plant pipeline and silo slurry line, as well as any other non-HDPE pipelines remediated under this approach.

4.6.2.2 Radiological Scanning and Field Measurements

Soil above the crown of the pipe to be excavated using this Approach F is not expected to be significantly contaminated. However, in certain sections of the pipe where the pipe was under pressure and/or previous leaks are suspected, radiological scanning with NaI detectors and in situ measurements with the HPGe instrument may be used, if physically possible, to confirm whether soil lying above the crown of the pipe can be staged and directly used to backfill the trench. No matter what soil will be used for backfill, backfill operation can only be conducted after completion of pipe removal and certification of residual impacted soil underlying the pipe.

Real-time radiological scanning is preferred to control excavation of the potentially impacted soil underlying the pipe. However, radiological scanning with NaI detectors and in situ measurements with the HPGe instrument at the bottom of a trench may not be feasible for some conditions encountered in the field. Open trenches may prove to be unsuitable for real-time scanning and/or HPGe measurements, because of the geometry of the excavation or because of risk to personnel entering the trench. If pre-excavation surveys indicate the potential for contamination under the pipe and if in situ HPGe measurements within the trench cannot be performed, excavated soil from under the pipe will be staged at an on-property location and the stockpile will be assigned to Excavation Approach C for later characterization and disposition decisions. Alternatively, if scanning and HPGe measurements can be performed in the trench and widespread contamination is indicated, excavation of the impacted soil under the pipe will be conducted similar to Excavation Approach D.

4.6.2.3 Attainment of WAC

WAC attainment for ASCOCs will be demonstrated using a combination of real-time scans, field measurements, and analytical data obtained on discrete samples. Real-time, gross-gamma scans and HPGe measurements will be performed on the excavation surfaces in the trench to demonstrate WAC attainment for uranium, if possible. When the trench geometry, perched water, and/or health and safety considerations prohibit the use of real-time scans and in situ HPGe measurements, the potentially contaminated soil underlying the pipe will be excavated and isolated in a stockpile on FEMP property. The stockpile will be remediated under Excavation Approach C to determine characterization and disposition decisions. WAC attainment for secondary ASCOCs, if applicable, will be determined by analytical data collected on discrete samples during pre-excavation sampling activities.

4.6.2.4 Logistics

Excavation of non-HDPE pipelines outside the Former Production Area will require consideration of off-property access, real-time monitoring limitations, perched-water controls, and handling and staging of pipeline and impacted soil. Right-of-way ownership and private property access will need to be obtained when the Sewage Treatment Plant pipeline between the FEMP and Great Miami River is removed, and construction permits for off-property excavation may be required. Adequate planning must be developed in the IRDP to ensure all necessary access routes and permits are obtained prior to initiating off-property excavation activities.

Real-time monitoring may be limited by the geometry of the trench and the presence of perched water and/or by health and safety considerations. Contingency plans will be developed in the IRDP that describe the actions needed when real-time monitoring cannot be conducted. These actions may include moving the characterization and disposal decisions to a different excavation approach similar to Approach D.

The handling and staging of pipeline and soil off-property may pose additional constraints on the remediation. Soil characterized as below established FRLs will be staged in proximal areas to use as backfill after the CU (i.e., a section of the trench) has been certified. However, if product material is in the pipeline or soil has been excavated without the ability to conduct an in situ scan or HPGe

measurement, different excavation and staging scenarios will apply. Contingency plans for these site-specific scenarios will be developed and addressed in the IRDP.

4.6.3 Excavation Details

Figure 4-13 presents the logic flow for conducting Excavation Approach F. Each of the 26 tasks is discussed in detail and tied to material presented in Sections 3.0, 4.0, and 7.0 and/or relevant appendices. A comparison of these tasks with other excavation approaches is given in Table 4-3.

Task 1 - Pipeline Section Delineation and Data Review

The potential pipeline excavation areas will be delineated using final construction plans with additional delineation provided where RI/FS data are available. However, additional pipeline excavation areas may be delineated upon completion of Excavation Approaches A through E.

Task 2 - Select COCs and Identify Potential Above-WAC Areas

The ASCOC list for Remediation Area 1, Phase II is summarized in Table 2-7. These lists are derived from RI characterization data and divided into primary and secondary ASCOCs (Section 2.1.3.1).

Based on the RI/FS characterization data, there are no known areas within the proposed Excavation Approach F boundaries with the potential to exceed established WAC levels. However, soil surrounding and underlying the pipelines could potentially contain ASCOCs above WAC levels. If such soil exists, it will be excavated and segregated under this approach.

Task 3 - Pre-Excavation Surveys and Sampling

The pre-excavation survey and sampling will be carried out as discussed under Task 3 in Section 4.1.3, with the following noted exceptions. Pipeline excavation in Area 1, Phase II property will take place after Excavation Approach A has been implemented in Area 1, Phase II. However, the surface above the pipeline in Area 1, Phase II will not be certified until the pipeline is removed and the trench has been backfilled.

Furthermore, surface surveys and/or sampling may need to be conducted for the pipeline extending from the Sewage Treatment Plant to the Great Miami River. If sampling is implemented, a nominal grid width of 50 ft will be centered along the length of the pipeline to develop an initial zone of

investigation that is 25 ft on each side of the pipeline. After establishing the grid, geoprobe borings may be placed on the established perimeter of the grid and within the estimated excavation area between the surface projection of the pipeline and grid perimeter to determine the depth of excavation. Section 3.1.3 provides additional details on establishing the excavation boundaries.

Task 4 - Determine Excavation Extent and Pipeline Section Sequence

Excavation volumes will be defined by using soil cores returned from geoprobe borings and surveying and/or sampling the cores to define the depth where ASCOCs are above their respective FRL. The presence of soil with ASCOCs at or above the WAC will result in delineation of a WAC excavation volume. Soil with ASCOCs at or above their respective FRL that meets the WAC will be delineated as a FRL excavation. Sample collection and handling procedures, laboratory protocols and methods, and instrument detection limits are presented in the QAPP (Appendix E).

In general, previous excavation completed in the Former Production Area is likely to have exposed the pipeline at the margin of the Former Production Area. Therefore, the pipeline section sequence for excavation is proposed to begin at the margin of the Former Production Area and proceed outward. The proposed excavation sequence for the pipeline associated with the Sewage Treatment Plant is to initially remove the on-property pipeline followed by removal of the off-property portion of the pipeline.

Task 5 - Prepare Area-Specific IRDP

An area-specific IRDP will be prepared as described under Task 7 in Section 4.1.3.

Task 6 - Prepare Excavation Site

Prior to excavation, a number of institutional and constructional measures will be implemented to control access to the area and to prevent the spread of contaminated soil. Because pipeline excavation within the boundary of the FEMP will be conducted after all other excavation is complete, grubbing and disposal of cleared shrubs and trees will not be an issue. However, these latter preparation activities may apply to excavation of the off-site pipeline that runs from the Sewage Treatment Plant to the Great Miami River. When off-site grubbing and clearing must be conducted, all needed permits and access controls must be obtained, and the action will be implemented in a manner that minimizes

the impact to the environment. Section 3.3.1.1 and Appendix F.2 further discuss site preparation activities.

Task 7 - Implement Run-Off Control, As Needed

Run-off control will be implemented on the FEMP site in the manner discussed under Task 9 in Section 4.1.3. Special considerations for run-off controls in off-site areas will be evaluated on a site-specific basis in the IRDP.

Task 8 - Implement Perched Water Control, As Needed

If excavation activities encounter perched water on the FEMP property, the protocol discussed under Task 12 in Section 4.2.3 will be executed. If perched water is encountered during off-site excavation activities, the water will be pumped and stored until a disposition decision can be reached. Sampling and analysis will be necessary to determine whether the water can be discharged to the surface or whether it needs to be treated prior to discharge. Specific sampling and analysis plans will be developed on a case-by-case basis in the IRDP.

Task 9 - Excavation to Crown of Pipeline and Set Soil Aside as Clean

Because pipeline excavation within the boundary of the FEMP property will take place after Excavation Approach A has been implemented, surface soil excavated to the crown of the pipeline will be below the FRL values established for the COCs. Similar conditions are expected to exist for the off-property pipeline leading from the Sewage Treatment Plant to the Great Miami River. Clean soil will be excavated and segregated prior to excavation of contaminated soil. In the event surface soil above the off-property pipeline has areas where ASCOCs are above their respective FRL, the contaminated soil will be excavated and segregated from clean soil.

Task 10 - Remove Section of Pipeline and Cap Ends

Pipeline sections outside the Former Production Area but within the FEMP boundary will be removed first. If holdup material is present in the pipeline, it will be drained and managed with the pipeline as summarized in Appendix F. The length of section to be removed will be tied to the nominal dimensions of the CU adjacent to the pipeline (i.e., 250 ft or 500 ft) or the length of the entire pipeline, whichever is shorter. After the pipeline is exposed by excavating the surrounding soil and

staging the soil into appropriate clean or contaminated piles, a section of the pipeline will be removed and the open end will be capped, if applicable.

If pre-excavation surveys and/or sampling indicate the potential for soil to exceed the WAC and if scanning instrumentation can enter the trench, a WAC scan of the soil under the removed section of pipeline will be conducted to delineate the excavation area (Task 11). However, if access to the trench is restricted and a WAC scan cannot be performed, bulk excavation will proceed without the WAC scan (Task 14) and the soil will be remediated under Excavation Approach C to determine the disposal option.

Task 11 - WAC Scan of Soil Below the Pipeline

When access to the trench is possible, soil below the pipeline will be surveyed to establish whether uranium is present above WAC. If above-WAC soil is detected, additional WAC scans will be conducted during excavation and/or geoprobe borings will be placed to determine the depth of above-WAC material, as needed. In the absence of finding any above-WAC soil, bulk excavation of the remaining impacted soil will proceed (Task 13).

Task 12 - WAC-Driven Excavation/Confirmation

After the extent of above-WAC soil has been delineated, excavation will resume to remove the identified volume of above-WAC material. Soil above the WAC will be excavated, segregated, and contained to prevent contamination of below-WAC areas.

Task 13 - Bulk Excavation of Remaining Impacted Soil

Following the removal of soil above the WAC, if applicable, any remaining soil containing ASCOCs above the FRLs will be excavated and staged prior to placement in the OSDF. RI/FS data and pre-excavation scans and characterization data will be used to demonstrate WAC attainment. Section 2.2.1 provides additional details on demonstrating WAC attainment.

Task 14 - Bulk Excavation of Potentially Impacted Soil and Placement into a Temporary Staging Area

When access of personnel and scanning instruments to the pipeline trench is not possible, bulk excavation of impacted soil will proceed, and the soil will be remediated under Excavation Approach C prior to determining the disposal option.

Task 15 - Precertification Scan to the Extent Possible

Upon completion of excavation, the site will be prepared for a precertification survey and/or sampling event. Based on the geometry of the excavation awaiting precertification, the survey and/or sampling equipment may be restricted by limited access and/or health and safety issues. The radiation survey will be conducted with NaI detectors and/or by discrete measurements with field instruments containing a HPGe, if possible. Precertification will be based on the residual activity of primary radioactive COCs in the soil, except in areas where primary COCs are metals or organic compounds. For these exceptions, discrete samples will be collected to supplement the pre-excavation data, as needed. Additional details on precertification activities are presented in Section 3.3.3.

Task 16 - CU Delineation/Classification

After the precertification scan, the pipeline trench will be divided into CUs. When possible, the CUs established on site will conform with surrounding CU dimensions (ideally 250 ft by 50 ft or 500 ft by 50 ft). For cases where the entire pipeline length is less than 250 ft, the CU dimensions will be adjusted accordingly. Additionally, in the event pre-excavation characterization has defined an excavation width greater than 50 ft (i.e., 25 ft on each side of the pipeline trace), the CU boundary will be extended to the designated width.

Task 17 - Evaluate Precertification Scan Results

Precertification results will be evaluated as discussed under Task 16 in Section 4.1.3.

Task 18 - Hot-Spot/FRL Excavation/Confirmation

Evaluation of hot spots will follow the protocol described under Task 17 in Section 4.1.3.

Task 19 - Prepare Certification Design Letter

When the CU is determined to be ready for certification, a CDL will be prepared to detail the sampling approach and locations (Section 7.3). The CDL will be submitted to EPA and OEPA for review and approval. Upon approval of the CDL by EPA and OEPA, the sample locations will be considered fixed and they may not be moved without review and concurrence by EPA.

Task 20 - CU-Specific Certification Sampling

The certification sampling will be conducted using the procedure described under Task 19 in Section 4.1.3.

Task 21 - Certification/Recertification

The criteria and statistical tests used to make the certification decision are described under Task 20 in Section 4.1.3.

Task 22 - Additional Hot-Spot/FRL Excavation/Confirmation

If certification fails and additional excavation is required, it will be carried out as indicated under Task 21 in Section 4.1.3.

Task 23 - Backfill Section with Excavated Soil Removed from Above Pipeline

After certification sample results have demonstrated that the CU is ready for certification, the trenches will be backfilled with below-FRL soil removed from above the pipeline. Interim grading and restoration will take place after the Certification Report is approved.

Task 24 - Segregated All Excavated Impacted Soil for Disposal

Soil that was staged because of the inability to conduct a WAC scan (Task 14) will be surveyed, sampled, and analyzed under Excavation Approach C prior to determining the disposal option.

Task 25 - Prepare Certification Report

The Certification Report will be prepared as described under Task 22 in Section 4.1.3.

Task 26 - Area-Wide Interim Grading and Restoration

Interim grading and restoration will be implemented as discussed under Task 23 in Section 4.1.3.

TABLE 4-1

EXCAVATION APPROACHES TIED TO REMEDIATION AREAS

Excavation Approach	Remediation Areas
A: Shallow Excavation of Impacted, On-Property Area Outside the Former Production Area and Other Waste Storage/Management Areas (Figure 4-2; Section 4.1)	1, 2, 6, and 7 (Figures 4-1 and 4-3)
B: Excavation in Waste Storage/Management Areas Outside the Former Production Area (Figure 4-4; Section 4.2)	2, 3, 6, 7, LSP, and SWL (Figures 4-1 and 4-5)
C: Excavation of Existing Soil Stockpiles in the Former Production Area and Remediation Area 1, Phase I (Figure 4-6; Section 4.3)	1, 3 and 5 (Figures 4-1 and 4-7)
D: Excavation Following D&D in the Former Production Area STP, and FTP (Figure 4-8; Section 4.4)	3, 4a, 4b, 5, 7, FTF, and STP (Figures 4-1 and 4-9)
E: Off-Property and Nonimpacted, On-Property Area Certification (Figure 4-10; Section 4.5)	1, 8, and off site areas (Figures 4-1 and 4-11)
F: Non-HDPE Pipeline Excavation Outside the Former Production Area (Figure 4-13; Section 4.6)	1 (Figures 4-1 and 4-12)

D&D = decontamination and dismantlement
FTF = Fire Training Facility
HDPE = high-density polyethylene
LSP = Lime Sludge Ponds
STP = Sewage Treatment Plant
SWL = Solid Waste Landfill

TABLE 4-2

REMEDIATION AREAS TIED TO EXCAVATION APPROACHES

Remediation Area	Excavation Approach
1 (includes STP)	A, D, E, and F
2	A and B
3 (includes FTF and LSP)	B, C, and D
4	D
5	C and D
6 (includes SWL)	A and B
7	A, B, and D
8	E
9 (off-site)	TBD

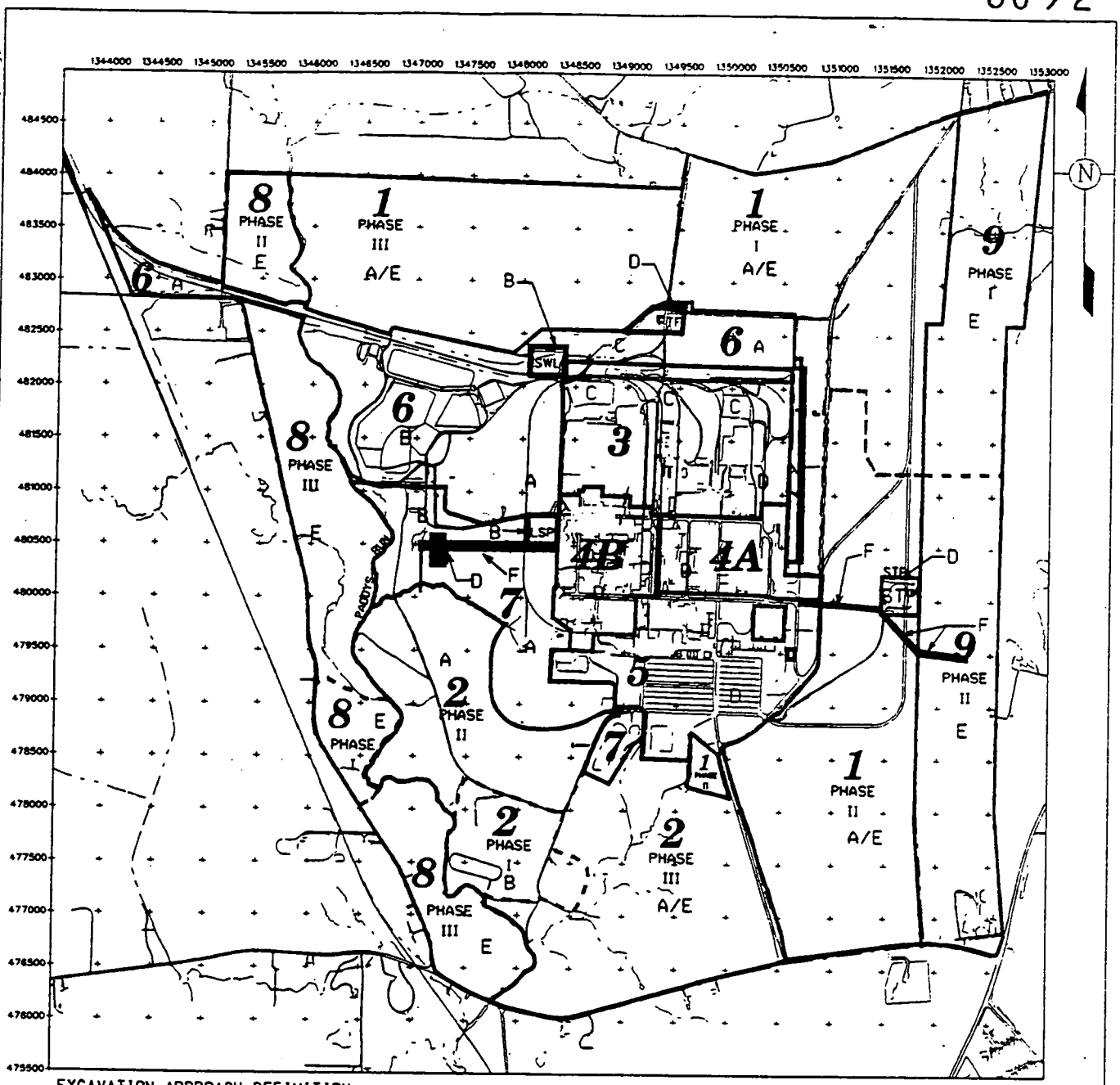
FTF = Fire Training Facility
LSP = Lime Sludge Ponds
STP = Sewage Treatment Plant
TBD = to be determined
SWL = Solid Waste Landfill

TABLE 4-3

CROSS-COMPARISON OF TASKS WITHIN THE EXCAVATION APPROACHES

Step	TASK	Excavation Approach					
		A	B	C	D	E	F
	Potential Excavation Area Delineation and Data Review	x	x	x	x	x	x
	Select COCs, Identify Potential Technetium-99, RCRA, HWMU, and Above-WAC areas	x	x	x	x	x	x
	Coordination with D&D Activities				x		
	Pre-Excavation Surveys and Sampling	x	x	x	x	x	x
	Delineate Excavation Extent Due to Technetium-99 Contamination	x	x	x	x		
	TCLP Test and Delineate Characteristic Waste Extent	x	x	x	x		
	Delineate Remaining Excavation Types	x				x	
	Determine Excavation Extent and Vertical Intervals or Unit Volume		x	x	x		
	Determine Excavation Extent and Pipeline Section Sequence						x
	Prepare Area-Specific IRDP	x	x	x	x	x	x
1	Pre-Excavation CU Delineation/Classification					x	
	Prepare Excavation Site	x	x	x			x
	Implement Run-off Control, as Needed	x	x	x	x	x	x
	Technetium-99 Driven Excavation, as Necessary	x	x	x	x		
	Characteristic Waste Excavation, as Necessary	x	x	x	x		
	Implement Perched Water Control, as Needed		x		x		x
	Layer/Volume-Specific, Non-Technetium-99, WAC Scan		x	x			x
	Non-Technetium-99, WAC-Driven, Excavation/Confirmation (Search and Remove)	x	x	x			x
	Real-Time, Non-Technetium-99, WAC Monitoring/Excavation				x		
	FRL-Driven Excavation (after above-WAC material is removed)	x				x	
	Bulk Excavation to OSDF		x	x	x		
2	Bulk Excavation to Temporary Staging Area for Segregation						x
	Pre-Certification Scan	x	x		x	x	x
	Post-Excavation CU Delineation/Classification	x	x		x		x
3	Pre-Certification Hot-Spot/FRL Excavation/Confirmation	x	x		x	x	x
	CU-Specific Certification Sampling and Scan	x	x		x	x	x
	FRL/HWMU/UST Certification/Recertification	x	x		x	x	x
	Additional FRL/Hot-Spot Excavation/Confirmation, As Necessary	x	x		x	x	x
4	Prepare Area-Wide-Certification Report	x	x		x	x	x
5	Area-Wide Interim Grading and Restoration	x	x		x	x	x

CU = Certification Unit
FRL = Final Remediation Level
HWMU = Hazardous Waste Management Unit
OSDF = On=Site Disposal Facility
UST = Underground Storage Tank
WAC = Waste Acceptance Criteria



EXCAVATION APPROACH DEFINITION:

A: SHALLOW EXCAVATION OF IMPACTED ON-PROPERTY AREA OUTSIDE OF THE FORMER PRODUCTON AREA AND OTHER WASTE STORAGE/MANAGEMENT AREAS.

B: EXCAVATION IN WASTE STORAGE/MANAGEMENT AREAS OUTSIDE THE FORMER PRODUCTION AREA.

C: EXCAVATION OF EXISTING STOCKPILES IN THE FORMER PRODUCTION AREA.

D: EXCAVATION FOLLOWING D & D IN THE FORMER PRODUCTION AREA. SEWAGE TREATMENT PLANT AND THE FIRE TRAINING FACILITY.

E: OFF-PROPERTY AND NON-IMPACTED ON-PROPERTY AREA CERTIFICATION.

F: NON-HIGH DENSITY POLYETHYLENE PIPELINE EXCAVATION OUTSIDE THE FORMER PRODUCTION AREA.

LEGEND:

- - - - - - PHASE BOUNDARY

— · — · — FEMP BOUNDARY

——— EXCAVATION APPROACH BOUNDARY

4b REMEDIATION AREA

B EXCAVATION APPROACH

STP = SEWAGE TREATMENT PLANT
FTF = FIRE TRAINING FACILITY
SWL = SOLID WASTE LANDFILL
LSP = LIME SLUDGE POND

SCALE

1500 750 0 1500 FEET

000257

FINAL

FIGURE 4-1.
PROPOSED EXCAVATION APPROACHES WITHIN SITEWIDE REMEDIATION AREAS

STATE PLANAR COORDINATE SYSTEM 1983

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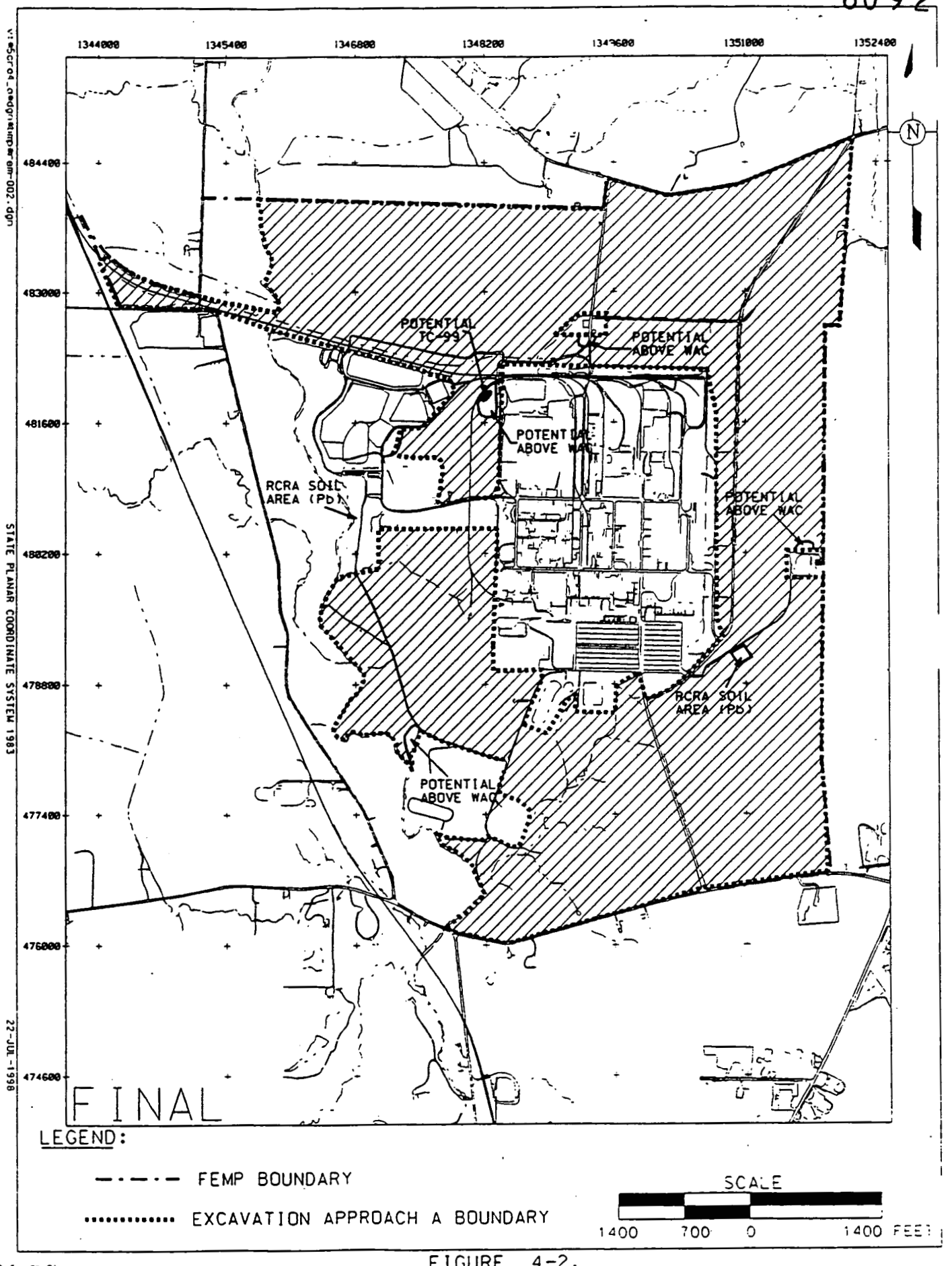


FIGURE 4-2.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH A
(FOR INFORMATION PURPOSES ONLY)

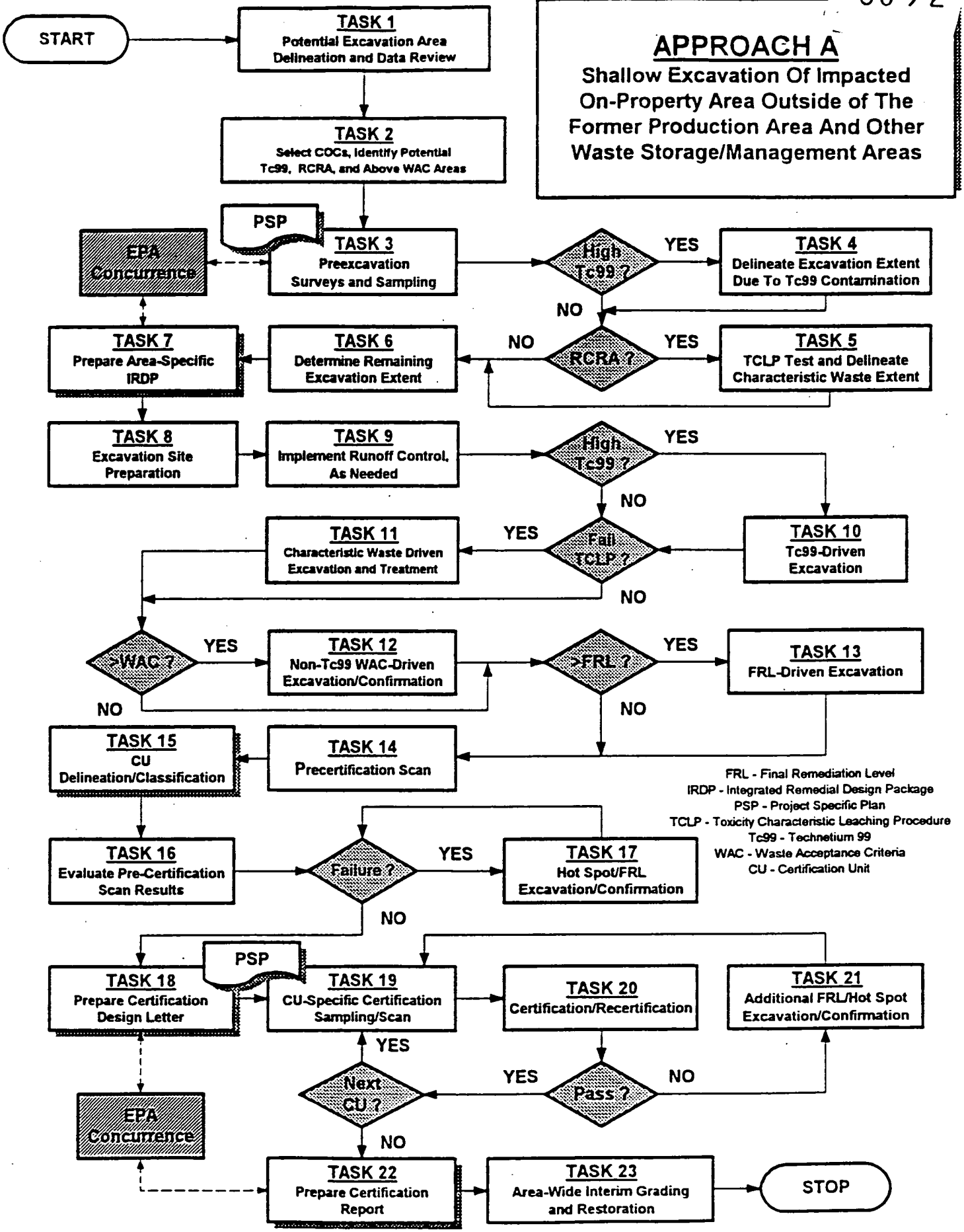


FIGURE 4-3 LOGICAL FLOW FOR EXCAVATION APPROACH A

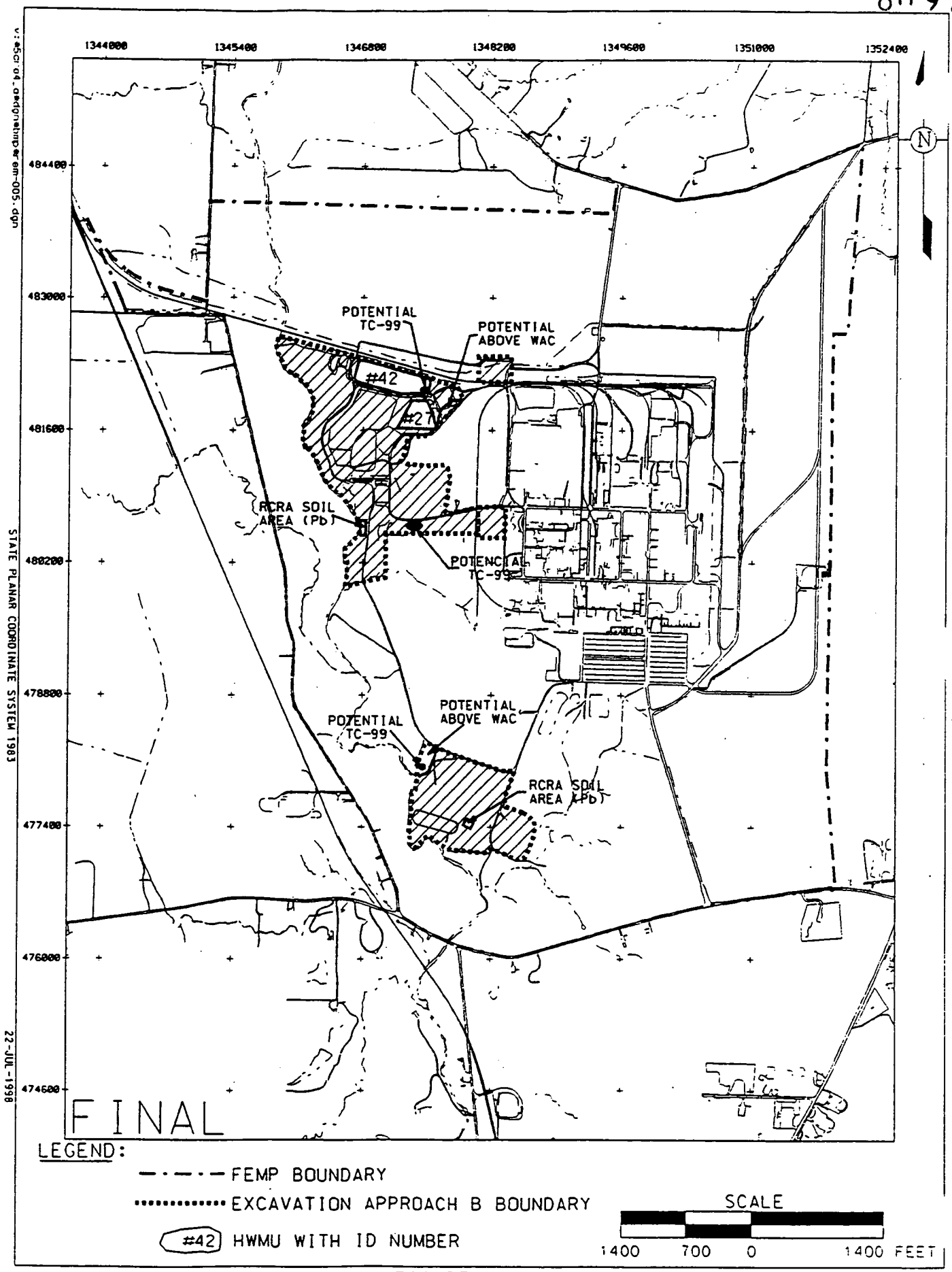


FIGURE 4-4.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH B
(FOR INFORMATION PURPOSES ONLY)

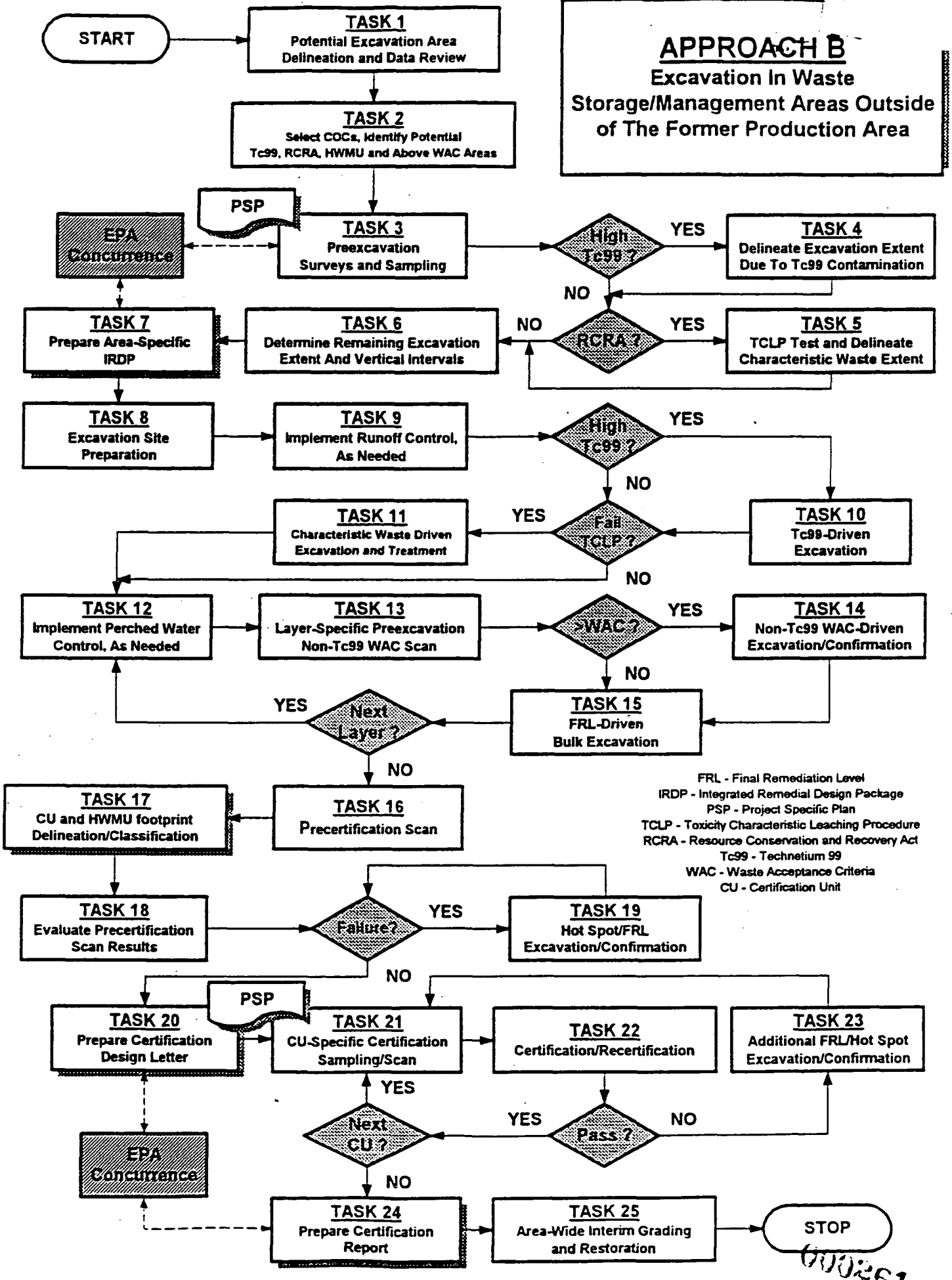


FIGURE 4-5 LOGICAL FLOW FOR EXCAVATION APPROACH B

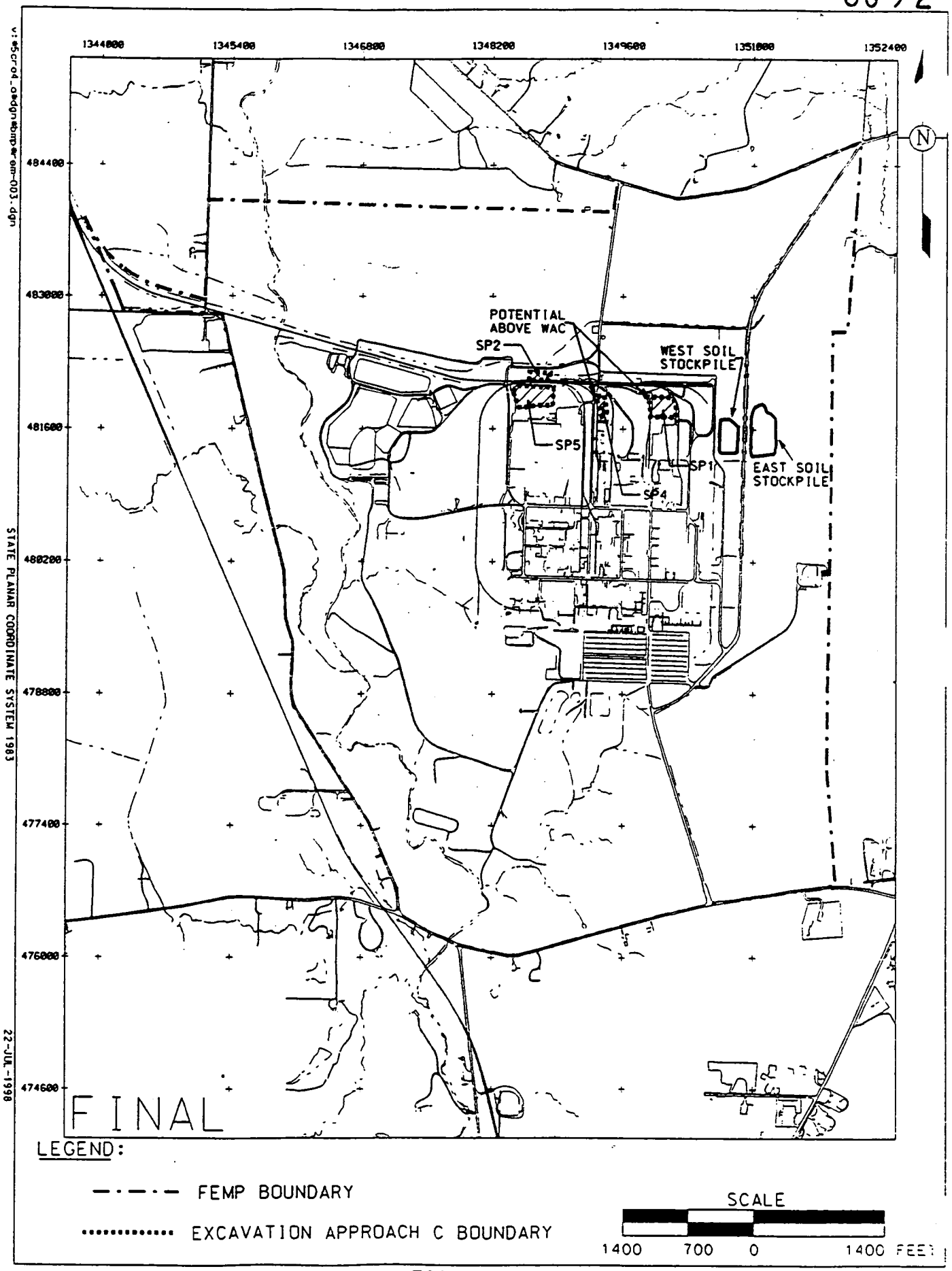


FIGURE 4-6.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH C
(FOR INFORMATION PURPOSES ONLY)

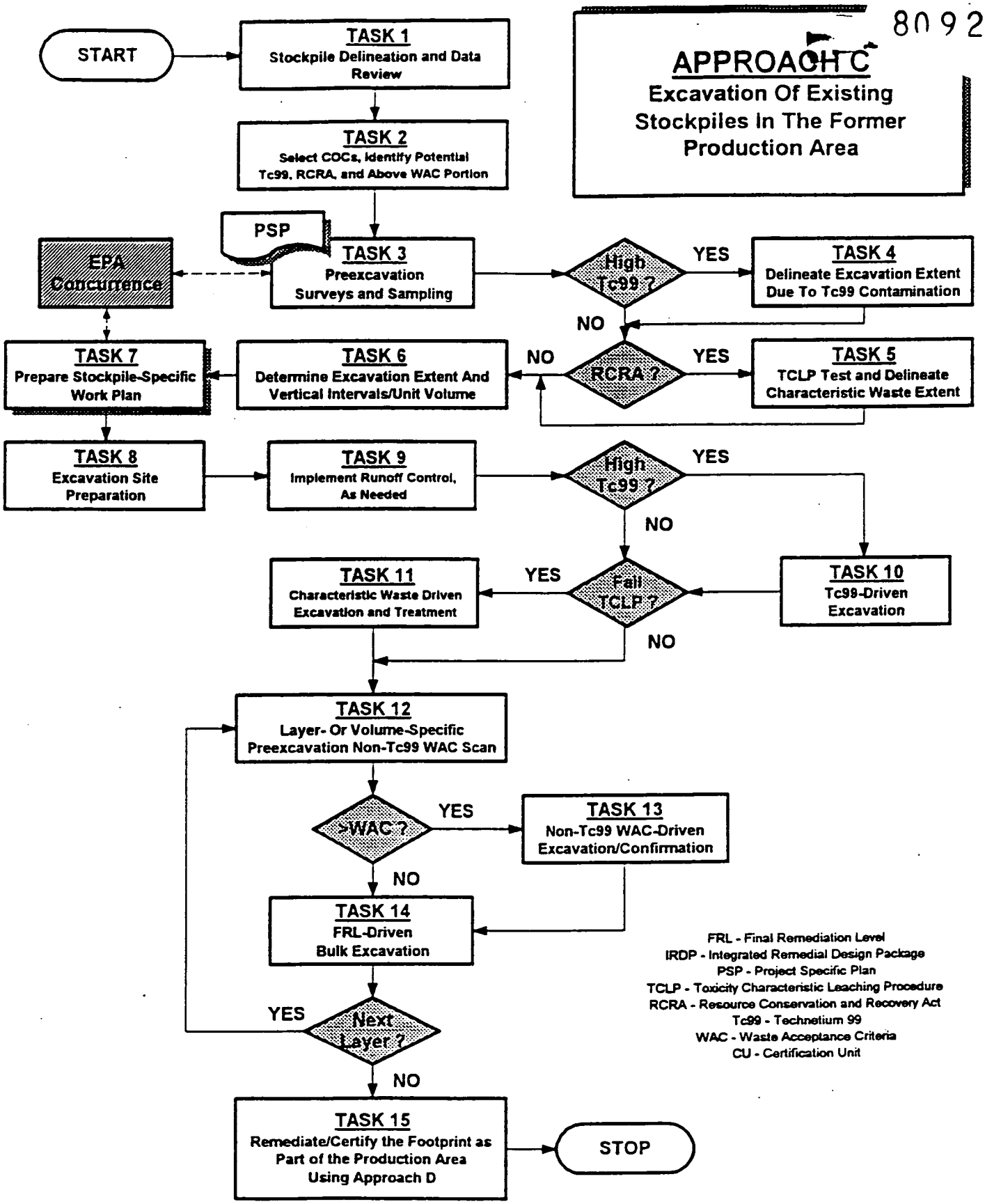


FIGURE 4-7 LOGICAL FLOW FOR EXCAVATION APPROACH C

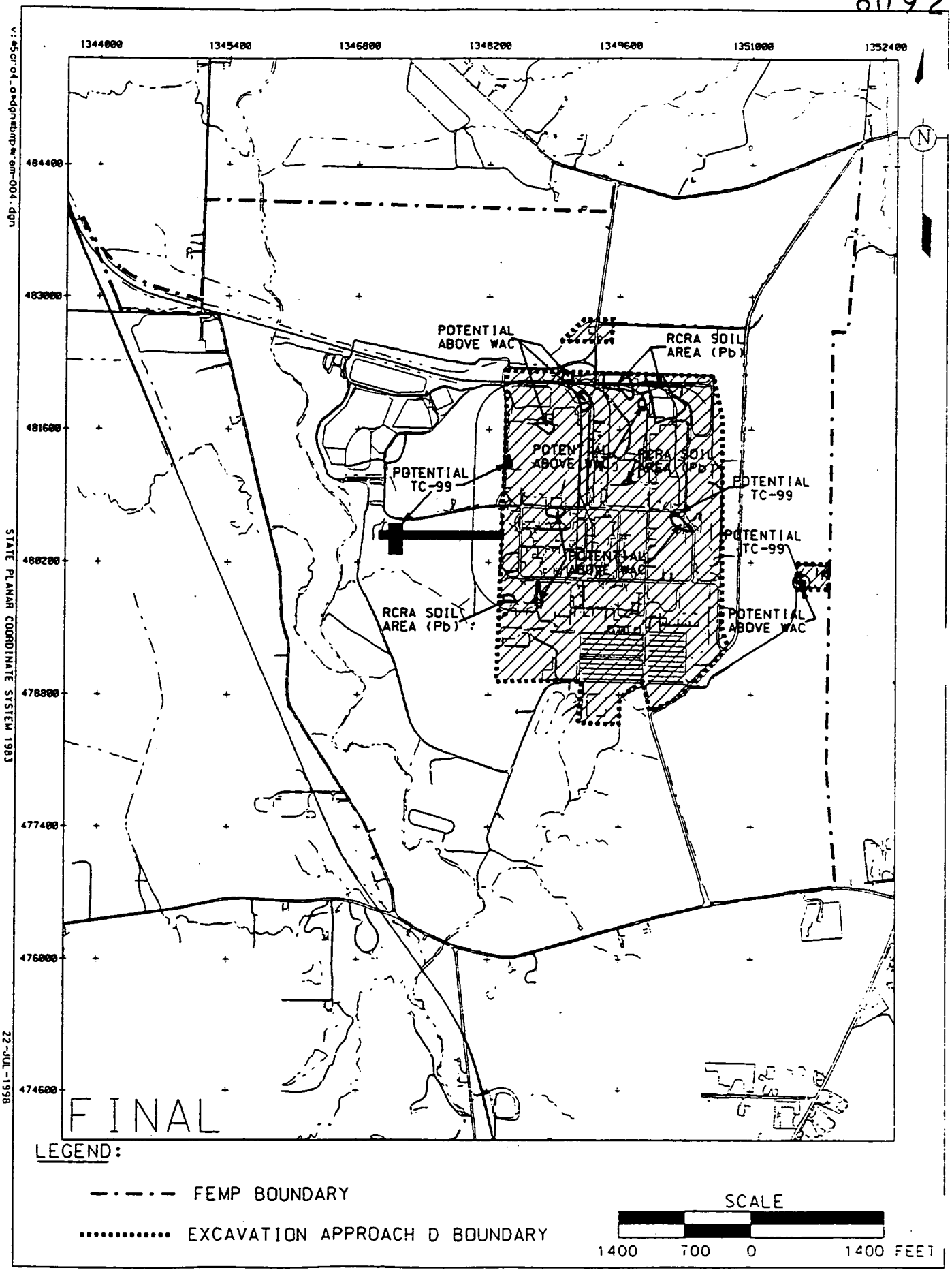


FIGURE 4-8.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH D
(FOR INFORMATION PURPOSES ONLY)

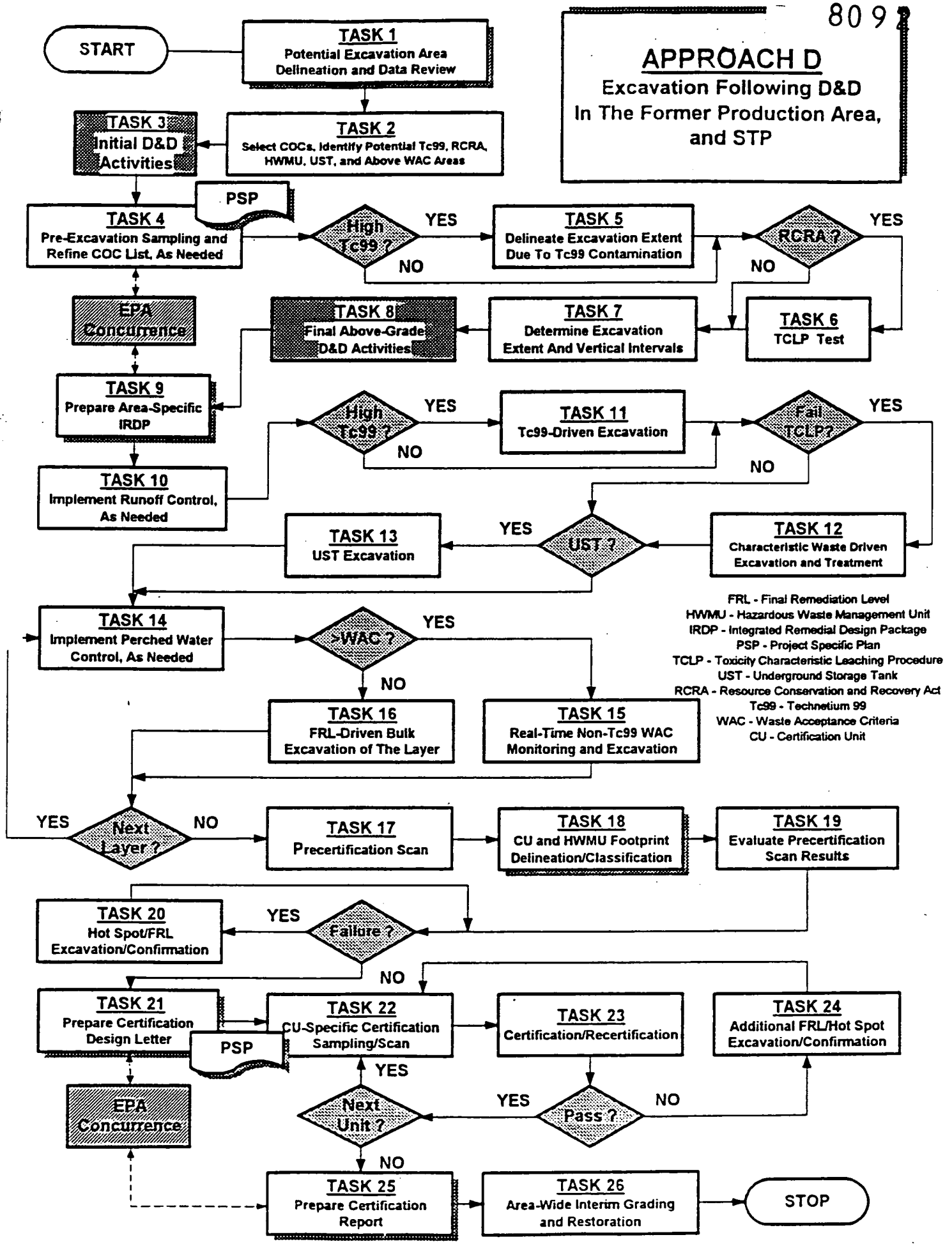


FIGURE 4-9 LOGICAL FLOW FOR EXCAVATION APPROACH D

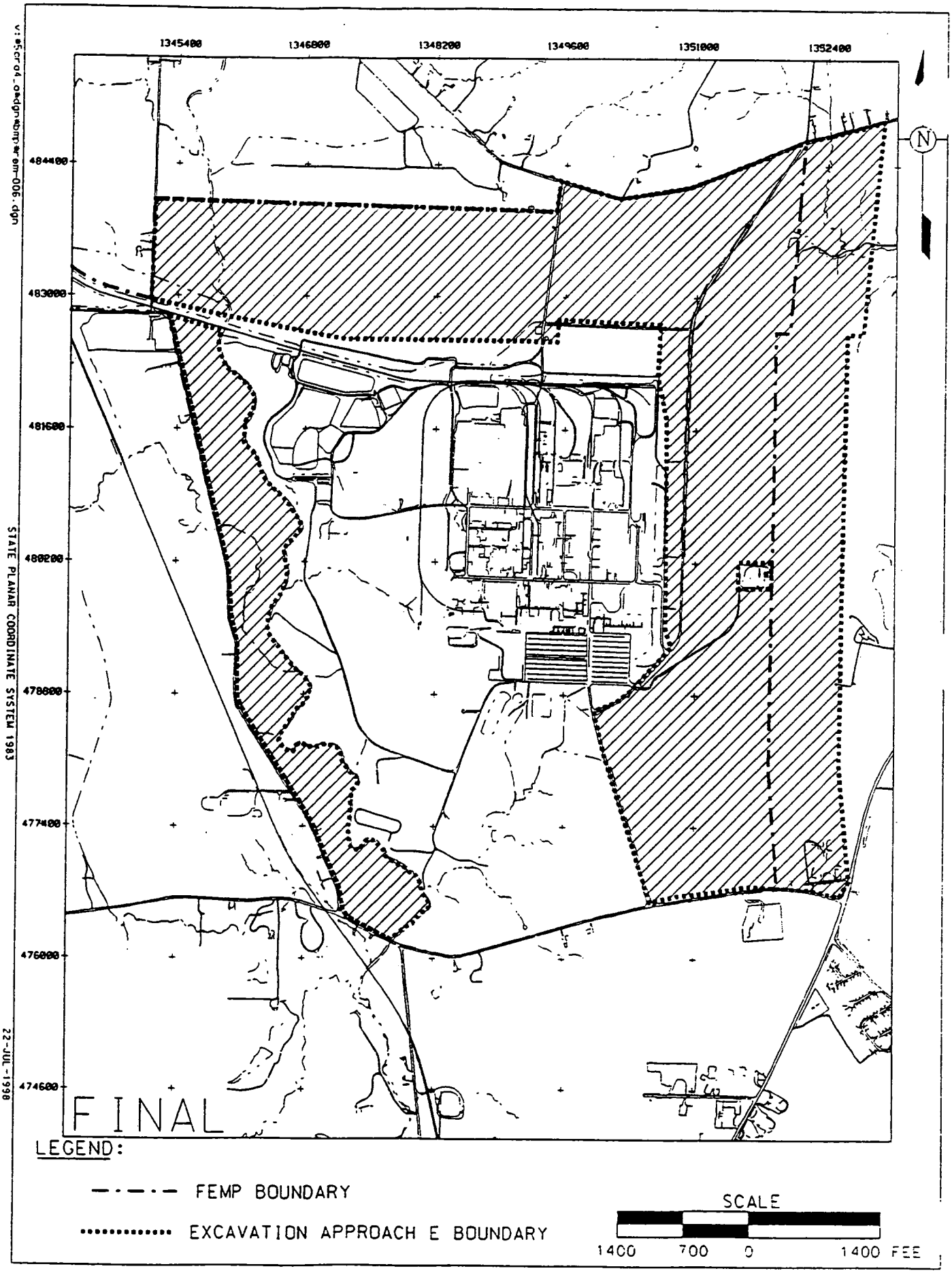


FIGURE 4-10.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH E
(FOR INFORMATION PURPOSES ONLY)

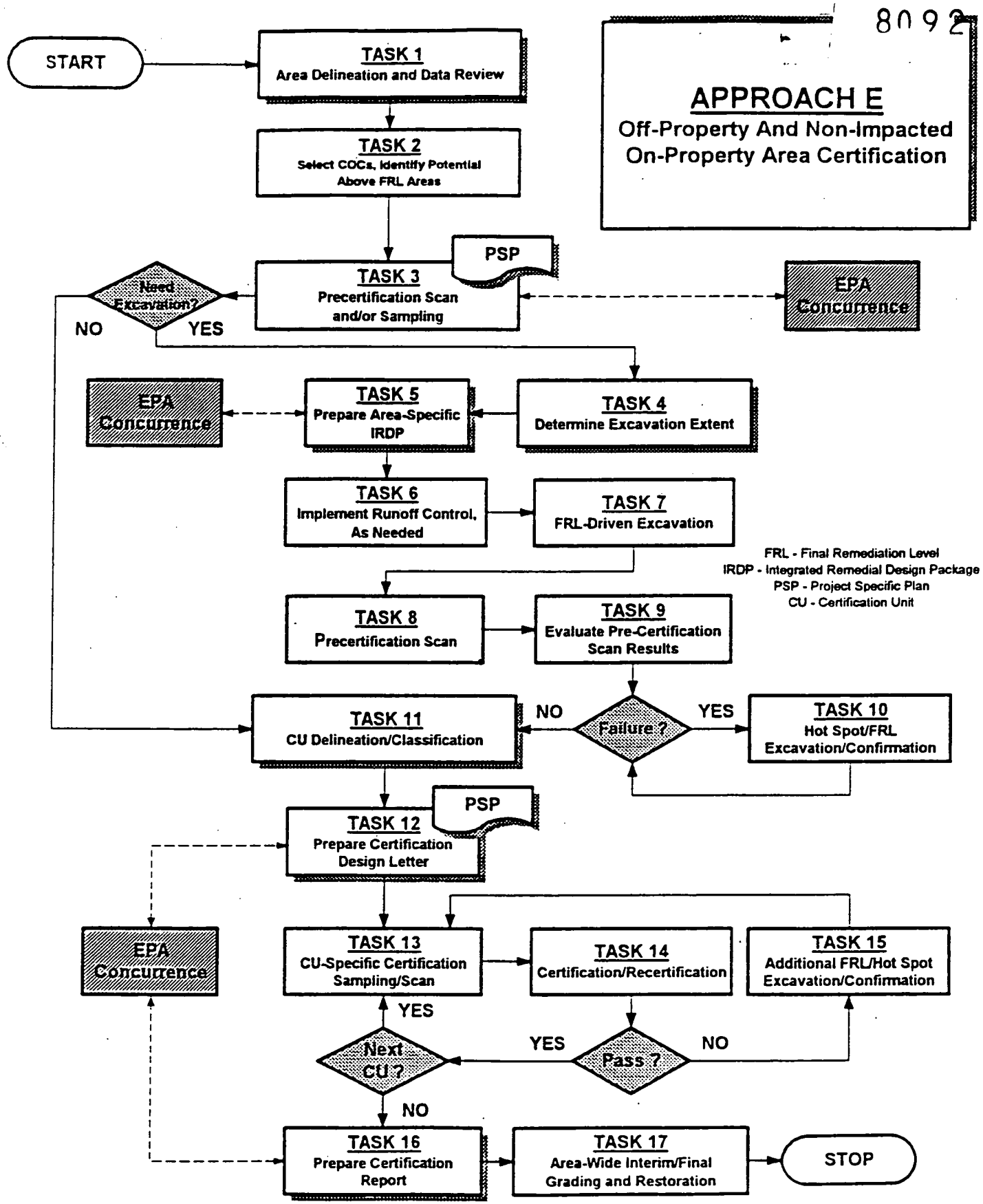


FIGURE 4-11 LOGICAL FLOW FOR EXCAVATION APPROACH E

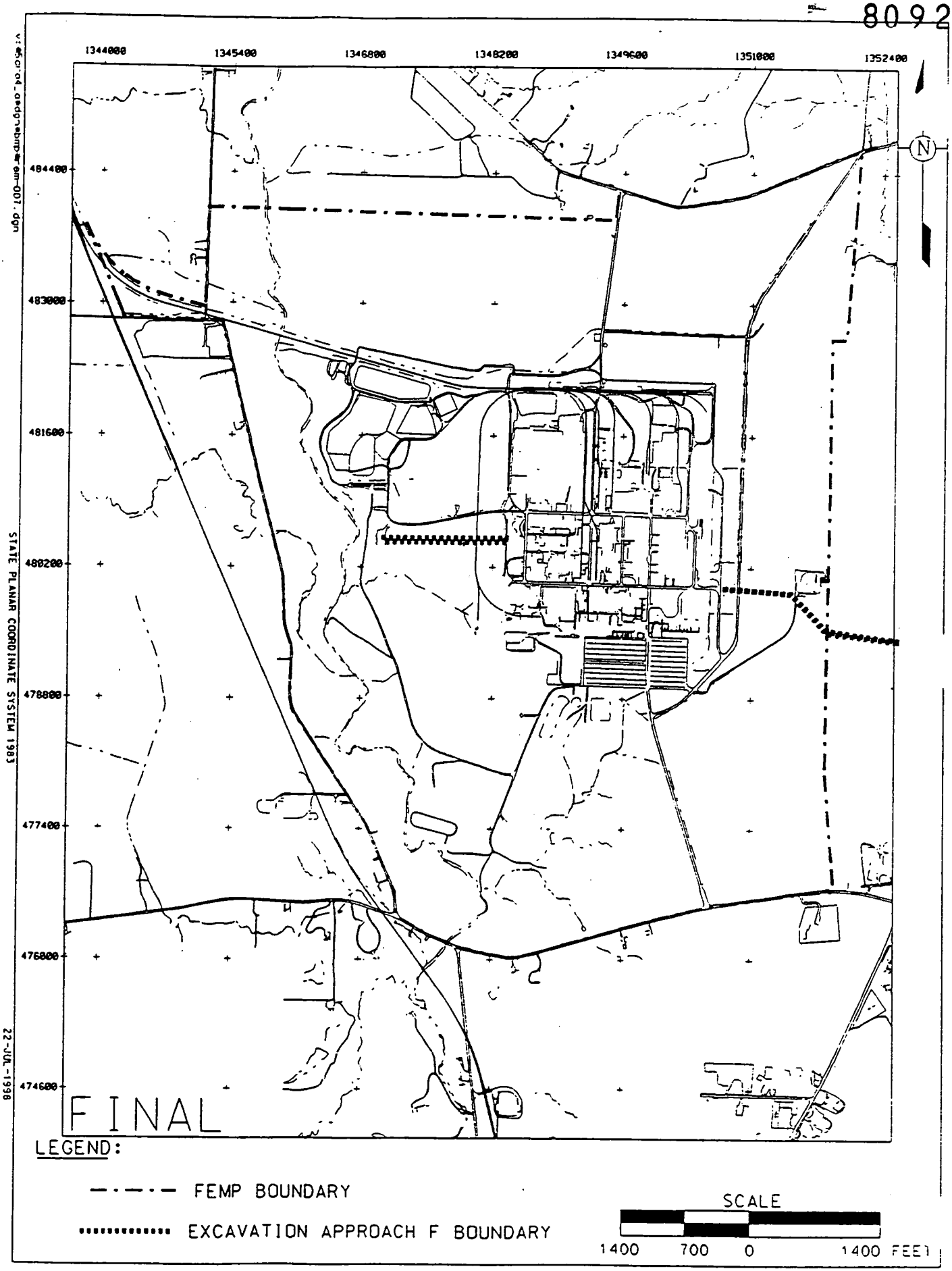


FIGURE 4-12.
ANTICIPATED EXCAVATION AREAS FOR EXCAVATION APPROACH F
(FOR INFORMATION PURPOSES ONLY)

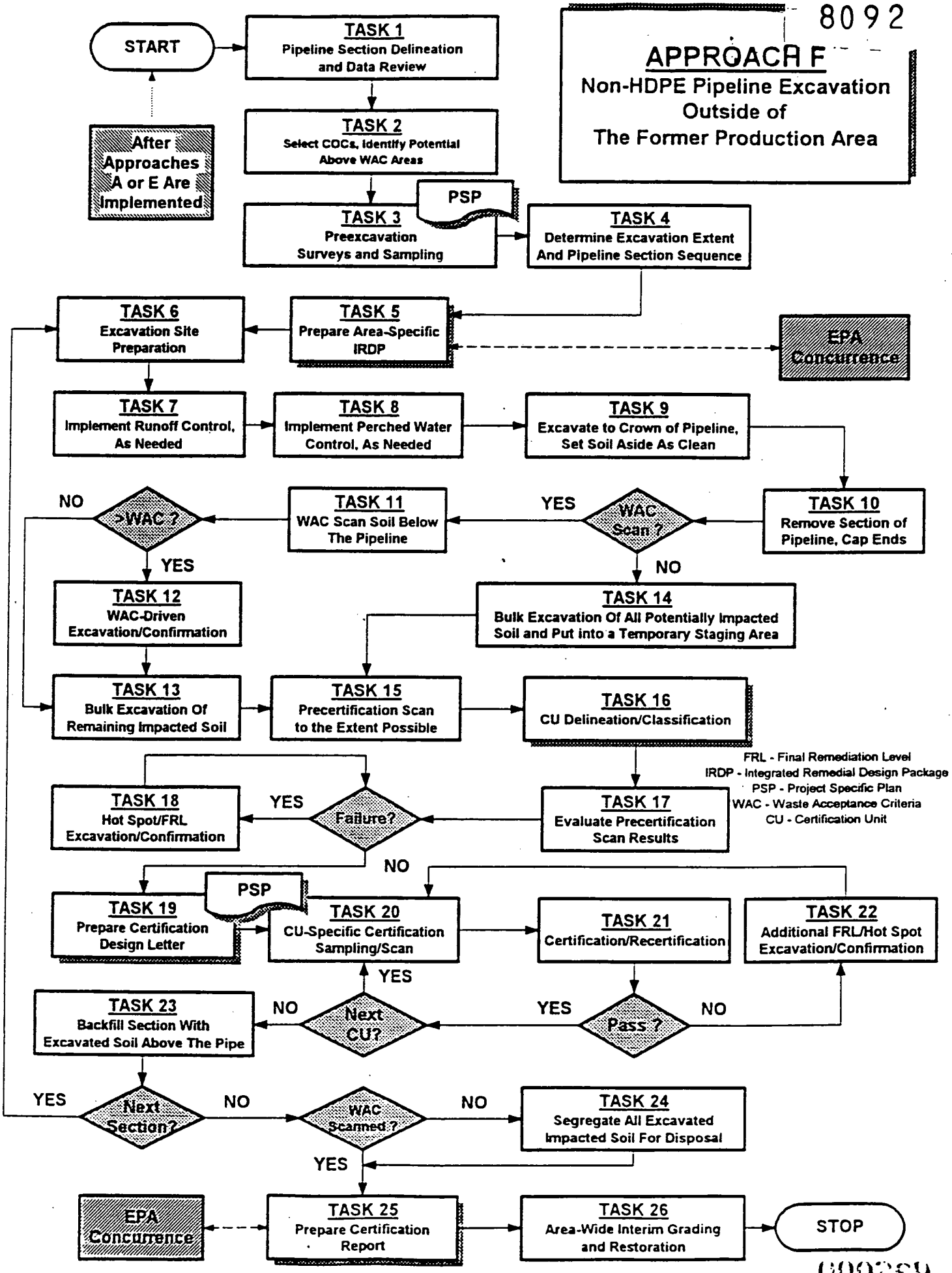
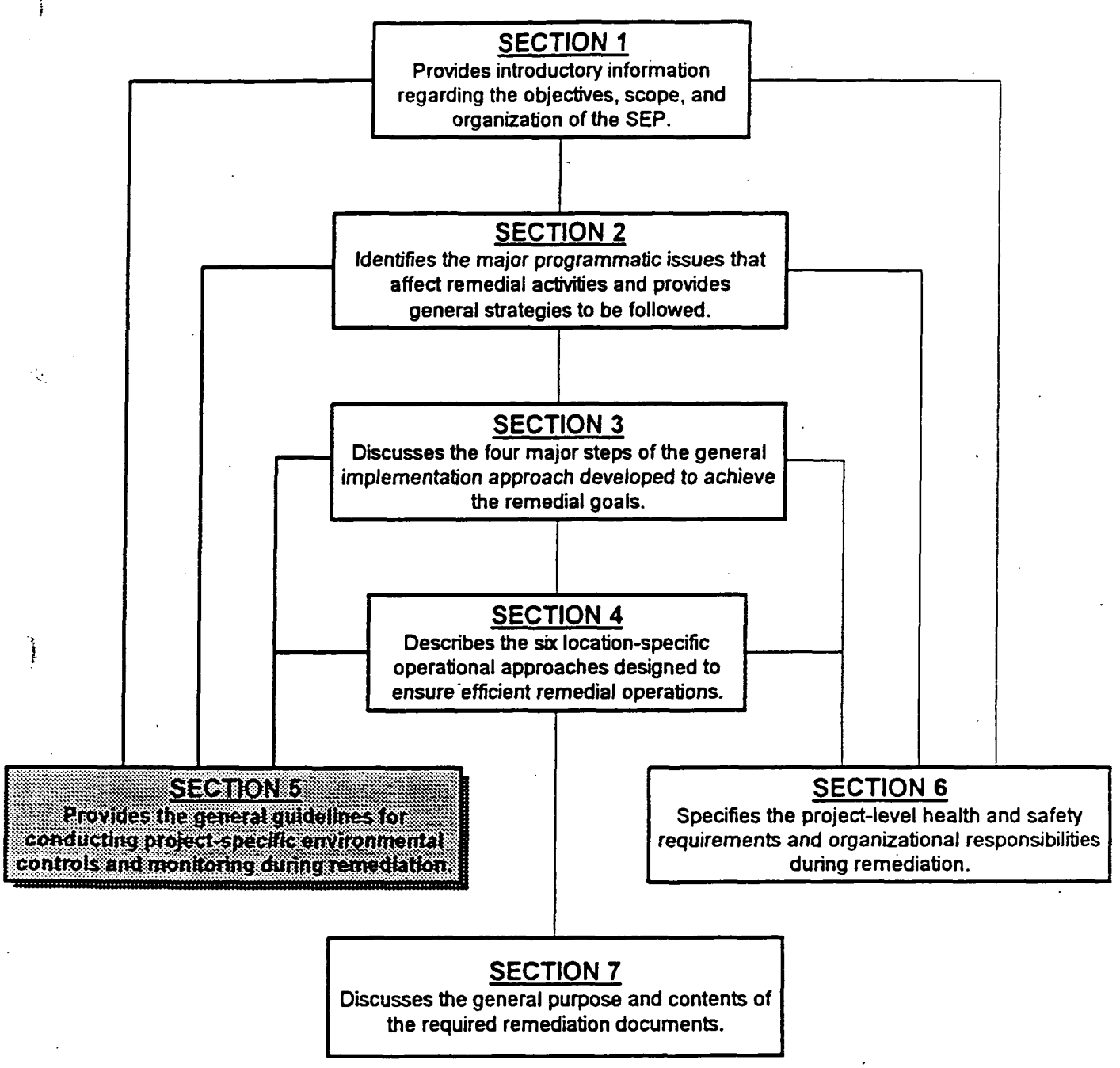


FIGURE 4-13 LOGICAL FLOW FOR EXCAVATION APPROACH F

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

5.0 ENVIRONMENTAL CONTROLS AND MONITORING

In accordance with the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997a), each remediation project is responsible for the design and execution of its own monitoring activities (outside the IEMP) to demonstrate compliance with its respective project-specific environmental-emission-control applicable or relevant and appropriate requirements (ARARs) (Appendix A) and to obtain the timely feedback required to track the effectiveness of those controls and make necessary, routine "process adjustments." This section includes the management strategy for implementing project-specific environmental control mechanisms and for conducting project-specific environmental monitoring, during remediation of impacted soils at the Fernald site. Environmental control mechanisms, and monitoring and reporting requirements, are provided by pathway for natural resource impacts, air, surface water, and groundwater. This sequence follows that of Appendix A, where the pertinent environmental requirements are presented.

This section of the Sitewide Excavation Plan (SEP) will be used as the basis for defining the specific environmental control, monitoring, and data evaluation requirements in each project-specific Integrated Remedial Design Package (IRDP). The information provided in this section addresses the approach for project-specific environmental control and monitoring, how the resulting information will be used by the project organization for "process-adjustment" decisions, and how it will be integrated with sitewide monitoring and reporting requirements, based on the regulatory-driven (Appendix A) and IEMP-related monitoring and reporting programs at the site. To the extent practical (dependent on sampling frequency, analysis turnaround times, etc.), data collected under both the project-specific and sitewide monitoring programs will be reported in accordance with their associated regulatory drivers and the framework of the IEMP reporting schedule. The IEMP will provide a summary reporting link (to assist with sitewide interpretations) and a cumulative feedback function for the project-specific monitoring conducted by the individual remediation projects. It should be noted, however, that routine "process-adjustment" decisions, which will be made by the Soil Characterization and Excavation Project (as the FEMP's lead project organization) to react and respond to project-specific operating conditions and process-control objectives, will not be reported as part of the IEMP quarterly or annual reporting cycles. Rather, these types of routine decisions will be maintained as part of the project organization's daily operations logs and are considered to be a normal course of day-to-day practice to

achieve project-specific operating objectives (Section 3.6). Figure 5-1 summarizes the FEMP sitewide and project-specific environmental monitoring and control mechanisms.

The need to relocate sitewide environmental monitoring program's monitoring locations or stations will be evaluated during the development of project-specific IRDPs. Relocations will be coordinated with IEMP personnel to ensure that the integrity of the sitewide environmental monitoring program is maintained. To the extent practical, those relocations will be identified in the IEMP during its annual review or biennial revision cycles. Needed relocations not known in time for these cycles will be identified in the respective IRDP and reflected in the subsequent IEMP cycle.

5.1 PROJECT-SPECIFIC CONTROL MECHANISMS AND MONITORING

Project-specific control mechanisms, associated monitoring, and the use of the resulting information by the project organization for "process-adjustment" decisions are presented in the following subsections. Each project-specific IRDP will utilize the control mechanisms, monitoring programs, and data evaluation programs described in this section for development of their project-specific programs, but may revise and improve the programs described herein using the "keep, stop, start" concept to take advantage of "lessons learned" during the previous phases of the soil remediation process.

5.1.1 Natural Resource Impacts

For soil remediation projects to be initiated under the SEP, the strategic control mechanism for natural resource impacts is threefold:

1. Identify the unavoidable impacts to natural resources anticipated to result from remediation activities.

2. Plan and design the remediation activities to limit the anticipated natural resource impacts to those which practically cannot be avoided.

3. Conduct natural resource restoration.

The first component, unavoidable impacts to natural resources, has been addressed by the Records of Decision (RODs) for Operable Units 2 and 5 (DOE 1995f, 1996e). These RODs identified the

unavoidable potential natural resource impacts anticipated to occur as a result of remediation activities to be initiated under the SEP. The second component, design, is discussed briefly in the following paragraph.

Avoidance of impacts to FEMP natural resources will be controlled through design as follows. Sensitive natural resource areas have been delineated at the FEMP through a variety of field activities and through regulator and stakeholder input. These areas, termed "Priority Natural Resource Areas," encompass the Paddys Run riparian corridor; the 26-acre forested wetlands; the northern woodlots of the site; and threatened and endangered species habitat on the FEMP. These areas are illustrated in Figure 5-2. All remedial activities will be designed to avoid impacts to Priority Natural Resource Areas to the extent practicable. Each IRDP will specify access points, laydown areas, etc., outside Priority Natural Resource Areas. Potential impacts to other FEMP natural resources will be minimized through the incorporation of appropriate environmental control mechanisms as well.

The third component, restoration, is addressed briefly in Section 3.5.3.

5.1.2 Air Pathway

The strategy for assessing impacts on the air pathway from remedial activities includes monitoring activities that will satisfy requirements for noise, fugitive emissions (visible dust), airborne radiological particulate, and radon and direct radiation monitoring during excavation of impacted soils. Air pathway monitoring activities initiated under the SEP to the maximum extent possible will make use of both the existing FEMP occupational air monitoring program and the sitewide environmental monitoring program (described in Section 6.0 of the IEMP). Using existing monitoring programs will help ensure that project-specific data are of comparable quality and are beneficial in evaluating and reporting project-specific air pathway releases under the various regulatory drivers (Appendix A) associated with these monitoring programs. Administrative and engineering control techniques, in accordance with the FEMP fugitive dust control "best available technology" (BAT) determination, will be implemented during excavation activities to mitigate potential emissions of fugitive dust and airborne radiological particulate emissions.

Project-specific monitoring requirements related to noise and fugitive emissions (visible dust) are presented in the following pages. Plans for integrating project-specific air pathway monitoring data into the IEMP reporting process are described in Section 5.2.2.

5.1.2.1 Noise

Federal law mandates that all federal agencies, including the Department of Energy (DOE), comply with federal, state, interstate, and local laws and regulations governing the control and abatement of environmental noise. As identified in the Operable Unit 5 ROD (DOE 1996e), the Noise Control Act (42 U.S.C. 4901 et seq.) and the Noise Pollution and Abatement Act (42 U.S.C. 7641 et seq.) are the two primary federal statutes regulating noise pollution and abatement. Executive Order 12088, entitled "Federal Compliance With Pollution Control Standards," also requires federal agencies to comply with the Noise Control Act. The implementing regulations associated with these statutes that are ARARs under the SEP (Appendix A) include the construction equipment noise standards promulgated in 40 CFR §204.1 and the transportation equipment noise standards promulgated in 40 CFR §205.1.

Control Mechanisms

Noise control and abatement will include noise control devices (mufflers) on vehicles and machinery, proper maintenance of vehicles and machinery, and also may include rescheduling time periods in which heavy equipment is used in the field. Currently, only minimal remediation activities are anticipated to be performed after sunset.

To ensure that Occupational Safety and Health Administration (OSHA) and American Conference of Governmental and Industrial Hygienists (ACGIH) noise limits are met, an administrative action level below these limits will be specified in the project-specific health and safety plans. This administrative action level will be used to assess the need for hearing protection for field personnel in the vicinity, the need for maintenance of vehicles and machinery, and the need for additional noise control and abatement.

Monitoring

Noise monitoring will be conducted to implement IRDP project-specific health and safety plans. Noise measurements will be made in the field by health and safety personnel, using health and safety

protocols for noise monitoring, to assess whether administrative action levels are exceeded; the need for hearing protection; the need for maintenance of vehicles and machinery; the need for additional noise control or abatement; and compliance with OSHA and ACGIH occupational noise limits.

Components of noise monitoring will include establishing remediation area-specific background levels prior to the start of excavation activities, and occasional monitoring during implementation of remedial activities. If background noise levels are within 10 dBA (decibels on the A-weighted scale) of a pre-contemplated administrative action level (e.g., from a preceding project), then a new administrative action level may be established for a given area before remediation of that area is initiated. If the environmental noise level falls within 5 dBA of the administrative action level, health and safety personnel will contact the project field manager to begin appropriate corrective actions.

Field managers will be responsible for documenting noise monitoring in the field in accordance with the record keeping guidelines presented in Section 3.6 and for initiating noise abatement measures.

5.1.2.2 Fugitive Emissions

Control Mechanisms

Project-specific IRDPs will be developed in accordance with the following, which has itself been developed from the "Fugitive Dust Control Requirements" (RM-0047), developed in turn from the FEMP-specific determination of BAT for dust control.

Water, commercially available dust suppression agents, or other appropriate methods and work practices, will be used proactively to reasonably minimize dust generation from remediation activities. Only the amount or method necessary for dust control will be applied; excessive amounts or methods will not be applied. The application rate of water or other dust suppression agents, and frequency of application, are anticipated to vary depending on existing moisture, surface type, and other environmental conditions. Water or other dust suppression agents will be applied in sufficient quantity to prevent dust generation but limited so that they do not result in migration of the agent beyond work area boundaries, ponding, or disruption of other portions of work.

For soil hauling activities, dust control shall be by progressive increments focused on making the material to be transported unlikely to become airborne. The base mechanism is anticipated to be reliance on inherent moisture in the soil or soil-like materials, coupled with a 15-mile-per-hour (mph) speed limit during hauling. If visible dust emissions from the hauled materials occur during hauling, one or a combination of the following dust control methods are anticipated to be used:

- Change configuration of material (e.g., place less in the trucks)
- Apply water mist
- Add surfactants or other agents to the water mist
- Apply resins, crusting agents, or foams in lieu of water mist (atypical truck load bed covers)
- Reduce hauling speed
- Cover truck load bed.

Wheel-washing stations will be used at the point of origin from the soil remediation project prior to entering any defined paved or unpaved roadways. Clods, clumps, or visible deposits of soil or other materials that could readily become visible fugitive emissions from paved or treated unpaved roadways/parking areas will be promptly removed. Appropriate dust control mechanisms will be applied to reasonably minimize the generation of visible dust that may result from the removal process.

Applicable definitions, and the criteria for determining visible dust or excessive visible dust, will be as follows:

1. Definitions

Dust alert: Whenever FDF gives notification to the Subcontractor that visible particulate emissions exceed the site-specific limit or Ohio standard during non-work periods.

Paved roadway or paved parking area: A predetermined and delineated area designed and improved specifically for vehicle traffic. Improvements to the predetermined area include the application of materials such as asphalt or cement that forms a level surface for travel. (RM-0047)

000276

Unpaved roadway or unpaved parking area: A predetermined and delineated area selected by OEPA and DOE for the specific purpose of vehicle traffic. Unpaved roads will appear in the IRDP on the design drawings. Improvements to the predetermined delineated area include the application of gravel, shredded shingles, cinders, compaction, etc. (RM-0047)

Visible particulate emissions (visible dust): Visible particulate that are generated during material handling, construction, or remediation activities, from equipment wheels or tracks, or from any tools or other equipment used. Visible particulate emissions are also those generated by wind. (RM-0047)

Wind erosion: Fugitive emissions strictly created by the wind and not by material handling, equipment, or vehicle traffic (RM-0047).

2. For dust control purposes, the relationship between categories, remediation activities, associated areas, dust control/work practices, and site-specific limits or Ohio standards are summarized in Table 5-1.

Remediation activities will be monitored for visible dust. Project personnel will tour the areas of remediation activities at the start of the day and periodically during the day. The number or type of dust suppression equipment in operation will not preclude stopping work if there is visible dust or excessive visible dust. Visible dust indicates the need to increase the level of dust control effort. Increasing levels of visible dust indicate a need to increase the dust control level of effort up to and including alteration of, possible slowdown of, or even temporary suspension of corresponding work activity(ies) observed to be generating the visible dust. Work activity(ies) observed to be generating the visible dust will be temporarily suspended if visible dust exceeds the corresponding site-specific limit or Ohio standard; an increase of dust controls and/or modification to work practices will be implemented to bring the fugitive emissions to, at a minimum, below the limit/standard during dust-generating activities.

Personnel will be on-call during non-work periods seven days per week (including holidays) to respond to an off-hours dust alert, as is defined above. Pre-designated site personnel will notify pre-designated Subcontractor personnel of a dust alert; dust suppression will begin no more than three hours after dust-alert notification given by the pre-designated site personnel.

As part of the Subcontractor's "Safe Work Plan," the Subcontractor will develop a "Dust Suppression Plan" to specify:

- A narrative description of how the Subcontractor field personnel will implement the "Dust Suppression Plan," how they will monitor for visible dust, how they will progressively implement increased dust control or alter work activities when required, and how they will maintain appropriate records of dust control activities.
- A listing of methods to be used to suppress dust, and the associated frequency that routine dust suppression is to take place.
- By method, the materials to be used to suppress dust — e.g., water, dust suppression agents, etc.
- By method, the specific types and quantities of equipment to be used to suppress dust.
- A description of the notification process, including designation of personnel, that the Subcontractor intends for site personnel to utilize during non-work periods to notify the Subcontractor of a "dust alert."

Monitoring

Real-time visual observation of visible dust, in accordance with the criteria described in the preceding control mechanisms discussion, will be used to assess the presence of visible fugitive dust emissions and progressively implement corrective changes.

Additionally, visual monitoring in accordance with 40 CFR Part 60, Appendix A, Method 22, Visual Determination of Fugitive Emissions from Material Sources and Smoke Emission from Flares, will be conducted.

Furthermore, in accordance with the Ohio Environmental Protection Agency's (OEPA's) fugitive dust control BAT determination for the FEMP, visual determination of opacity will be conducted on activities identified in Table 5-1 as project field activities and material handling/vehicle traffic on storage piles. That determination will be in accordance with 40 CFR Part 60, Appendix A, Method 9, Visual Determination of Opacity of Emissions from Stationary Sources (or an approved alternative method).

Field managers will be responsible for documenting visible emission monitoring records in the field in accordance with the recordkeeping guidelines defined in Section 3.6 and initiating fugitive dust

abatement measures. Records of the following information for each work day (including off-hours dust-alert response, except as noted below) will be maintained for each soil remediation project:

- The date, weather conditions, and scheduled work activities (e.g., excavation, trenching, hauling, placement, compaction, loading, etc.)
- Records of opacity readings (if any) conducted that day in accordance with 40 CFR Part 60, Appendix A, Method 9, Visual Determination of Opacity of Emissions from Stationary Sources (or an approved alternative method) [NOTE: not required for off-hours dust alert responses]
- Time of dust-alert notification given to the Subcontractor, names of the individuals (FDF notifier, Subcontractor employee notified, and Subcontractor dust-alert responders), and time of initiation of dust suppression activity [NOTE: required only for days when such notification occurs]
- Identification of areas (or segments) where dust control was performed
- The manner or type of dust control activity(ies) applied by area (or segment) to which applied
- Application rate of water or other dust suppression agents — at a minimum, tank truck load capacity and number of tankloads applied per area (or segment) to which applied
- Identification of the party(ies) responsible for the dust control activity by area (or segment) — at a minimum, name of the Subcontractor firm.

5.1.2.3 Airborne Radiological Particulates

Control Mechanisms

Airborne radiological particulate emissions associated with on-site excavation activities to be initiated under the SEP are anticipated to all be from fugitive emissions. Control mechanisms for fugitive emissions are presented in the preceding subsection. No additional airborne radiological particulate control mechanisms for environmental or public safety concerns are anticipated to be required as a result of remedial activities to be initiated under the SEP.

Monitoring

Airborne radiological particulate emissions associated with on-site excavation activities to be initiated under the SEP will be monitored via the sitewide airborne radiological particulate monitoring program presented in Section 6.0 of the IEMP. The IEMP airborne radiological particulate monitoring program

locations are based on the primary wind rose sectors and potential receptor locations. As discussed in Section 6.0 of the IEMP, that program is designed to collect data representative of ambient air quality at select locations at or near potential receptors and encompasses all the current and expected point and diffuse sources at the Fernald site, including the SEP soil remediation excavations. The IEMP air monitoring network as approved is designed to be representative of potential receptors in each sector. The IEMP's existing network of airborne radiological particulate monitor stations placed at the FEMP fenceline provide an adequate level of assurance that the cumulative dose from FEMP remediation activities can be managed to remain within the National Emissions Standards Hazardous Air Pollutants List (NESHAPs) standards. The data collected under the IEMP airborne radiological particulate monitoring program will be used to assess the collective effect of concurrent remediation activities at the site, including those to be initiated under the SEP, under various regulatory drivers described in Section 6.0 of the IEMP.

No supplement or modification to the sitewide airborne radiological particulate monitoring program (as briefly described above) is anticipated to be required as a result of remedial activities to be initiated under the SEP until SEP work begins in the former waste pits area. The need to supplement or modify the then-existent IEMP airborne radiological particulate monitoring program will be evaluated during the development of the project-specific IRDP for that area. Supplement to or modification of the then existent program might then be required if monitoring stations do not already exist downwind (under the prevailing wind) of the SEP remediation activities, or if the monitoring frequency and/or analyses addressed by the program at that time do not adequately address the COCs in that particular remediation area. However, since these same issues will arise as part of the Waste Pits remedial action project that will precede the soil remediation project under this SEP, the potential need for supplement or modification triggered by SEP-initiated soil remediation activities is anticipated as very minor. If needed, such a supplement or modification would be coordinated with IEMP personnel to ensure that the integrity of the sitewide airborne radiological particulate monitoring program was maintained. To the extent practical, such a supplement or modification would be identified in the IEMP during its annual review or biennial revision cycles; if it could not be accommodated within these cycles, it would be identified in the respective IRDP and reflected in the subsequent IEMP cycle.

Furthermore, some of the airborne radiological particulate monitoring stations might need relocation to

facilitate excavation activities to be initiated under the SEP. The need to relocate any of the airborne radiological particulate monitoring stations will be evaluated during the development of project-specific IRDPs; if relocation is required, it will be coordinated with IEMP personnel to ensure that the integrity of the sitewide monitoring network is maintained.

5.1.2.4 Radon

Control Mechanisms

Emission of radon from soils being remediated under the SEP is not anticipated to be an environmental or public safety concern. Hence, no control mechanisms are anticipated to be required as a result of remedial activities to be initiated under the SEP.

Monitoring

Radon emissions associated with on-site excavation activities to be initiated under the SEP will be monitored via the sitewide radon monitoring program presented in Section 6.0 of the IEMP. That program is designed to monitor environmental radon concentrations resulting from radon generating sources at the site, in addition to fulfilling the monitoring requirements imposed by the Federal Facility Agreement for Control and Abatement of Radon-222 Emissions. As remedial activities are undertaken at the Fernald site, the sitewide radon monitoring program may change to ensure proper monitoring as a result of changing work activities. No supplement to that sitewide radon monitoring program is anticipated to be required as a result of remedial activities to be initiated under the SEP.

However, some of the radon monitoring stations might need relocation to facilitate excavation activities to be initiated under the SEP. The need to relocate any of the radon monitoring stations will be evaluated during the development of project-specific IRDPs; if relocation is required, it will be coordinated with IEMP, Radiological Environmental Monitoring (REM), and Radiation Control personnel to ensure that the integrity of the sitewide monitoring network is maintained.

5.1.2.5 Direct Radiation

Control Mechanisms

No additional control mechanisms for environmental or public safety concerns are anticipated to be required as a result of remedial activities to be initiated under the SEP.

Monitoring

Environmental radiation levels associated with on-site excavation activities to be initiated under the SEP will be monitored via the sitewide environmental direct radiation monitoring program presented in Section 6.0 of the IEMP. That program is designed to collect measurements of environmental radiation levels resulting from radioactive materials stored on site. As remedial activities are undertaken at the Fernald site, the sitewide environmental direct radiation monitoring program may change to ensure proper monitoring as a result of changing work activities. No supplement to that sitewide environmental direct radiation monitoring program is anticipated to be required as a result of remedial activities to be initiated under the SEP.

However, some of the environmental direct radiation monitoring stations might need relocation to facilitate excavation activities to be initiated under the SEP. The need to relocate any of the environmental direct radiation monitoring stations will be evaluated during the development of project-specific IRDPs; if relocation is required, it will be coordinated with IEMP, REM, and Radiation Control personnel to ensure that the integrity of the sitewide monitoring network is maintained.

5.1.3 Surface Water Pathway

Control Mechanisms

As a condition of its National Pollutant Discharge Elimination System (NPDES) Permit (Ohio EPA Permit No. 1IO00004*ED), the FEMP was required to develop and implement a Storm Water Pollution Prevention Plan (SWPPP) by May 1, 1996 (DOE 1996e). The SWPPP identifies potential sources of pollution associated with industrial and construction activities that may affect storm water quality at the facility and describes the practices that will be employed to reduce pollutants within these types of discharges. The SWPPP also contains provisions on the inspection programs which are being implemented to ensure that discharges of storm water associated with industrial and construction activities comply with the requirements of the FEMP NPDES Permit and of the SWPPP.

Effective implementation of erosion control and storm water management strategies depends on addressing these issues during the design, early in the planning phase of a remediation project. The erosion control measures and storm water management strategies must be appropriate for the area of remediation activity, and must be clearly transferred from the conceptual basis to the detailed design

000282

while maintaining the constructability of the remediation activity. Inside the Former Production Area and waste pit area drainage basin (hereinafter referred to as the "Former Production Area drainage basin" as that term is used in the SWPPP), erosion and sediment control measures will be implemented, as appropriate, to mitigate sediment loading to the existing controlled storm sewer system. Outside the Former Production Area drainage basin, erosion and sediment control measures will be implemented to protect downgradient areas.

Inside the Former Production Area drainage basin (i.e., inside the Former Production Area and waste pit area drainage basin), storm water run-off will continue to be controlled by the existing controlled storm sewer system, gravity drained to the Storm Water Retention Basin (SWRB), and under normal conditions, treated through the Advanced Wastewater Treatment (AWWT) facility. Additional erosion and sediment controls may be specified under project-specific IRDPs, as appropriate, to ensure that sediment loading to the existing controlled storm sewer system is minimized to the greatest extent practicable during excavation activities. It is anticipated that surface water control and treatment devices currently in place within the Former Production Area drainage basin of the site will remain largely in place until remediation of the area has been completed; however, they will be dismantled in phases (area-by-area) during implementation of the SEP. To the extent practical, surface water discharges from the area being worked will be conveyed via pumping or other appropriate mechanism to the adjacent area where the conveyance system is still intact. Because of the finite treatment capacity available at the site, it is the intent of the FEMP to minimize storm water treatment requirements through prioritization, pollutant source isolation and excavation sequencing, and limiting duration of open excavations. Thus, in accordance with the SWPPP (DOE 1996e), once an area is certified clean, surface water run-off/storm water from that area will be diverted so that it is not routed to the SWRB or to the AWWT.

Outside the "storm water run-off controlled" Former Production Area drainage basin, storm water from construction activity is regulated as an industrial activity (if a certain magnitude of earth-moving activities is involved). Soil remediation activities to be initiated under the SEP are a subset of construction activities. In accordance with the SWPPP under the FEMP's NPDES permit, erosion and sediment controls (sediment basins/traps, silt fences, etc.) will be installed where appropriate to protect downgradient areas. These controls will be designed and installed as specified in individual,

project-specific IRDPs to manage surface water run-off and run-on, minimize erosion, and control sedimentation in on-site surface waters such as wetlands and Paddys Run.

The grubbing and grading of various areas of the site, particularly those associated with construction of the OSDF and excavation of the Southern Waste Units, will result in the generation of substantial quantities of downed trees and brush. Current management options include the following:

- Chip (or shred) and land apply these materials concurrently with their generation.
- Chip (or shred) and manage in on-site stockpiles for potential use as compost during future site restoration activities.
- Grind stumps and roots in place, excavate with the soil, and dispose of in the On-Site Disposal Facility (OSDF).

In the first case, chipped/shredded tree and brush material can be land applied in areas identified where soil excavation will not be required to achieve soil final remediation levels (FRLs), or in areas which have already undergone FRLs attainment certification. Small quantities may also be used in non-certified areas for landscaping and maintenance (mulching, unpaved walkways, etc.).
The specific strategy(ies) used to manage chipped/shredded tree and brush material from each remediation area will be identified in its corresponding IRDP; however, management of chipped/shredded material under either of the first two options (other than disposal in the OSDF) is supported by the following analysis:

- Soil FRLs. Sampling of on-site tree tissues supports the premise that land application of these materials will not adversely affect the site's ability to attain soil FRLs. Analytical data have demonstrated that the concentrations of constituents exhibited in on-site tree tissues are substantially lower than their respective soil FRLs (Appendix D). Therefore, the biodegradation and subsequent release of constituents contained in woody tree and brush tissues during land application will not lead to an exceedance of soil FRLs in any areas of the site. Grubbed stumps will be managed as debris for disposal into the OSDF to ensure the potentially contaminated soils clinging to their roots are not introduced into the chipped/shredded tree and brush material stream.
- Storm Water Quality. Because of the bio-degradation process, slight increases in loadings and observed values for conventional pollutants, such as biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), pH,

color, and turbidity, are likely to be associated with storm water discharges from both woodchip stockpile areas and areas in which chipped/shredded tree and brush material has been land applied. In either case, discharges from these areas are not anticipated to contribute to the eutrophication of Paddys Run, since their small volume and intermittent nature will render them innocuous when mixed with the larger volume of run-off available within Paddys Run during a typical storm event. To further minimize potential impacts, drainage from woodchip stockpiles will be controlled by locating the stockpile in a location that does not drain directly into Paddys Run, or by employing runoff diversion methods such that the concentrated runoff from the pile does not drain directly to Paddys Run.

Storm water discharges from woodchip stockpile and land application areas are considered industrial in nature and therefore can be managed under the terms and conditions of the existing FEMP NPDES permit, provided they occur at one of four permitted industrial storm water outfalls along Paddys Run. The current permit specifies biannual monitoring for conventional pollutants at each outfall and, therefore, additional monitoring of run-off from woodchip stockpile and land application areas is deemed unnecessary at this time.

Also in accordance with the SWPPP under the FEMP's NPDES permit, during development of project-specific IRDPs, the need to provide treatment (beyond the erosion and sediment controls mentioned above) for storm water generated during remediation will be evaluated based upon two categories of activities:

- Shallow soil excavation or other earth-moving activities
- Deeper excavation.

The need to provide treatment (beyond erosion and sediment controls) is best determined through a comparison to existing conditions and whether storm water degradation is expected to occur during the period of excavation. For instance, areas with only surficial or shallow subsurface contamination may be removed in a manner such that storm water degradation would not be expected. For areas where there is considerable subsurface contamination (e.g., Operable Unit 2 Southern Waste Units), the removal of the surface soils would expose the subsurface contamination, such that storm water degradation could be expected. Thus, consistent with the SWPPP (DOE 1996e), project-specific IRDPs will designate whether treatment (beyond erosion and sediment control) of storm water run-off will be provided.

During the development of each project-specific IRDP, the FEMP Drainage Area Map (Figure 2-1 of the SWPPP) will be revised to show changes in the drainage areas flowing to NPDES-permitted storm water outfalls *4003 through *4006 that result from SEP-initiated remedial activities in these areas. A revised copy of the FEMP Drainage Area Map will be submitted with each project-specific IRDP and with the annual update of the SWPPP. Revisions to the descriptions of the watershed basins currently provided in Section 4.0 of the SWPPP will be provided with the annual SWPPP update.

Monitoring

Under the SWPPP (DOE 1996e) in accordance with the FEMP's NPDES permit, an industrial activity inspection program exists for the FEMP site. It covers both the Former Production Area drainage basin and areas outside that drainage basin. Under the FEMP's industrial activity inspection program, quarterly inspections are and will be conducted in areas draining to the site's controlled storm sewer system (Former Production Area drainage basin) and the uncontrolled watershed basins draining through NPDES permitted storm water outfalls *4003 through *4006 (Figure 5-3). These industrial activity inspections include evaluation of housekeeping issues, engineering controls and practices, and material handling and management activities associated with any industrial processes located within each of these watershed basins. Industrial activity inspections are not conducted within areas that are actively being inspected under the construction activity inspection program described below. Industrial activity inspections are documented and maintained as part of the NPDES and SWPPP files at the facility. See the SWPPP for further details.

Similarly, under the SWPPP (DOE 1996e) in accordance with the FEMP's NPDES permit, a construction activity inspection program exists for the FEMP site. Under the FEMP's construction activity inspection program, weekly inspections are and will be conducted within all construction areas at the site and after any rain events totaling 0.5 inch or more of precipitation within a 24-hour period. Construction activity inspections mandated by the SWPPP are and will be conducted in all remediation areas disturbed under the IRDPs. Inspections conducted in these areas will ensure that:

- Erosion and sediment controls required under the approved IRDPs are in place and are well maintained.

000286

- Work practices and housekeeping activities are conducted in a manner that reduces the potential discharge of pollutants in association with storm water discharges from disturbed areas.

- Corrective actions related to the establishment and/or maintenance of erosion and sediment control structures are documented and tracked to resolution.

- Excessive erosion and/or siltation to Paddys Run or other off-property waterways is not occurring as result of construction activities initiated under the IRDPs.

Construction activity inspections are documented and maintained as part of the NPDES and SWPPP files at the facility. See the SWPPP for further details.

Outside the Former Production Area drainage basin, a project-specific Storm Water Monitoring Program will be implemented under the SEP. Its primary objective is to monitor performance of erosion and sediment control structures (e.g., sediment traps and basins) against their anticipated design efficiencies; TSS is the appropriate indicator parameter for this objective. Note that the particle-bound fraction of a constituent of concern (COC) is anticipated to settle either in the sediment trap/basin or in the surface water course; both of these on-site surfaces will be addressed by follow-on soil remediation projects. Its secondary objective is to determine whether the run-off, or potential overflow, presents an unacceptable impact to surface water quality or presents an unacceptable cross-media impact to Great Miami Aquifer groundwater. Because uranium is the principal site contaminant and the predominant COC in the soils being remediated, total uranium is the appropriate indicator parameter for this objective; however, if the principal area-specific constituent of concern (ASCOC) in the project-specific IRDP is not uranium, an appropriate alternate indicator parameter will be designated. IEMP monitoring in the surface water courses at the basin-specific NPDES permitted outfalls address site discharge concerns.

Sampling, analyses, and evaluation will be conducted as follows:

- Specifically designated, installed control structures will be sampled once a month, *provided* that the qualifying storm event (next bullet) occurs and that sufficient discharge occurs to collect a sample.

- Influent and effluent grab samples will be collected during storm events of a magnitude of 0.5 inch of rainfall or greater within a 24-hour period.

- The influent and effluent samples will be analyzed for TSS at ASL B; for the effluent, an additional volume will be collected and analyzed for total uranium (or other area-specific indicator parameter) at ASL B.

- A trap efficiency will then be calculated from this TSS data, which will be compared to the anticipated trap efficiencies for the particular type of control structure to determine its effectiveness.

- Trap efficiency and effluent TSS will be trended to evaluate changes over time and the need for potential corrective actions.

- Effluent total uranium (or other area-specific indicator parameter) data will be trended to evaluate changes over time and the potential need for additional monitoring.

Project-specific IRDPs will designate:

- The control structure(s), if any, that will be sampled for this type of evaluation.

- The area-specific indicator parameter.

- The anticipated trap efficiency(ies) for the particular type(s) of control structures designated. (Anticipated trap efficiencies generally range from 50 to 80 percent for sediment traps, and 60 to 80 percent for sediment basins.)

- Any modifications to the evaluation frequency, rainfall event magnitude, or duration of such evaluation efforts.

- Any other modifications or qualifications, as appropriate.

If the trap efficiency of a particular control structure is less than anticipated for that type of structure, existing administrative and engineering controls specified in an IRDP will be evaluated for the watershed basin in which the control structure is located. Attempts to rectify the problem through improvements in administrative and engineering controls will be documented and tracked through the construction inspection process currently in place under the SWPPP. Improvements to administrative and engineering controls may include revisions to project-specific work and housekeeping procedures, repair or maintenance of existing control structures, minor retrofits to control structures, or the installation of additional control structures such as silt fences and checkdams.

The area-specific indicator parameter data will be compared to the surface water human-health-protective FRL for that parameter (Table 9-5 in the Operable Unit 5 ROD, DOE 1996e). If the

000255

trended measured values indicate exceedance of the FRL value, effluent monitoring for additional remediation-area-specific parameters will be initiated at the control structure. The frequency of monitoring and the selection of specific parameters to be monitored would be determined for each remediation area on an as-needed basis and would be described and documented in a project-specific post-IRDP document. Frequency and parameter designation would be coordinated with IEMP personnel so that the same monitoring occurred downgradient at the basin-specific NPDES permitted outfall and at other points downgradient of the control structure as appropriate, under the IEMP program. Measured values for the parameters would then be evaluated against the following criteria:

Potential surface water impact:

- Only in situations where surface-water COC concentrations at the downgradient, basin-specific, NPDES-permitted storm water outfall exceed the surface-water FRL or BTV would future action be considered.

Potential groundwater impact:

- Only in situations where surface-water COC concentrations at the corresponding IEMP surface water course sampling point (near the point where the protective glacial overburden has been breached by unlined site drainage courses) downgradient of the control structure exceed the concentration in the Great Miami Aquifer (GMA) would future action be considered.

In the situations listed above, the following actions would be contemplated:

- Scale up the expanded monitoring, continue the expanded monitoring as is, scale down the expanded monitoring, cease the expanded monitoring.
- Improve administrative and engineering controls, such as revisions to project-specific work and housekeeping procedures, repair or maintenance of existing control structures, minor retrofits to control structures, or the installation of additional control structures such as silt fences and checkdams.
- Modify the approach to be implemented in subsequent soil remediation projects to further minimize potential adverse impacts to the surface water pathway from soil remediation activities.

As discussed in Section 5.2.3, storm water run-off from the Former Production Area drainage basin will continue to be monitored under the IEMP to continue to fulfill the site's current NPDES and

Federal Facilities Compliance Agreement (FFCA) monitoring and reporting obligations. To the extent practical (dependent on sampling frequency, analysis turnaround times, etc.), surface water monitoring data collected under the sitewide IEMP monitoring program or under project-specific IRDPs will be reported within the framework of the IEMP reporting schedule.

5.1.4 Groundwater Pathway

Control Mechanisms

Impacts to the GMA might occur during the excavation of soil under the SCEP. The potential for impacts to the GMA is expected to be highest when the overlying glacial till is breached or is excavated to significantly reduce the effective till thickness. Therefore, for soil remediation projects to be initiated under the SEP, the strategic control mechanism to mitigate against potential adverse impacts to the GMA is as follows:

1. Identify known or reasonably expected impacted perched water zones using existing site characterization (geotechnical, hydrogeologic, groundwater monitoring, etc.) information.

    a. For deep excavations in projects in those areas identified under 1 above, as appropriate and practicable, implement dewatering of in situ perched water during deep excavation to control seepage into the open excavation; other project-specific controls may be implemented (Section 2.5.4).

2. Pump out the water (perched water or storm water) that accumulates in the open deep excavation to limit the volume of potential infiltration through this pathway.

3. Identify known or reasonably expected areas where the overlying glacial overburden is already or will be breached, or where it will be excavated to significantly reduce the effective till thickness.

    a. Where excavation to construct sediment basins or run-off collection channels extends into the sands and gravels of the GMA, create an infiltration barrier (typically by placing compacted clay) in the bottom of the feature to minimize the long-term potential for adverse impact through this pathway.

    b. For projects in those areas identified under 3 above, monitor select Type 2 GMA wells in the proximity of such projects to evaluate whether adverse impacts to the GMA occur during the soil remediation activity.

4. Identify deep excavations in projects that are to remain as a pond or lake where insufficient effective thickness of undisturbed glacial overburden will likely remain after excavation is complete.

000290

a. After the terminal extent of excavation has been reached (cleanup certified), create an infiltration barrier (e.g., compact existing clay or place compacted clay) in the bottom of the open excavation identified under 4 above to minimize future potential adverse impact through this pathway.

The actual mechanism(s) to be implemented will be determined by the project-specific IRDP. During the development of a project-specific IRDP, early efforts will focus on the identifications under mechanisms 1, 3, and 4 above; Aquifer Restoration and Wastewater Project personnel will be informed of these projects. For projects specifically designated under mechanisms 1, 3, and 4 above, Aquifer Restoration and Wastewater Project personnel will provide input to SCEP personnel during the development of project-specific IRDPs (e.g., what effective thickness of undisturbed glacial overburden is sufficiently protective of the GMA) so that the individual project will be protective of the GMA to the extent practicable. For projects specifically designated under mechanism 3 above, each project-specific IRDP will identify pre-existing (if any) Type 2 groundwater monitoring wells (to remain after well abandonment efforts) in proximity to and downgradient of the area to be excavated which will be used for project-specific groundwater monitoring; where the number or placement is insufficient, additional wells will be installed for this purpose.

Project-specific IRDPs will designate:

- Whether impacted perched water zones are known or reasonably expected to exist in the project area.
- Whether dewatering (or other appropriate project controls) will be implemented during deep excavation to control seepage of perched water into the open excavation; if dewatering is to be used, then the IRDP also will estimate the pumping rate required and designate how the water will be managed (e.g., conveyed to AWWT for final treatment, or discharged to surface water courses without treatment).
- Whether water (perched water or storm water) that accumulates in the open deep excavation will be pumped out; if so, then the IRDP also will designate how the water will be managed (e.g., pretreatment, conveyed to AWWT for final treatment, or discharged to surface water courses without treatment; see discussion in preceding surface water pathway subsection).
- Whether the overlying glacial overburden in the project area is already or will be breached, or whether it will be excavated to significantly reduce the effective till thickness.

- Whether an infiltration barrier will be created in the bottom of sediment basins or run-off collection channels.

- Whether any Type 2 groundwater monitoring wells in the proximity of the project will be monitored; if so, then the IRDP also will identify those wells, the sampling and analysis requirements (frequency, indicator parameters, etc.), and the duration of that monitoring effort. Unless specified otherwise in an IRDP, such project-specific groundwater monitoring will cease when soil cleanup is certified for that area (those certification units).

- Whether a deep excavation is anticipated to remain open as a lake or pond; what effective thickness of undisturbed glacial overburden is sufficiently protective of the GMA; and whether an infiltration barrier will be created in the bottom of the open deep excavation after the terminal extent of excavation has been reached (cleanup certified).

Monitoring

The sitewide management strategy for monitoring groundwater during remedial activities is described in detail in Section 3.0 of the IEMP (DOE 1997a), which lists the objectives, regulatory drivers, monitoring, data evaluation, and reporting requirements for the program. Sitewide monitoring of groundwater will continue under the IEMP during SCEP soil remediation. Aquifer Restoration and Wastewater Project personnel will use groundwater monitoring data collected under the IEMP monitoring program to assess the potential impact of remedial activities on groundwater quality within the GMA and will assist SCEP personnel in assessing the need to conduct project-specific groundwater monitoring to supplement the IEMP groundwater monitoring. Project-specific groundwater monitoring is briefly described above.

Data from any such project-specific groundwater monitoring effort will be used to assess the impact of the soil remediation activities on the GMA and will be reported in the IEMP reports to the extent practical (dependent on sampling frequency, analysis turnaround times, etc.). During implementation of SCEP soil remediation activities, the data will be evaluated in conjunction with Aquifer Restoration and Wastewater Project personnel to spot a trend or change in trend that could indicate a potential adverse impact to groundwater quality within the GMA. The data will be carefully scrutinized in an effort to determine whether the soil remediation activities are adversely affecting the GMA groundwater (e.g., vertical migration through the glacial overburden or as a result of surface water infiltration), or whether other conditions (migration of existing plume, groundwater remediation

activities) are the likely impacting factors. In the event that data from project-specific groundwater monitoring indicate a potential adverse impact, an appropriate future course of action will be evaluated and implemented considering the following:

- Is this area of the GMA already planned for groundwater remediation? If not, should it be remediated (in accordance with the criteria in the OU5 ROD, DOE 1996e)
- If the answer to either of the above is yes: Is GMA groundwater remediation of this area already ongoing? If not, should GMA groundwater remediation for the area be re-prioritized?
- After project-specific groundwater monitoring ceases as previously determined, should monitoring of those wells be continued under the IEMP?
- What modifications, if any, can be retrofitted to that soil remediation project to mitigate the situation?
- What modifications to approach can be implemented in subsequent soil remediation projects to further minimize potential adverse impacts to the GMA from soil remediation activities?

5.2 COORDINATION WITH SITEWIDE MONITORING

The IEMP has been prepared in a manner that focuses on air, surface water, and groundwater monitoring, data evaluation, and reporting necessary to ensure protection of human health and the environment during sitewide remediation activities. The IEMP provides the central reporting mechanism to the regulators and the stakeholders for the ongoing environmental/emission control and monitoring activities at the FEMP.

The following subsections describe how the reporting of project-specific monitoring data collected under the SEP will be integrated into existing reporting programs established under the IEMP and its associated regulatory drivers. The integration of project-specific and sitewide monitoring, data evaluation, and reporting responsibilities is summarized in the following subsections.

5.2.1 Air Pathway

The sitewide air monitoring program is described in Section 6.0 of the IEMP (DOE 1997a). Descriptions of the objectives, regulatory drivers, monitoring, data evaluation, and reporting requirements for the program are provided therein. Sitewide air monitoring will continue under the

IEMP during remedial activities to be initiated under the SEP. Data from this program will be used to assess the impact of air emissions from remedial activities.

To the extent practical (dependent on sampling frequency, analysis turnaround times, etc.), data collected under the sitewide air monitoring program will be reported in accordance with their associated regulatory drivers and within the framework of the IEMP reporting schedule.

5.2.2 Surface Water Pathway

The sitewide surface water environmental monitoring program is described in Section 4.0 of the IEMP (DOE 1997a). Descriptions of the objectives, regulatory drivers, monitoring, data evaluation, and reporting requirements for the program are provided therein. Monitoring of surface water discharges from the Former Production Area drainage basin in accordance with NPDES and FFCA requirements will continue under the IEMP during remedial activities to be initiated under the SEP. Data from this program, in conjunction with information from project-specific surface water monitoring discussed in Section 5.1.3, will be used to assess the impact of remedial activities on Paddys Run and the Great Miami River.

To the extent practical (dependent on sampling frequency, analysis turnaround times, etc.), data collected under both the sitewide and project-specific monitoring programs will be reported in accordance with their associated regulatory drivers and within the framework of the IEMP reporting schedule.

5.2.3 Groundwater Pathway

The site's groundwater monitoring program is described in Section 3.0 of the IEMP (DOE 1997a). Descriptions of the objectives, regulatory drivers, monitoring, data evaluation, and reporting requirements for the program are provided therein. Sitewide monitoring of groundwater will continue under the IEMP during remedial activities to be initiated under the SEP. Data from this program, in conjunction with information from any project-specific groundwater monitoring discussed in Section 5.1.3, will be used to assess the impact of remedial activities on the GMA.

000294

To the extent practical (dependent on sampling frequency, analysis turnaround times, etc.), groundwater monitoring data will be reported in accordance with its associated regulatory drivers and within the framework of the IEMP reporting schedule.

TABLE 5-1

DUST CONTROL REQUIREMENTS

Category	Remediation Activities/Areas Included	Dust Controls/Work Practices (to be applied progressively as environmental conditions dictate)	Site-Specific Limit or Ohio Standard
Paved roadways and paved parking areas	Activities: • Hauling nonimpacted materials • Hauling impacted materials • Vehicle and equipment traffic Areas: All predetermined areas designed and improved specifically for vehicle traffic. Improvements include the application of materials such as asphalt or concrete that form a firm level surface for travel.	• Apply dust suppression agents. • Minimize the amount of unnecessary traffic on unpaved roadways or unpaved parking areas. • Limit speed to 15 mph during operation of equipment or vehicles. • Apply dust suppression agents such as surfactants or crusting agents to inactive storage piles, or cover with tarpaulin, plastic, etc., if practical; for extended periods of planned inactivity, vegetate as a last resort if periodic application of crusting agent or protective cover proves ineffective. • Apply appropriate dust suppression agents such as water or surfactants to material being transported by truck load beds to ensure the material will not become airborne; cover truck load bed when transported material is still likely to become airborne. • Wheel wash prior to entering unpaved roadways. • Remove, as practical, any clods, clumps, tracks, or visible deposits of soil or mud from unpaved roadways. • Repair or resurface roadways/parking areas as needed, or use an alternative road surface as a last resort.	Limit: Visible particulate emissions shall not exceed one (1) minute during any sixty (60)-minute observation period.

8092

TABLE 5-1
(Continued)

Category	Remediation Activities/Areas Included	Dust Controls/Work Practices (to be applied progressively as environmental conditions dictate)	Site-Specific Limit or Ohio Standard
Unpaved roadways, unpaved parking areas, and wind erosion from storage piles	Activities: • Hauling nonimpacted materials • Hauling impacted materials • Vehicle and equipment traffic Areas: All predetermined areas designed and improved specifically for vehicle traffic. Improvements include the application of gravel, shredded shingles, cinders, compaction, etc., to the delineated areas.	• Apply dust suppression agents. • Minimize the amount of unnecessary traffic on unpaved roadways or unpaved parking areas. • Limit speed to 15 mph during operation of equipment or vehicles. • Apply dust suppression agents such as surfactants or crusting agents to inactive storage piles, or cover with tarpaulin, plastic, etc. if practical; for extended periods of planned inactivity, vegetate as a last resort if periodic application of crusting agent or protective cover proves ineffective. • Apply appropriate dust suppression agents such as water or surfactants to material being transported by truck load beds to ensure the material will not become airborne; cover truck load bed when transported material is still likely to become airborne. • Wheel wash prior to entering unpaved roadways. • Remove, as practical, any clods, clumps, tracks, or visible deposits of soil or mud from unpaved roadways. • Repair or resurface roadways/parking areas as needed, or use an alternative road surface as a last resort.	Limit: Visible particulate emissions shall not exceed three (3) minutes during any sixty (60)-minute observation period.

TABLE 5-1
(Continued)

Category	Remediation Activities/Areas Included	Dust Controls/Work Practices (to be applied progressively as environmental conditions dictate)	Site-Specific Limit or Ohio Standard
Project field activities and material handling/vehicle traffic on storage piles	Activities: • Excavation • Trenching • Loading/Unloading • Transportation to defined roadway (paved or unpaved) • Load-in/load-out of storage piles • Material placement into On-Site Disposal Facility • Vehicle traffic on storage piles Areas: • Working faces • Transition areas between working faces and defined (paved or unpaved) roadways • Storage piles	• Apply dust suppression agents • Minimize the amount of unnecessary traffic in and around field activities • Limit speed to 15 mph during operation of equipment or vehicles • Reduce rate of excavation • Minimize height of drop during loading and unloading • Change method of excavation & transport (e.g., from front-end loader dumping into a truck to a self-propelled pan) • Apply dust suppression agents such as surfactants or crusting agents to storage piles • Apply appropriate dust suppression agents such as water or surfactants to material being transported by truck load beds to ensure the material will not become airborne; cover truck load bed when transported material is still likely to become airborne	Standard: Visible particulate emissions shall not exceed twenty percent (20%) opacity as a three (3)-minute average [OAC 3745-17-07(B)(1)]

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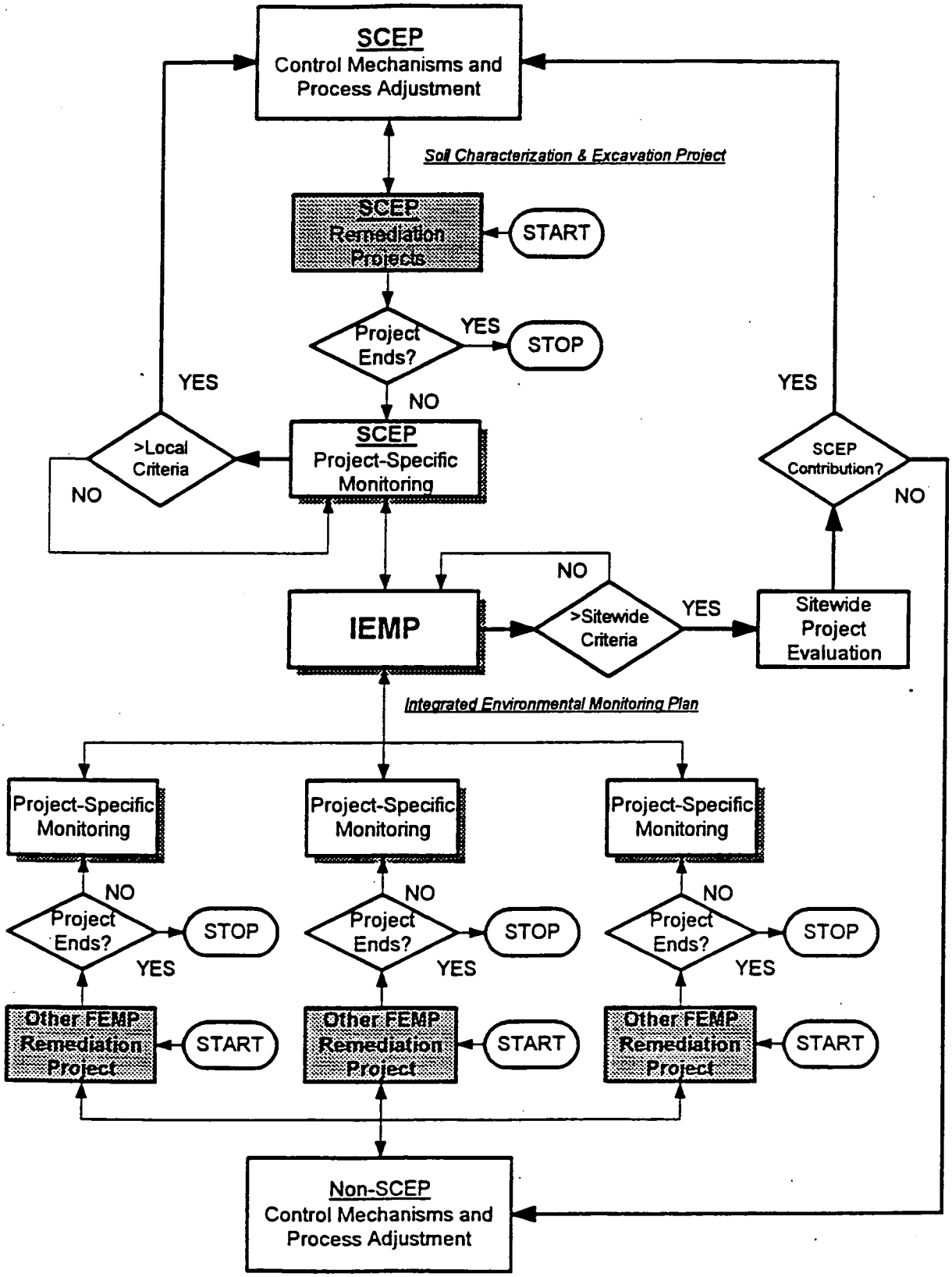
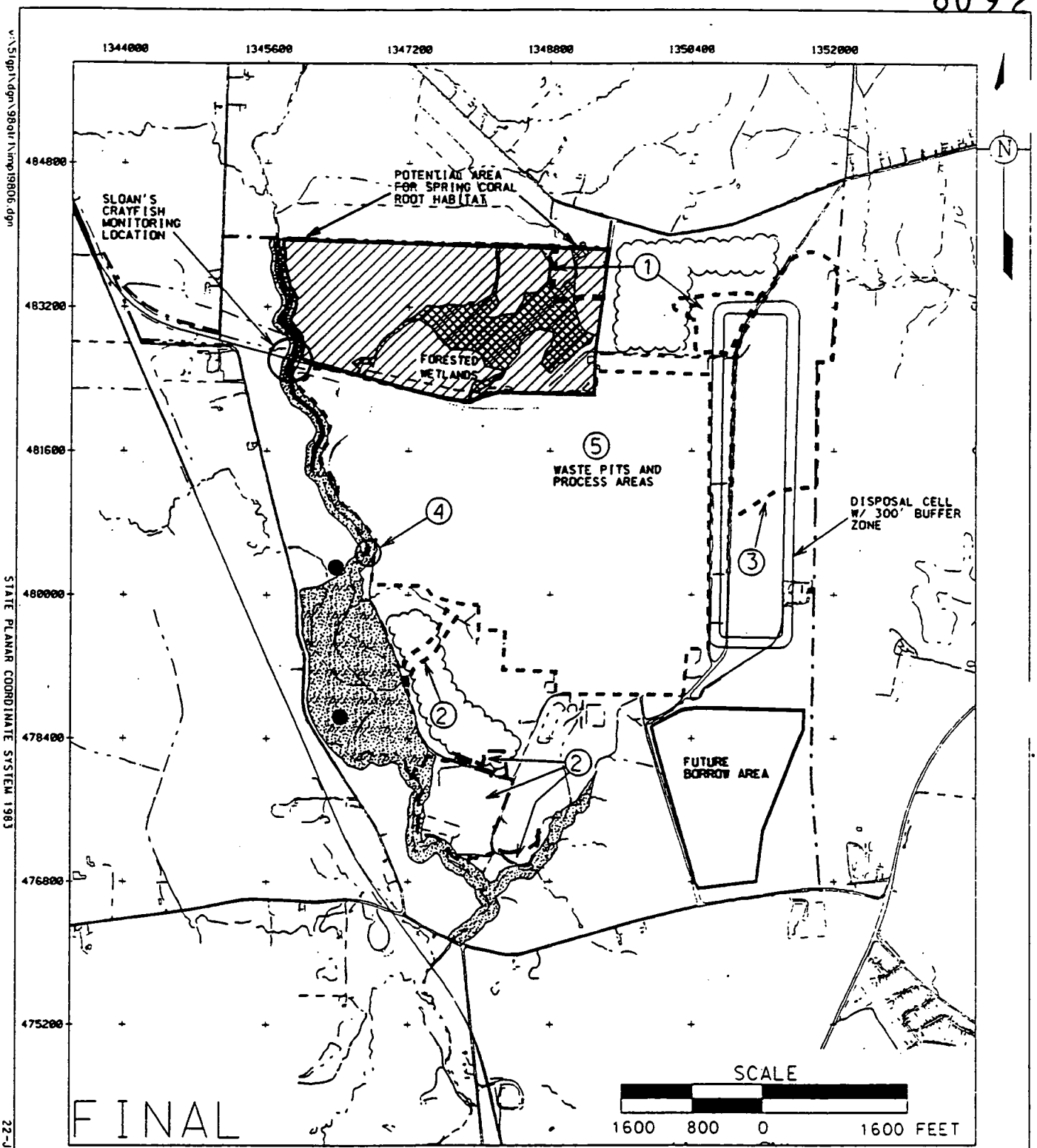


FIGURE 5-1 SITEWIDE AND PROJECT-SPECIFIC ENVIRONMENTAL MONITORING AND CONTROLS



LEGEND:

- FEMP BOUNDARY
- PADDYS RUN AND TRIBUTARIES RIPARIAN CORRIDOR
- SLOAN'S CRAYFISH AREA
- INDIANA BROWN BAT HABITAT
- WETLANDS
- NORTHERN WOODLOT AREA
- PINES
- POTENTIAL RUNNING BUFFALO CLOVER AREAS

IMPACTED HABITAT AREAS:		ACREAGE:
1	NORTHERN WOODLOT/PINES	9.77
2	SOUTHERN PINES/ WASTE UNITS	24.32
3	GRASSLAND	55.10
4	PADDYS RUN CORRIDOR	11.07
5	WETLANDS ASSOCIATED WITH WASTE PITS/PROCESS AREA	10

FIGURE 5-2. PRIORITY NATURAL RESOURCE AREAS

v:\5fgp1\dgn\98qtr1\mp19806.dgn
STATE PLANAR COORDINATE SYSTEM 1983
22-JUL-1998
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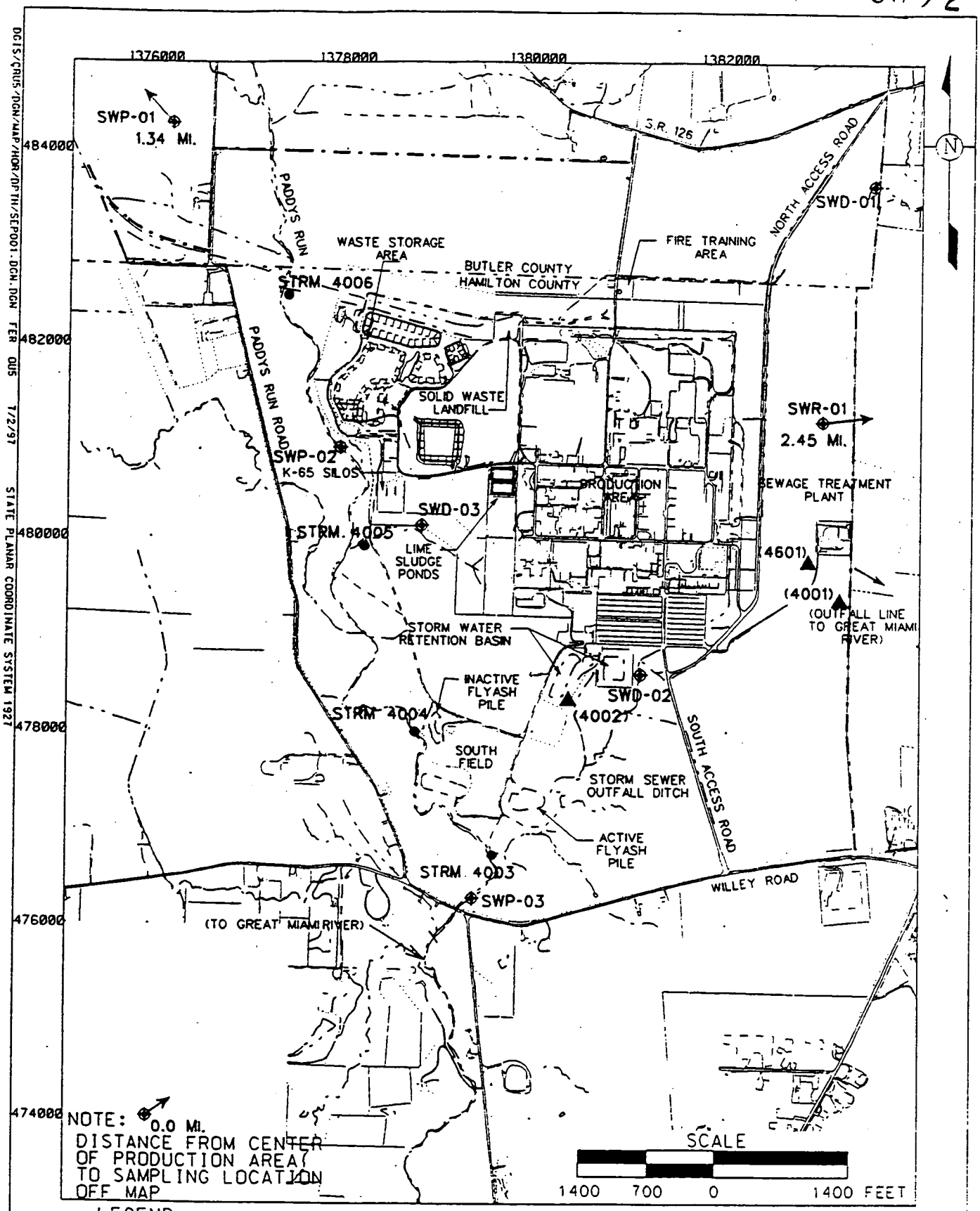
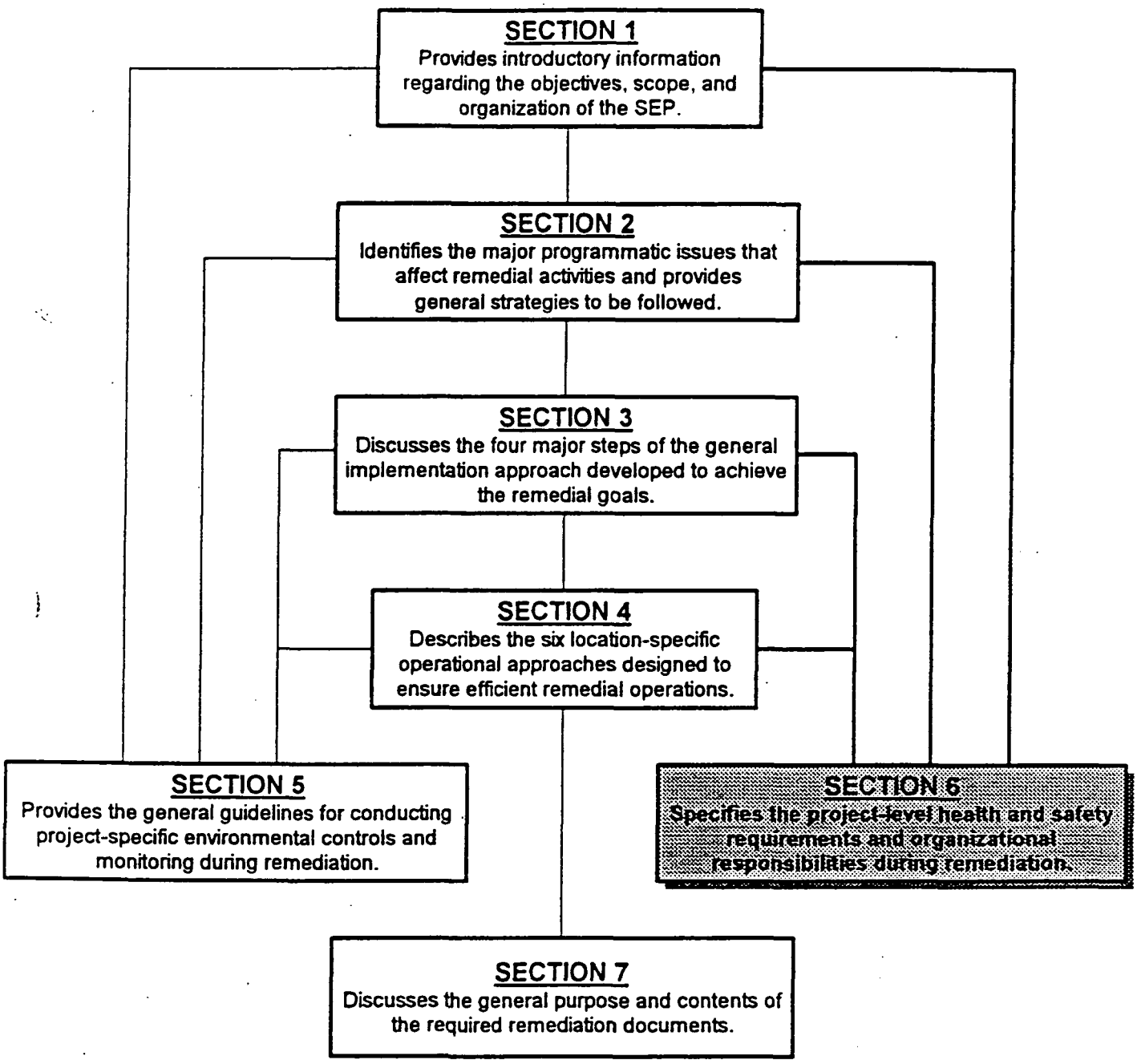


FIGURE 5-3. IEMP SURFACE WATER SAMPLE LOCATIONS

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

6.0 PROJECT HEALTH AND SAFETY

Fernald Environmental Management Project (FEMP) is required to comply with various health and safety standards during implementation of the Sitewide Excavation Plan (SEP). These standards include U.S. Department of Energy (DOE) Order 5480.4, "Environmental, Protection, Safety and Health Protection Standards"; DOE Order 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"; FEMP RM-0021, "Safety Performance Requirements Manual"; 10 CFR Part 835; and FEMP RM-0020, "Radiological Controls Manual." The portions of these documents applicable to each remediation project will be delineated in Part 8 of the remediation subcontract. This section summarizes the project-specific health and safety requirements to be observed during remediation under this SEP.

All FEMP employees, visitors, vendors, contractors, and subcontractors are required to abide by the provisions of applicable Project-Specific Health and Safety Requirements Matrices (PSHSRMs) and/or Project-Specific Health and Safety Plans (PSHSPs) prepared by FEMP (DOE 1995h) as well as the FEMP-approved Safe Work Plan prepared by the subcontractor. Managers and supervisors are responsible for ensuring that the requirements of the applicable PSHSPs and PSHSRMs are met. All personnel have stop-work authority for imminent safety hazards resulting from noncompliance with the applicable health and safety practices.

All subcontractor activities conducted in support of this project are governed by the safety requirements specified within the remediation contract, which addresses environmental, occupational, industrial, and construction health and safety. In addition to the contract requirements, PSHSPs, and the requirements of this document, the subcontractor will comply with all federal, state, and local requirements [e.g., Occupational Safety & Health Act (OSHA), Subpart P - Excavations, 1926.650, .651, .652, and Appendix A through F].

6.1 PROJECT-SPECIFIC HEALTH AND SAFETY PLANS

The purpose of the PSHSP/PSHSRM and/or the Environment, Safety, Health and Training Requirements Matrix (ESH&TRM) is to provide health and safety guidance for protecting workers during all phases of work associated with the project. Specific health and safety guidance and

requirements for each major phase of excavation will be identified in a PSHSP/PSHSRM and/or ESH&TRM. Each project will be evaluated by Safety and Health to determine which documents will be developed.

The ESH&TRM is developed to aid the subcontractor in identifying the hazards associated with the project. The matrix is prepared to address minimum requirements for foreseen and known hazards existing at the time of contract. Actual conditions are subject to change. Additional mitigators may be required based on actual radiological, industrial hygiene, and safety conditions existing during work activities. The ESH&TRM will be included in each Invitation for Bid/Request for Proposal package to provide health and safety requirements for each discrete phase or activity in the project.

The Subcontractor shall use the ESH&TRM to determine the general and task-specific health and safety requirements when developing the safe work plan. The ESH&TRM includes a hazard analysis for each task and required mitigators, including personal protective equipment (PPE), engineering and administrative controls, pre-job planning and permits, personal training personnel and air monitoring, medical monitoring and medical surveillance, and decontamination and disposal procedures.

The PSHSRM/PSHSP or the subcontractor's proposed Safe Work Plan may be revised if tasks are added or removed from the list. When required, the PSHSRMs and the detailed PSHSP will be maintained at the project site; controlled copies will be kept in the project document control files. The PSHSP and PSHSRM will identify the following components:

- Project organization and responsibilities (PSHSP only)
- Hazards associated with the project tasks
- Worker training requirements
- PPE for each project task
- Medical surveillance requirements
- Frequency and types of air and personnel monitoring
- Site control measures
- Decontamination procedures
- Emergency response and contingency plans
- Additional permits required (e.g., confined-space evaluation)
- Other work practice requirements.

When required, the PSHSP will be provided at mobilization. The plan shall be read, understood, and signed by the subcontractor and lower-tier subcontractors. The subcontractor and lower-tier subcontractors shall orient their employees to the plan, and employees will sign a sheet acknowledging that they understand the requirements.

The ESH&TRM will include health and safety requirements (handling guidance, permits, etc.) for materials that require special handling, as defined in Appendix F. Based on this information, the contractor will develop procedures/plans to handle these materials that will include PPE required, exposure monitoring, contamination control, and all other aspects of worker protection. These procedures/plans will complement the Environmental Contingency Plans in Section F.4.

6.2 SUBCONTRACTOR SAFE WORK PLANS

Subcontractors will be required to prepare a Safe Work Plan, and submit it to FEMP for approval. The subcontractor shall utilize the ESH&TRM and applicable contract documents to prepare the safe work plan.

The subcontractor Safe Work Plan will describe the work in sufficient detail to:

- Provide assurance to FEMP that:
  - The subcontractor has assessed the risks associated with the work, and addressed preventive measures for safety and health hazards
  - The work in progress complies with the health and safety and performance requirements specified in the subcontract documents
  - The subcontractor has safely planned the work in sufficient detail to meet schedule requirements.
- Provide a basis for FEMP's internal planning activities.

The Safe Work Plan will be used to brief the work force before each activity begins. The following items will be addressed in the subcontractor Safe Work Plan:

- A narrative description of the work to include the subcontractor's methods of performing work

000305

- Crew size and craft
- Sub-tier subcontractors with a description of their work (as applicable)
- Number and type of equipment to be used and the subcontractor's plan for repair and maintenance
- Training requirements and levels required to operate each piece of equipment to be used
- Critical sequence of work, along with the reason it is critical
- Methods of waste minimization, disposal, and cleanup
- A narrative description of a hazard analysis for each task. The hazards involved, mitigators, and controls will be well defined, practicable, and clearly written for workers in the field. Specialized equipment or training will be specifically addressed.
- OSHA requirements for competent persons, and those activities to be completed prior to start of work
- Occupational exposure monitoring in compliance with OSHA and applicable contract documents
- Radiological controls functional area of the Standards/Requirements Identification Document (S/RID).

6.3 EMERGENCY PREPAREDNESS

Health and safety emergencies during remedial activities are covered by the existing FEMP Emergency Preparedness Program. This program details the procedures to be followed at the FEMP in the event of an accident (spill) or emergency. The program provides a strategy for managing communications, site assessment, fire control, medical assistance, and monitoring equipment. Emergency phone numbers are provided in the program, which is distributed to participating mutual aid organizations and other local organizations, such as local fire departments, hospitals, etc., in the general vicinity of the FEMP.

The FEMP emergency organization is available 24 hours a day to respond to all emergencies and abnormal events. Any off-site emergency notifications will be made by Emergency Preparedness. All project personnel will be trained in Emergency Preparedness procedures.

000305

6.4 OCCUPATIONAL AIR MONITORING (Employee Exposure)

This section is to be used as a guide for occupational exposure monitoring. It contains basic requirements and strategy for occupational air monitoring associated with excavation projects. Project-specific monitoring strategies must be developed by FEMP when determined necessary by the cognizant FEMP Health & Safety Officer (HSO). The Subcontractor will incorporate its occupational exposure monitoring requirements into their FEMP-approved Safe Work Plan. These strategies will address the contaminants of concern for the specific project area.

6.4.1 Sampling Strategy

6.4.1.1 Activities to be Sampled

Good work practices and engineering controls, including dust control measures, will maintain worker exposure levels of nonradioactive contaminants below OSHA/American Conference of Government and Industrial Hygienists (ACGIH) limits and exposures to airborne radioactive contaminants below 10 CFR 835 occupational exposure limits. Air monitoring will be performed to verify that worker exposures to contaminants are below these limits.

Monitoring will be conducted on those workers performing activities with the highest potential for exposure to the contaminants identified for the project. Those activities anticipated to have the highest exposure potential are:

- Workers on foot (e.g., spotters) in the active excavation area
- Equipment operators performing dumping, spreading and/or excavating
- Workers and equipment operators performing work within a Contamination Area.

In addition to personal sampling, radiological monitoring will be conducted at the perimeter of the active excavation area during remedial activities/construction to ensure that workers outside the project work area are not affected.

Monitoring requirements for all excavation work will be addressed in a project-specific air monitoring plan or the PSHSRM for that phase of the work as determined by FEMP HSO. All radiological monitoring activities will be conducted by FEMP Health & Safety personnel. The subcontractor shall conduct Industrial Hygiene monitoring (as required) and submit data to the FEMP HSO. The FEMP

Industrial Hygienist will conduct side-by-side occupational exposure monitoring periodically to verify subcontractor data.

The occupational air monitoring plan or PSHSRM will be reviewed every six months after the start of construction (or more often as needed) and will be modified as necessary by the HSO.

6.4.1.2 Contaminants of Concern

Air monitoring will be conducted for the contaminants identified or suspected within the project area. The following contaminants are likely to be encountered during excavation projects:

- Presumed asbestos-containing materials
- Dust, nuisance
- Metals
- Organic vapors
- Uranium (thorium if indicated as the isotope of concern).

Because of its relatively low concentrations, technetium-99 is not considered a contaminant of concern from a remedial worker health and safety standpoint.

6.4.1.3 Available Historical Data

In the preparation of project-specific monitoring requirements, FEMP Health & Safety personnel will use all available historical sample data [e.g., previous occupational and radiological monitoring/ sampling, remedial investigation/feasibility study (RI/FS) data, etc.]. This information will be considered when establishing initial PPE levels and sampling strategies. If occupational air monitoring data for an activity are not available, FEMP will implement a conservative approach in the specification of PPE until initial sample data become available.

6.4.1.4 Monitoring for Unidentified Contaminants

Air monitoring needs will be reviewed as work proceeds. Work activities will be reviewed, and available information on specific contaminants will be reviewed. The FEMP HSO will determine the need for worker exposure assessment/re-assessment based on the available information. Information to be reviewed, as available, includes:

000309

- Actual air monitoring data associated with the project (e.g., air monitoring results collected during excavation)
- Any chemicals/products used during the course of the project (e.g., glues, disinfectants, etc.)
- Reports of dusty conditions or the presence of unusual odors.

Material Safety Data Sheets (MSDSs) will be reviewed and evaluated by project construction management for any new products used during project work. If the MSDS indicates that a material to be used contains a hazardous component, a determination will be made as to the need for air monitoring based on the following factors: the potential for exposure considering the applicable occupational limits, the amount of the product to be used, the duration of the activity, and work practices and controls to minimize exposure.

6.4.2 Monitoring Methods and Frequency

6.4.2.1 Personal Air Sampling Planned During Project Work

Asbestos

Activity:	Handling/placement/covering of presumed asbestos-containing material
Frequency:	Subcontractor to collect samples daily, FEMP to collect samples weekly (when such activities are performed)
Number:	25 percent of workers involved in each activity within the regulated asbestos area
Location:	Worker breathing zone
Method:	NIOSH 7400 or nationally recognized equivalent method (Note: NIOSH stands for the National Institute for Occupational Safety and Health.)

Dust, Nuisance

Activity:	General excavation activities
Frequency:	Monthly and as determined necessary by the FEMP Health & Safety representative
Number:	25 percent of work force
Location:	Worker breathing zone
Method:	NIOSH 0600 or a nationally recognized equivalent method (Note: Direct reading instruments may be used at the direction of the FEMP Health & Safety Representative rather than using sample collection with subsequent analysis.)

Metals

Activity:	General excavation activities where metals have been determined to be a potential exposure concern
Frequency:	Monthly and as determined necessary by the Health & Safety Representative
Number:	25 percent of work force

Location: Worker breathing zone
Method: NIOSH 7300 or a nationally recognized equivalent method (Note: Direct reading instruments may be used at the direction of the FEMP Health & Safety Representative rather than using sample collection with subsequent analysis.)

Organic Vapors

Activity: General excavation activities where organic vapors have been determined to be a potential exposure concern
Frequency: As determined necessary by the Health & Safety Representative when materials with potential to produce organic vapors are discovered
Location: Worker breathing zone
Method: Direct reading photoionization detector (PID); sample collection with subsequent analysis by NIOSH/OSHA may be used upon review of particular impacted materials.

Airborne Radiological Contamination

Activity: Handling/placement/covering of radiologically contaminated material
Frequency: Daily (when such activities are performed)
Number: 25 percent of personnel in each work group (may vary based on work being performed and group being represented by sample)
Location: Worker breathing zone
Method: Lapel air samplers with in-line filters; samplers are collected after use and filters removed/replaced for counting on a low background counting instrument (after 7-day decay period); use "real time" dust monitoring data as an indicator of airborne radiological hazards in the field.

6.4.2.2 General Area Air Sampling Planned During Project Work

Asbestos

Activity: Handling/placement/covering of presumed asbestos-containing material
Frequency: Subcontractor to collect samples daily, FEMP to collect samples weekly (when such activities are performed)
Location: At the perimeter of the work area to include upwind and downwind locations
Method: NIOSH 7400 or a nationally recognized equivalent method.

Dust, Nuisance

Activity: General excavation activities
Frequency: Monthly and as determined necessary by the FEMP Health & Safety representative
Location: At the perimeter of the work area upwind and downwind
Method: NIOSH 0600 or a nationally recognized equivalent method (Note: Direct reading instruments may be used at the direction of the FEMP Health & Safety Representative rather than using sample collection with subsequent analysis.)

000220

Metals

Activity:	General excavation activities where metals have been determined to be a potential exposure concern
Frequency:	Monthly and as determined necessary by the FEMP Health & Safety representative
Location:	At the perimeter of the work area upwind and downwind
Method:	NIOSH 7300 or a nationally recognized equivalent method (Note: Direct reading instruments may be used at the direction of the FEMP Health & Safety Representative rather than using sample collection with subsequent analysis.)

Organic Vapors

Activity:	General excavation activities where organic vapors have been determined to be a potential exposure concern
Frequency:	As determined necessary by the FEMP Health & Safety Representative
Location:	At the perimeter of the work area upwind and downwind
Method:	Direct reading PID (sample collection with subsequent analysis by NIOSH/OSHA recognized method may be used upon review of particular impacted materials.)

Airborne Radiological Contamination

Activity:	Handling/decontamination of radiologically contaminated material within a significantly contaminated area (e.g., from Production Area and waste storage/management units)
Frequency:	Daily (when such activities are performed)
Location:	At the perimeter of the work area to include upwind and downwind locations
Method:	Low-volume air samplers with in-line filters; filters are removed/replaced each day and counted on a low-background counting instrument (after 7-day decay period)
Note:	Generally, project-specific air monitoring is not required during remediation for soil contamination areas outside of the Former Production Area and waste storage/management units.

6.4.3 Results and Action Levels

See Table 6-1 for monitoring levels and action levels.

6.4.4 Data Reporting and Documentation

Results of air monitoring will be documented and will be summarized/provided to project management for use, and will be supplied to the appropriate FEMP Health & Safety Officer. The HSO will ensure that all needed documentation is provided in a timely manner to the project personnel. Involved workers will be informed of the results of personal air sampling as required by OSHA and/or 10 CFR 835.

6.4.5 Quality Assurance

6.4.5.1 Calibration/Analysis Requirements

All monitoring/sampling will be performed by qualified and trained personnel using appropriate methods, and following manufacturer's instructions for equipment operation and maintenance.

Personal air sampling pumps will be calibrated before and after use each day. Nonradiological samples will be analyzed by appropriate OSHA or NIOSH methods, and radiological samples will be analyzed by FEMP-approved Radiological Control methods (to meet the limits specified in 10 CFR 835 and DOE/EH-0256T, DOE Radiological Controls Manual). Real-time air monitoring instruments will be calibrated according to manufacturer's recommendations before being used in the field.

6.4.5.2 Sample Chain of Custody

Collected samples will remain in the custody of the sampling personnel, transportation personnel, or analytical personnel (or locked) at all times. Chain of custody will be documented on forms that accompany the sample from collection through analysis.

6.4.5.3 Sample Blanks

Appropriate blanks, as defined by analytical method, will be provided for analysis.

6.4.5.4 Special Sample Storage/Handling Requirements

Special sample storage/handling requirements will conform to those of the OSHA or NIOSH analytical method in use.

000216

TABLE 6-1

OCCUPATIONAL MONITORING AND ACTION LEVELS

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Asbestos	0.1 (f/cc) 8-hour time-weighted average (TWA) limit (OSHA)	Workers performing work inside regulated asbestos areas will be required to wear an air purifying respirator with HEPA cartridges. ≥0.1 f/cc. Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Ensure controls prescribed in the OSHA asbestos standard including the use of an air purifying respirators with HEPA cartridges have been implemented.	≥0.01 f/cc. Modify work practices and/or engineering controls to ensure fiber levels outside the asbestos work area are maintained below this level. (When fiber levels exceed 0.1 f/cc, further analysis of the sample by TEM may be used to confirm the presence/absence of asbestos fibers on the sample.) Expand the controlled area.
Nuisance Dust (Respirable)	3 mg/m^3 8-hour TWA (ACGIH)	≥1.5 mg/m^3. Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirator s with HEPA cartridges. ≥15 mg/m^3. **Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application.** Require use of full-face air purifying respirators with HEPA cartridges.	≥1.5 mg/m^3. Modify work practices and/or engineering controls to ensure dust levels outside the work area are maintained below this level. Expand the controlled area.

TABLE 6-1

(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
(Total or Inhalable)	10 mg/m^3 8-hour TWA (ACGIH)	≥5 mg/m^3 8-hour TWA or ≥ 10 mg/m^3 15 minute average Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirators with HEPA cartridges. ≥50 mg/m^3 **Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application.** Require use of full-face air purifying respirators with HEPA cartridges.	≥5 mg/m^3 8-hour TWA or ≥ 10 mg/m^3 15 minute average Modify work practices and/or engineering controls to ensure dust levels outside the work area are maintained below this level. Expand the controlled area.
Metals	Various[1] e.g.; lead: 0.050 mg/m^3 8-hour TWA (OSHA); arsenic: 0.010 mg/m^3 8-hour TWA (OSHA)	≥Action level[b]. (e.g., 0.030 mg lead/m^3 8-hour TWA ≥0.005 mg arsenic/m^3 8-hour TWA) Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirators with HEPA cartridges, dependent on results.	≥Action level[b]. Modify work practices and/or engineering controls to ensure metals levels outside the work area are maintained below this level (e.g., lead: 0.030 mg/m^3 8-hour TWA; arsenic: 0.005 mg/m^3 8-hour TWA). The controlled area will be expanded

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TABLE 6-1

(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Organic Vapors	Various [a] (see action levels)	Detection to 5 ppm 8-hour TWA, or detection to 25 ppm STEL (PID). Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application, work practices, and engineering controls. Require use of respirators with combination cartridges. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-establish controls and PPE (e.g., respirator requirements) based on action level for the specific contaminant. > 5 ppm 8-hour TWA, or > 25 ppm STEL (PID). Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-evaluate respirator requirements.	> 5 ppm. Modify work practices and/or engineering controls to ensure vapor levels outside the work area are maintained below this level. Expand the controlled area. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-establish controls based on action level [2] for the specific contaminant.

TABLE 6-1

(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Radiological	Applicable DAC's: Uranium: 2E-11 :Ci/cc Th-230: 3E-12 :Ci/cc Th-232: 5E-13 :Ci/cc Radon: 0.3 Working Levels (WL) Thoron: 1.0 Working Levels (WL)	At 4 DAC-Hrs per week, as indicated by Breathing Zone air sample results with applied respiratory protection factor (if respirator worn), work practices, administrative controls, and engineering controls will be re-evaluated (e.g., dust control, respiratory protection) and proper application ensured. Respiratory protection types: • Full Face Air Purifying Respirator (FFAPR) with HEPA or combination cartridge (50 PF) • Full Face Powered Air Purifying Respirator (FFPAPR), Mask Mounted type (MM) with HEPA cartridge only or Belt mounted type (6A) with HEPA or combination cartridge (1000 PF). PAPR may be required for metal burning/torch cutting or highly contaminated work. At ≥ 10% DAC, as indicated by General Area air sample results, re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Post the affected area as an Airborne Radioactivity Area. At ≥ 1 DAC, as indicated by General Area air sample results, control occupational exposure by the use of respiratory protection (required at ≥ 1 DAC). Re-evaluate work practices, engineering controls, and any existing respiratory protection requirements (including applicable respiratory protection factors).	At 10% DAC, modify work practices and/or engineering controls to ensure airborne radiological contamination levels are maintained below 10% DAC at the perimeter and below 2% DAC outside of the posted construction area (based on a weekly average). If boundaries exceed 10% DAC (based on a weekly average) the radiological area boundary will be expanded. Perform monitoring with direct reading instruments, and collect air samples to verify boundaries are posted correctly.

[a]Limit for occupational exposure control will be the current OSHA or ACGIH limit (whichever is lower).

[b]Action level for occupational exposure control will be the current OSHA or ACGIH limit (whichever is lower) x 0.5, or as otherwise established by OSHA.

TABLE 6-1

OCCUPATIONAL MONITORING AND ACTION LEVELS

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Asbestos	0.1 (f/cc) 8-hour time-weighted average (TWA) limit (OSHA)	Workers performing work inside regulated asbestos areas will be required to wear an air purifying respirator with HEPA cartridges. ≥0.1 f/cc. Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Ensure controls prescribed in the OSHA asbestos standard including the use of an air purifying respirators with HEPA cartridges have been implemented.	≥0.01 f/cc. Modify work practices and/or engineering controls to ensure fiber levels outside the asbestos work area are maintained below this level. (When fiber levels exceed 0.1 f/cc, further analysis of the sample by TEM may be used to confirm the presence/absence of asbestos fibers on the sample.) Expand the controlled area.
Nuisance Dust (Respirable)	3 mg/m^3 8-hour TWA (ACGIH)	≥1.5 mg/m^3. Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirator s with HEPA cartridges. ≥15 mg/m^3. **Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application.** Require use of full-face air purifying respirators with HEPA cartridges.	≥1.5 mg/m^3. Modify work practices and/or engineering controls to ensure dust levels outside the work area are maintained below this level. Expand the controlled area.

TABLE 6-1

(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
(Total or Inhalable)	10 mg/m^3 8-hour TWA (ACGIH)	≥5 mg/m^3 8-hour TWA or ≥ 10 mg/m^3 15 minute average Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirators with HEPA cartridges. ≥50 mg/m^3 **Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application.** Require use of full-face air purifying respirators with HEPA cartridges.	≥5 mg/m^3 8-hour TWA or ≥ 10 mg/m^3 15 minute average Modify work practices and/or engineering controls to ensure dust levels outside the work area are maintained below this level. Expand the controlled area.
Metals	Various [1] e.g.; lead: 0.050 mg/m^3 8-hour TWA (OSHA); arsenic: 0.010 mg/m^3 8-hour TWA (OSHA)	≥Action level [b]. (e.g., 0.030 mg lead/m^3 8-hour TWA ≥0.005 mg arsenic/m^3 8-hour TWA) Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Require use of half-mask or full-face air purifying respirators with HEPA cartridges, dependent on results.	≥Action level [b]. Modify work practices and/or engineering controls to ensure metals levels outside the work area are maintained below this level (e.g., lead: 0.030 mg/m^3 8-hour TWA; arsenic: 0.005 mg/m^3 8-hour TWA). The controlled area will be expanded

TABLE 6-1

(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Organic Vapors	Various [a] (see action levels)	Detection to 5 ppm 8-hour TWA, or detection to 25 ppm STEL (PID). Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application, work practices, and engineering controls. Require use of respirators with combination cartridges. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-establish controls and PPE (e.g., respirator requirements) based on action level for the specific contaminant. > 5 ppm 8-hour TWA, or > 25 ppm STEL (PID). Re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-evaluate respirator requirements.	> 5 ppm. Modify work practices and/or engineering controls to ensure vapor levels outside the work area are maintained below this level. Expand the controlled area. Perform monitoring with direct reading instruments, or collect air samples to identify and quantify contaminants. Re-establish controls based on action level [2] for the specific contaminant.

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TABLE 6-1

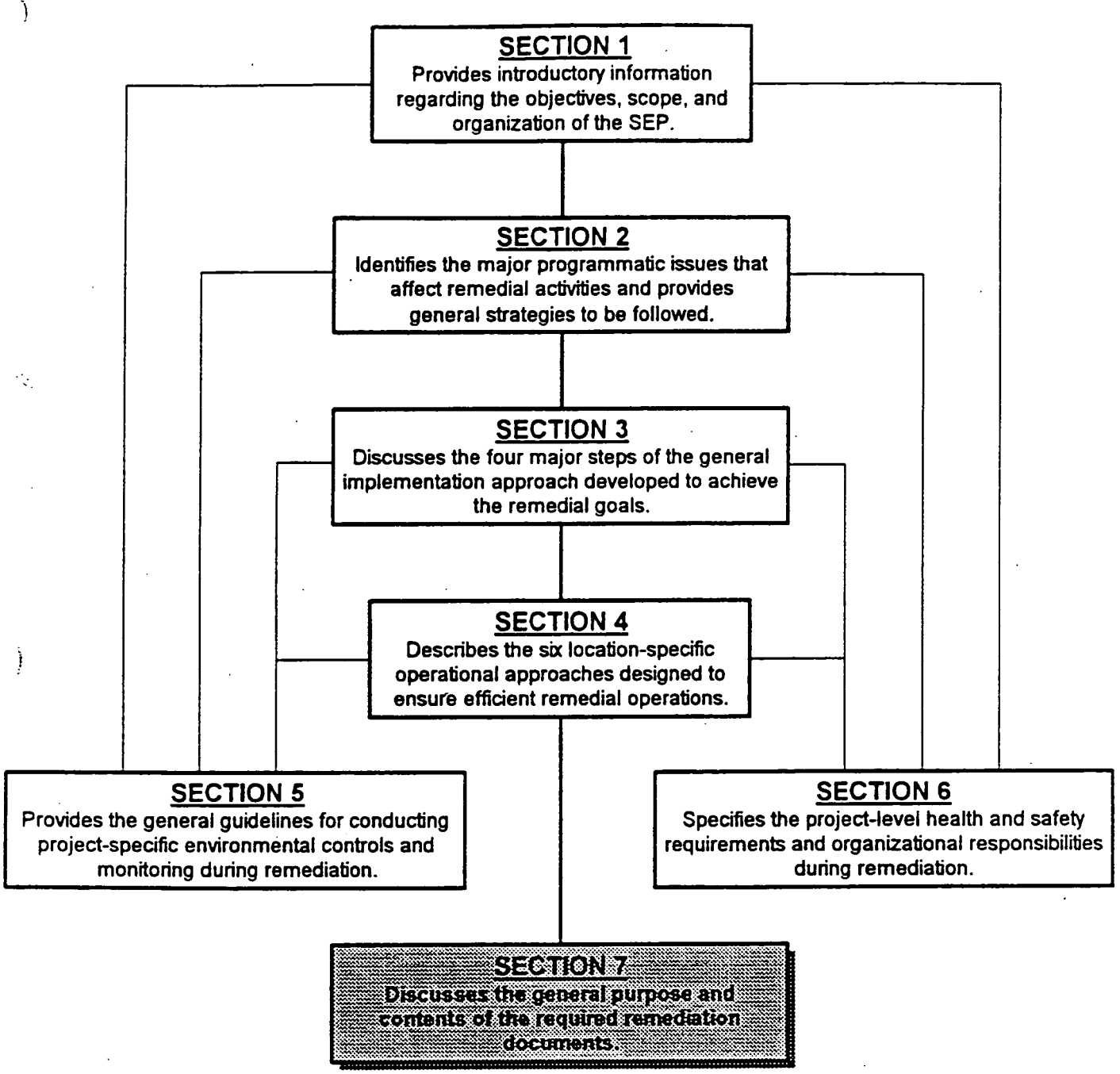
(Continued)

Contaminant	Permissible Exposure Limits (PEL) or Derived Air Concentration (DAC)	Action Levels - Worker Protection	Action Levels - Perimeter
Radiological	Applicable DAC's: Uranium: 2E-11 :Ci/cc Th-230: 3E-12 :Ci/cc Th-232: 5E-13 :Ci/cc Radon: 0.3 Working Levels (WL) Thoron: 1.0 Working Levels (WL)	At 4 DAC-Hrs per week, as indicated by Breathing Zone air sample results with applied respiratory protection factor (if respirator worn), work practices, administrative controls, and engineering controls will be re-evaluated (e.g., dust control, respiratory protection) and proper application ensured. Respiratory protection types: • Full Face Air Purifying Respirator (FFAPR) with HEPA or combination cartridge (50 PF) • Full Face Powered Air Purifying Respirator (FFPAPR), Mask Mounted type (MM) with HEPA cartridge only or Belt mounted type (6A) with HEPA or combination cartridge (1000 PF). PAPR may be required for metal burning/torch cutting or highly contaminated work. At ≥ 10% DAC, as indicated by General Area air sample results, re-evaluate work practices and engineering controls (e.g., dust control) and ensure proper application. Post the affected area as an Airborne Radioactivity Area. At ≥ 1 DAC, as indicated by General Area air sample results, control occupational exposure by the use of respiratory protection (required at ≥ 1 DAC). Re-evaluate work practices, engineering controls, and any existing respiratory protection requirements (including applicable respiratory protection factors).	At 10% DAC, modify work practices and/or engineering controls to ensure airborne radiological contamination levels are maintained below 10% DAC at the perimeter and below 2% DAC outside of the posted construction area (based on a weekly average). If boundaries exceed 10% DAC (based on a weekly average) the radiological area boundary will be expanded. Perform monitoring with direct reading instruments, and collect air samples to verify boundaries are posted correctly.

[a]Limit for occupational exposure control will be the current OSHA or ACGIH limit (whichever is lower).

[b]Action level for occupational exposure control will be the current OSHA or ACGIH limit (whichever is lower) x 0.5, or as otherwise established by OSHA.

SITEWIDE EXCAVATION PLAN



APPENDIX A - Soil Remediation ARARs and TBCs
APPENDIX B - Sitewide Sequencing Plan
APPENDIX C - Constituent of Ecological Concern Selection
APPENDIX D - Wood Sampling Program
APPENDIX E - SEP Quality Assurance Project Plan (QAPP)
APPENDIX F - Implementation of Construction and Waste Management Practices
APPENDIX G - Certification Design Rationale
APPENDIX H - Summary of Field Measurement and Laboratory Analytical Technologies
APPENDIX I - Sitewide Extent Of Contamination By Constituent

7.0 SOIL REMEDIATION DOCUMENTS

The Sitewide Excavation Plan (SEP) addresses sitewide planning for soil excavation and provides the management strategy and technical guidelines necessary to govern soil remediation at the Fernald Environmental Monitoring Project (FEMP). Information included in the SEP consists of methods and protocols that will be consistently used during each phase of remediation from predesign investigation to final cleanup certification. The SEP also presents area-specific information regarding the nature and extent of contamination as well as various physical conditions (e.g., depth of excavation) expected throughout the FEMP during remediation.

Area-specific integrated remedial design packages (IRDPs) will be prepared for each remediation area in phases that correlate to the sequence of implementing remedial action. Phasing of these remedial design deliverables will accomplish two goals: 1) expedite remediation to facilitate the accelerated plan and 2) incorporate the lessons learned. This concept was identified in the Operable Unit 5 FS Report (DOE 1995b), based on guidance on expediting remedial design and remedial action in "Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties" (EPA 1990a). The guidance suggests that accelerated cleanup can be achieved by phasing a project into meaningful remedial work elements that can be implemented on different schedules, an approach which results in acceleration of remedial design and remedial action. After completion of soil remedial action according to an area-specific IRDP, an area-specific Certification Design Letter (CDL) and Certification Report will be prepared to guide and document the certification process that is necessary to demonstrate attainment of all the remedial requirements listed in the SEP.

Figure 7-1 and Table 7-1 summarize types and timing of the planned soil remediation documents during typical steps of area-specific soil remediation. Figure 7-2 shows the hierarchy of the soil remediation documents as well as phasing of the sitewide soil remediation. As shown on Figure 7-2, the IRDPs address only the area-specific remedial actions. Following completion of the remedial action, certification will be conducted according to the general protocols provided in Sections 3.0 and 4.0 of this SEP and will be documented in the area-specific CDL and the Certification Report. This section describes the purposes, contents, and hierarchy of the three major area-specific soil remediation documents (i.e., IRDP, CDL, and Certification Report) to be prepared in phases during

the FEMP soil remediation according to the SEP management strategy and technical guidelines. Predesign investigations conducted prior to preparation of each of these documents will be documented through the development of PSPs and data summary reports. Finally, a description is given of three other sitewide future documents (i.e., Natural Resources Restoration Plan, Remedial Action Report, and Site Closeout Report) that are planned and/or required to complete the remediation process at the FEMP.

7.1 PROJECT-SPECIFIC PLANS

Project Specific Plans (PSPs) will be developed prior to all field investigations that are carried out to collect identified data needs for a remediation area. The PSPs will be developed and implemented during predesign, precertification, and certification activities (Figure 7-1). One or more predesign PSPs will be used to collect additional data needed to: 1) refine the estimated extent of excavation required to meet FRLs, 2) delineate above-WAC areas, and 3) determine the presence or absence of HWMU and UST COCs in their respective footprints. The PSP for precertification activities will be used to assess the readiness of the area for the certification and to develop the CDL. Prior to conducting the certification sampling, a PSP will be developed that reflects the sampling strategy and design presented in the Certification Design Letter (CDL). The results of the certification sampling will be recorded in certification reports. A data summary report will be generated for each PSP to provide a unique record of the findings for each PSP and will be incorporated into the appropriate document. Most of the data summary reports will be incorporated into the IRDPs. The content of PSPs and data summary reports are described in the following sections.

7.1.1 Content of Project-Specific Plans

Several PSPs will be developed in each remediation area to address the variety of characterization and geotechnical issues associated with the predesign, precertification, and certification activities. The general content of a PSP will reflect the following information:

- An introduction that provides the background information that is pertinent to the scope of work to be performed (including a history of former investigations and removal actions)
- The scope of work to be executed, including each type of investigative strategy (e.g., geoprobe borings, HPGe, etc.) and associated sampling locations, sample identification, and type of equipment

- Justification for the list of COCs to be investigated (i.e, COCs that may exceed the FRLs and OSDF WAC)
- All applicable QA/QC protocols, including sample collection methods and equipment operation procedures
- Tables that summarize sample and/or boring locations, depths, analytes and anticipated coordinates. These are typically included as an appendix. Figures will also be presented to show sample locations, relative to existing data points and current modeled extent of excavation
- The analytical approach will be presented to show analytical methods, constituent holding times, and ASLs.
- A contingency plan that identifies potential additional sampling locations based on the analytical results of the initial investigation.

In addition, each PSP will be consistent with the SCQ, and the appropriate DQO will be attached as an appendix to the PSP.

7.1.2 Content of Data Summary Reports

Each PSP will be followed up with a Data Summary Report, if appropriate, or a data summary in the IRDP. The purpose of these reports is to briefly present the results of a field investigation. This information may be used later in the area-specific IRDP and Certification Design Letter to refine the excavation footprint and sampling design, respectively. At a minimum, each data summary report will include a:

- Summary of field activities and approved variances during implementation of the PSP
- Table of analytical results
- Figures and discussions of analytical trends
- Figures of cross-sections and plan views of sample locations, where appropriate
- Updated excavation models for areas exceeding the FRL and WAC, and refinement of HWMU and UST footprints.

7.2 INTEGRATED REMEDIAL DESIGN PACKAGE

The IRDPs will be prepared for individual areas or a combination of the remediation areas Figure 7-2. Area-specific information (e.g., results of the predesign investigation) required to conduct soil remediation according to the SEP technical guidelines and appropriate area-specific implementation approaches (Section 4.0) will be combined and presented in each IRDP. Each IRDP will also include an area-specific implementation plan that incorporates the area-specific elements of a Remedial Action (RA) work plan, design drawings, and specifications. The information to be provided in the general scope of work for each of these deliverables is summarized in Section 7.2.1. Each IRDP will incorporate the lessons learned concept so that remedial action can be streamlined for each subsequent phase of soil remediation.

7.2.1 Design Package Components

The IRDPs will provide area-specific details of implementation of the sitewide remediation strategy outlined in the SEP. The general content to be included in an IRDP is listed below.

Implementation Plan:

- Schedule of remedial activities
- Scope of work and boundaries of the data, including areas of remediation
- Summary of existing RI data, process knowledge, and/or additional predesign investigation data to perform remediation
- Summary of subsurface conditions (e.g., piping, structure foundation, pile, perched water zone, and soil geotechnical properties), if necessary
- Summary of known extent of contamination and special materials
- Summary of applicable final remediation levels (FRLs) and waste acceptance criteria (WAC)
- Identification of area-specific constituents of concern
- Anticipated excavation boundaries
- Area-specific access control requirements
- Area-specific excavation approaches

000325

- Excavation control elements (e.g., monitoring equipment)
- Erosion and surface water control, if necessary
- Dewatering and perched water control, if necessary
- Precertification evaluation protocols, to determine that actions are complete.

Design Drawings:

- Site preparation and temporary facilities location
- Excavation plan and cross-sections
- Excavation plan and design boundaries, model results, and characterization data used in the model
- Storm water control elements
- Erosion and sediment control
- Interim Grading Plan (to be conducted after certification)
- Decontamination facility utilities to be saved/removed
- Survey monuments

Specifications:

- General requirements
  - Summary of work
  - Submittal schedule
  - Health and safety requirements
  - Mobilization and site access
  - Quality assurance/quality control requirements
  - Management of impacted material
- Construction-related items
  - Dust control measures
  - Erosion control measures
  - Excavation requirements
  - Demolition requirements
  - Dewatering requirements
  - Waste handling/disposition
  - Interim restoration
  - Process piping.

7.2.2 Model Outline

Each Implementation Plan will be organized to efficiently present all the engineering details of an area-specific remediation approach to be developed under the SEP sitewide management strategy and technical guidelines. Following is a model outline for the future IRDPs.

MODEL OUTLINE FOR FUTURE IMPLEMENTATION PLANS

EXECUTIVE SUMMARY
LIST OF TABLES
LIST OF FIGURES
LIST OF ACRONYMS AND ABBREVIATIONS

1.0 INTRODUCTION
- 1.1 Scope and General Approach of the Implementation Plan
- 1.2 Background and Description of the Remediation Area
- 1.3 Summary of the Regulatory Drivers
- 1.4 Components of the Remedy
- 1.5 Lessons Learned

2.0 PREDESIGN INVESTIGATION
- 2.1 Summary of the RI/FS and Predesign Investigations
  - 2.1.1 RI/FS Data Review
  - 2.1.2 Additional Sampling/Measurements
- 2.2 Identification of Area-Specific Constituents of Concern
- 2.3 Summary of Surface and Subsurface Conditions
  - 2.3.1 Surface Coverage and Drainage Pattern
  - 2.3.2 Soil Stratigraphy and Geotechnical Properties
  - 2.3.3 Perched Water Zone
  - 2.3.4 At- and Below-Grade Structures and Debris
  - 2.3.5 Environmental Monitoring Facilities
- 2.4 Anticipated Excavation Boundaries
  - 2.4.1 Summary of the Extent of Contamination
  - 2.4.2 Above WAC Material
  - 2.4.3 Toxicity Characteristic Soil, HWMUs, and USTs

3.0 REMEDIAL ACTION APPROACH
- 3.1 Site Preparation
  - 3.1.1 Establishing Site Boundaries and Controls
  - 3.1.2 Establishing the Support Area
  - 3.1.3 Installation of Equipment Wash Facility
  - 3.1.4 Installation of Surface Water Management System and Erosion and Sediment Controls
  - 3.1.5 Surveying and Excavation Layout
  - 3.1.6 Protection of Environmental Monitoring Facilities
- 3.2 At- and Below-Grade Structure Demolition
- 3.3 Soil Excavation and Segregation

000227

3.3.1 Clearing and Grubbing
3.3.2 Monitoring
3.3.3 Excavation of Special Materials
3.3.4 Impacted Material Excavation
3.3.5 Impacted Material Transportation and Disposition
3.4 Material Handling and Treatment
3.5 Precertification Evaluation and Additional Excavation
3.6 HWMU/UST Closure and Certification
3.7 Interim Grading and Restoration
3.8 Institutional Controls
4.0 PROJECT-SPECIFIC ENVIRONMENTAL CONTROLS AND MONITORING
4.1 Natural Resource Impacts
4.2 Air Pathway
4.3 Surface Water Pathway
4.4 Groundwater Pathway
5.0 PROJECT-SPECIFIC HEALTH AND SAFETY
6.0 REMEDIAL ACTION MANAGEMENT STRATEGY
6.1 Organization and Responsibilities
6.2 Configuration Management
6.3 Contractor Procurement and Award Strategy
6.3.1 Bid Solicitation Process
6.3.2 Pre-Bid/Proposal Meeting and Tour
6.3.3 Excavation/Remediation Subcontract Award
6.3.4 Equipment and Material Procurement
6.4 Contractor Management
6.4.1 Status Meetings
6.4.2 Surveillance and Inspection
6.4.3 Health and Safety Oversight
6.4.4 Radiological Monitoring and Oversight
6.5 Impacted Material Management
6.6 Contingency Management
6.7 Data and Records Management
6.8 QA/QC and Regulatory Audit
6.9 Integration/Coordination with Other FEMP Activities
6.10 Schedule

Any other relevant area-specific information and/or procedures that have not been already described in the SEP and are not suitable for the main text of an IRDP will also be presented in Appendices to facilitate more detailed review processes. Examples of topics to be presented in the appendix section may include:

- Predesign investigation data summary tables
- IRDP PSPs

- Project cost estimation
- Comment responses.

7.2.3 Schedule

The phasing of the remedial design deliverables is presented on Figure 7-2. Each IRDP is listed in the sequence in which remediation is anticipated to occur under the accelerated sitewide remediation plan. Integration with other projects' schedules were taken into consideration. Each IRDP will be submitted following completions of area-specific pre-excavation investigation and initial design activities. The submittal schedule for the IRDP deliverable is defined in Table 1-5. Soil remedial actions will commence and continue, with the schedules for remedial actions to be identified in the individual IRDPs.

7.2.4 Review and Finalization of Design Deliverables

Each IRDP will be submitted to EPA and OEPA for approval prior to implementation. DOE will formally respond to EPA and OEPA comments within 30 days of receipt of agency comments. Upon approval of the IRDP or conditional approval by the agencies of the responses to comments, remediation excavation may commence. Necessary revisions to the IRDP will then be incorporated and a final document transmitted. As a general practice, the FEMP does not intend to initiate IRDP-based field work unless either a conditional or final agency approval of the IRDP is obtained. Whenever possible, the submittal of draft IRDPs will be scheduled such that sufficient time is made available to submit a revised document for review and approval prior to the need to initiate excavation activities. Under select schedule-driven circumstances, the FEMP may need to request conditional approval of an IRDP based on agency review of detailed comment responses and/or change pages or revised drawings from the document. If a remediation area is determined to provide unique or unanticipated remediation challenges, DOE may request a formal preliminary review for a design deliverable not already considered in the Operable Unit 5 RD Work Plan (DOE 1996a) and this SEP.

7.3 CERTIFICATION DESIGN LETTER

A CDL will be prepared and submitted to the regulatory agencies following completion of the area-specific IRDP tasks, including precertification activities (Section 3.3), as a notification to initiate the certification process for the remediated areas. The CDLs will first provide a summary of the area-specific remediation completed and results of the precertification activities conducted according to the

000329

SEP guidelines. The main focus of the CDLs will be the delineation of certification units (CUs), the CU-specific certification COCs, the location of certification samples, and the certification sampling approaches. Once sample locations have been confirmed by field check as accessible for soil collection, they may not be moved without prior consent of the EPA and OEPA.

7.3.1 Contents

Although a formal regulatory review and comment-response process is not intended for the CDLs, they will provide the regulatory agencies opportunities to evaluate the certification approach before the actual certification process is completed. Modifications to the certification process can be incorporated upon specific regulatory requests, if necessary. Each certification design letter will also be combined into the final area-specific certification report at the end of a certification process for formal regulatory review comment and approval. The general content to be included in a CDL is as follows.

Implementation Plan:

- Schedule of the certification activities
- Scope of work and boundaries of the data, including areas of remediation
- Summary of the precertification scan and/or measurement data
- Summary of known pattern and/or extent of residual contamination
- Summary of applicable FRLs
- Identification of CU-specific constituents of concern for certification purposes
- Summary of the certification sampling/measurement and/or laboratory analysis methods

Design Drawings:

- CU delineation maps
- Certification sampling locations
- Storm water control elements during certification
- Erosion and sediment control during certification
- Survey monuments.

7.3.2 Schedule

In general, an area-specific CDL will be prepared within 30 days after successful completion of the remedial action specified in a corresponding area-specific IRDP and the precertification activities in the remediated area according to the SEP guidelines. Certification sampling and analysis will commence immediately after a regulatory review and approval of the CDL.

7.4 CERTIFICATION REPORT

The SEP and area-specific Implementation Plans (as part of the area-specific IRDPs) together will satisfy the RAWP requirements as presented in the Amended Consent Agreement (ACA) (EPA 1991). Certification Reports will be used to progressively demonstrate that the remedial action objectives are completed for soil remediation, although the Certification Report is not required in accordance with EPA guidance or the ACA. The intent of submitting a Certification Report for each phase of a remediation area is to receive acknowledgment that the pertinent operable unit remedial actions were achieved so that natural resource restoration can proceed as rapidly as possible. The certification reporting process will occur in two steps:

- First, following evaluation, graphical presentations of important new certification data demonstrating remediation progress (e.g., residual concentration contours of the primary COCs, pictures of the excavated areas, etc.) will be prepared, updated, and quickly loaded onto a website on the Internet to allow electronic access of the latest site conditions for the regulatory agencies.
- Second, upon completion of all certification data demonstrating that FRLs are achieved for all the CUs in the remediated area, a formal certification report will be submitted to the agencies. Upon regulatory acceptance of certification, the remediated area will be ready for interim grading or final natural resource restoration activities.

An area-specific Certification Report will be prepared after the remedial action and precertification activities are completed for each of the remediation areas described in Section 1.0. As the final area-specific remediation deliverable, the main objectives of the Certification Reports are to document what remedial actions occurred in specific areas, describe the certification process, present the data supporting the certification that the ASCOCs do not exceed the FRLs specified in the relevant RODs, satisfy HWMU and UST closure requirements, summarize the data/manifests generated during remediation for WAC attainment demonstration, and describe access controls implemented to prevent recontamination.

7.4.1 Contents

Each Certification Report will include the following:

000231

- Introduction. A general description will be included of how the area-specific remedy was implemented.

- Chronology of Events. Major events associated with the remedial action will be provided, beginning with the approvals of the IRDP and a selected construction subcontractor.

- Performance Standards and Construction Quality Control. The criteria or requirements that are necessary to demonstrate completion of remedial action in a remediation area as defined in the IRDP and the Certification Design Letter will be included.

- Construction Activities. A narrative description of construction activities undertaken for the relevant phase of remediation will be included. This includes an estimate of quantities excavated/treated/disposed, achievement of FRLs, and materials and/or equipment used. Participants in the remedial action will also be identified, including federal and state agencies, and construction contractors.

- Summary of Material and Data Tracking. A summary of data, records, and manifests generated during the remediation for material balance, WAC attainment, treatment, transportation, and disposition purposes will be provided.

- Certification that the Remedy Is Operational and Functional. Certification will be an affirmation that performance standards have been met for the excavation of contaminated material. The basis for the determination will also be provided.

- Statistical Summary Tables. Statistical analysis results will be provided which support the certification decision (Table 7-2).

- Summary of Project Cost. The final costs for the remediation phase will be summarized and compared to the original remedial action estimate provided in the IRDP.

Information on lessons learned will also be provided to facilitate improvement in each subsequent phase of remediation. Identification of problems encountered during excavation will be supplemented with proposed solutions to streamline the next phase of remediation.

7.4.2 Certification Report Outline

Each certification report will be organized to present the contents listed in Section 7.4.1, and all the details of an area-specific certification process conducted following precertification activities as described in the SEP sitewide management strategy and technical guidelines. Data generated throughout the remediation, precertification, and certification activities will also be presented and

analyzed to support the certification conclusions. Following is a model outline for the future Certification Reports.

MODEL OUTLINE FOR THE CERTIFICATION REPORTS

EXECUTIVE SUMMARY
LIST OF TABLES
LIST OF FIGURES
LIST OF ACRONYMS AND ABBREVIATIONS

1.0 INTRODUCTION
- 1.1 Purpose
- 1.2 Background
- 1.3 Area Description
- 1.4 Scope
- 1.5 Objectives
- 1.6 Report Format
- 1.7 FEMP Certification Master Map

2.0 CERTIFICATION APPROACH
- 2.1 Certification Strategy
  - 2.1.1 Area Specific Constituents of Concern
  - 2.1.2 ASCOC Selection Criteria
  - 2.1.3 ASCOC Selection Process
- 2.2 Certification Approach
  - 2.2.1 Certification Design
- 2.2.2 Sample Selection Process
- 2.2.3 Certification Sampling
- 2.2.4 Statistical Analysis

3.0 OVERVIEW OF FIELD ACTIVITIES
- 3.1 Area Preparation
- 3.2 Changes to Scope of Work

4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES, AND DATA REDUCTION
- 4.1 Analytical Methodologies
  - 4.1.1 Chemical Methods
  - 4.1.2 Radiochemical Methods
- 4.2 Data Verification and Validation

4.3 Data Reduction

5.0 CERTIFICATION EVALUATION AND CONCLUSIONS
5.1 Certification Results and Evaluation
5.2 Certification Conclusions

6.0 PROTECTION OF CERTIFIED AREAS

References

Appendix A Certification Samples, Results and Statistics Tables

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Any other relevant area-specific information and/or procedures that have not been already described in the SEP and are not suitable for the main text of a Certification Report will also be presented in appendices to facilitate more detailed review processes. Examples of topics to be presented in the appendix section may include:

- CU maps and statistical tables
- Certification data summary tables
- Certification PSPs
- WAC attainment summary
- Project cost summary
- Comment responses.

7.4.3 Schedule, Review and Finalization

The area-specific Certification Reports will be prepared for the phases established for the IRDPs, as described in Section 7.2. An independent QA review will be conducted on the Certification Report to verify that the content and quality of reported information meets the QA/QC protocols discussed in the QAPP (Appendix E). A draft area-specific Certification Report will be submitted generally within 120 days following completion of the certification activities conducted for a remediated area (i.e., receipt of data satisfying the FRLs). The DOE will formally address all EPA and OEPA comments on the draft certification reports through the submittal of a comment-response document generally within

30 days of receipt of the agencies' comments. Comments will be incorporated into each certification report, and revisions will be formally submitted for the reports.

7.5 OTHER RELATED FUTURE DOCUMENTS

Three other major sitewide or operable-unit-specific documents are planned and/or required to guide and document the completion of the remediation at the FEMP. They include the Natural Resource Restoration Plan, the Remedial Action Report, and the Site Closeout Report. The Natural Resource Restoration Plan generally defines the site restoration strategy. The Remedial Action Report and the Site Closeout Report are prepared to document completions of major remedial milestones. Table 7-3 summarizes and compares the scopes and contents of the Certification Report (including the Certification Design Letter), Remedial Action Report, and Site Closeout Report intended for the area-specific, operable-unit-specific, and sitewide scales, respectively. The following subsections describe the purposes and contents of these documents. Figure 7-3 shows the organizational structure of and relationships between the major remediation documents to be prepared.

7.5.1 Natural Resources Restoration Plan and Design Packages

Strategy for restoration of the natural resources after site remediation will be provided in the Natural Resources Restoration Plan (NRRP). A conceptual final land use design will be presented in the NRRP, as negotiated among DOE, regulators, the Natural Resource Trustees, and other stakeholders. In general, the NRRP will be consistent with the final land use scenario selected during the Operable Unit 5 FS (DOE 1995b) in which the site will be maintained as an undeveloped park after remediation. Any local, interim grading to be conducted immediately after certification of a remediated area will be designed (in the IRDP) considering the final sitewide grading plan presented in the final NRRP, to minimize the potential amount of rework during the sitewide final grading and restoration. The NRRP will also fulfill the requirements in the Amended Consent Agreement (EPA 1991) for a land use plan and an institutional control plan for Operable Unit 5.

Area-specific Natural Resource Restoration Design Packages (NRRDPs) will be developed pursuant to the conceptual sitewide restoration set forth in the NRRP. The NRRDPs will contain detailed design drawings and specifications regarding final grading, site preparation, re-seeding, vegetation planting, installation of structures, and maintenance. DOE will obtain approval for each NRRDP from EPA, OEPA and Natural Resource Trustees prior to implementation.

7.5.2 Remedial Action Report

Upon completion of remedial action, each operable unit must complete a Remedial Action Report (EPA 1992b). The purpose and content of the Remedial Action Report is to document the activities that occurred under remediation for each operable unit. The Remedial Action Report shows how the remedial objectives for each operable unit were met and summarizes the information necessary for inclusion in the Site Closeout Report. One Remedial Action Report will be written that covers remediation of the Operable Unit 2 waste units, Operable Unit 5 soil, and Operable Unit 3 at- and below-grade debris; the Certification Reports for the individual soil remediation areas will be generally used as the basis for preparing the Remedial Action Report. Operable Unit 1, Operable Unit 4, and the remaining portions of Operable Units 3 and 5 will be addressed in separate remedial action reports.

A Remedial Action Report contains the following basic elements, which are similar to the content of a Certification Report, with a few exceptions:

- Introduction. This section provides a short general description of the site and the remedy implemented.
- Chronology. A summary of the major events associated with the remedial action is included.
- Performance Standards and Construction Quality Control. This section summarizes the criteria or requirements that the remedial action contractor met in completing the project and the basis for determining that the standard was met. This section also provides a summary of the implementation of the construction quality control plan and provides an assurance that the remedial action is complete.

- Final Inspection. This section documents the pre-final and final inspections conducted by the contracting party and contractor at the completion of construction.

- Certification that the Remedy is Operational and Functional. An affirmation is presented that the performance standards have been met.

- Summary of Project Costs. This section provides the final costs for the project and compares them to the original remedial action estimate.

7.5.3 Site Closeout Report

After the Remedial Action Report of the last operable unit has been submitted to show the successful implementation of remedial action, a Site Closeout Report will be prepared for the entire site. The Remedial Action Reports are generally used as the basis for preparing the Site Closeout Report and contribute to the ultimate decision regarding deletion from the Superfund National Priorities List (NPL) (EPA 1989). The Site Closeout Report shows that remediation of the entire site has been completed. It is important to note that in cases where waste has been left on site, such as at the FEMP, the five-year review procedures established in Section 121(e) of CERCLA, as amended by SARA, will continue to be appropriate regardless of the completion or deletion status of the site.

Site completion occurs when the following conditions have been met:

- Cleanup levels have been achieved and all cleanup actions have been successfully implemented pursuant to the RODs

- The site is protective of human health and the environment across all pathways of exposure

- The constructed remedy is operational and functional and performing according to engineering design specification

- The only activities remaining at the site are operations and maintenance (O&M) activities.

000237

Operable Unit 5 may be considered to have a Long-Term Response Action (LTRA) for cleanup of the

Great Miami Aquifer. If this is determined to be the case, an Interim Closeout Report will be prepared. It will contain final information for all completed operable units at the site and will describe the LTRA activities to be performed and the cleanup levels to be achieved for the LTRA portion of the site. Therefore, this report must be prepared after all the other operable unit cleanup activities have been finalized, and after those organizations have prepared their respective Remedial Action Reports. The interim report will act as the determining factor for designating sites as LTRA on the NPL and for internal Superfund tracking. At this point, OEPA will be expected to assume responsibility for the LTRA oversight. The Interim Closeout Report will be amended when cleanup levels are achieved to include final information for the LTRA operable unit (Operable Unit 5) to satisfy completion requirements. The Interim Closeout Report and the amendment together will constitute the final Site Closeout Report, which indicates that remediation of the entire site has been completed. This report should include the following:

- Summary of Site Condition: Site background, RI/FS results, ROD summary, design criteria, community relations, and cleanup activities performed will be summarized.

- Demonstration of QA/QC from Cleanup Activities: This includes documentation that QA/QC and sampling and analyses protocol were followed, results of on-site inspections, and equipment acceptance records.

- Monitoring Results: Sufficient data will be available to demonstrate that the cleanup levels specified in the RODs were achieved and that implemented remedies are performing at design specifications. This section would be contained in the amendment to the Interim Closeout Report for any LTRA operable units.

- Summary of Operation and Maintenance: Assurance will be given that:

  - O&M plans are in place and are sufficient to maintain the protectiveness of the remedy.

  - All necessary institutional controls (e.g., deed restrictions) are in place.

- Protectiveness: Results of the sitewide postremedial risk assessment will demonstrate the relative protectiveness of remediation at the FEMP.

- Bibliography: All referenced documents and any other documents relevant to completion of the site will be included.

NPL Deletion Criteria allow sites to be deleted from, or recategorized on, the NPL in instances where no further response is appropriate [Section 300.66(c)(7) of the NCP] when the EPA and the state agree that all response actions are completed. The deletion docket is not a continuation of the administrative record for the site, although documents contained in the administrative record should be referenced in the deletion docket if they are still available to the public.

000339

TABLE 7-1
HIERARCHY AND CONTENT OF SOIL REMEDIATION DOCUMENTS

Sitewide	Reports Area-specific	Report content	Field Sitewide	Tasks Area-specific
Sitewide Excavation Plan (SEP)		Sidewide soil remediation strategy, sequencing, and general procedures	Field scanning equipment evaluation/selection	
Natural Resources Restoration Plan (NRRP)		Sitewide final land use and natural resource restoration strategy		
	Predesign Project Specific Plans Predesign Data Summary Reports Integrated Remedial Design Packages (IRDPs)	Area-specific remedial design package per SEP requirements		Predesign investigation per SEP requirements
				Remedial action according to SEP/IRDP
	CERTIFICATION DESIGN LETTERs	Area-specific CU-delineation and certification sampling plan per SEP requirements		Precertification scan per SEP requirements
	CERTIFICATION REPORTs	Area-specific WAC attainment, hot spot/FRL certification, and HWMU/UST closure records per SEP requirements		Certification Sampling/Analysis per SEP requirements
	Natural Resources Restoration Design Package (NRRDP)	Area-specific natural resource restoration design and implementation plan consistent with the NRRP		Interim grading/protection per SEP requirements
			Final restoration per NRRP strategy	

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TABLE 7-2
EXAMPLE OF STATISTICAL INFORMATION TO BE INCLUDED IN THE CERTIFICATION REPORT

	Analyte 1	Analyte 2	...	Analyte N
Station Number 1 Station Number 2 : Station Number *N*	Result & Qualifier : :	Result & Qualifier : :	...	Result & Qualifier : :
FRL	Final Remedial Level			
Units	Units of measurement			
Conf. Level	Confidence Level: **95%** for primary COCs, **90%** for secondary COCs			
W-statistic Prob.	Shapiro-Wilk probability, the highest for either normal (raw data) or lognormal (log-transformed data)			
Test Procedure	The statistical test procedure used to determine certification compliance: **t-Test(N)** - t-Test assuming Normal distribution **t-Test(LN)** - t-Test assuming Lognormal distribution **Wilcox** - Wilcoxon Signed Rank assuming symetric but not Normal distribution **Sign** - Sign Test if not Normal, Lognormal or symetric or too many non-detected results			
Sample Size	Number of sample results used in the statistical calculations. Note: only the maximum of two duplicates is used; "R" or rejected data are not used in the calculations.			
Est. Mean	**Estimated Mean** based on Normal or Lognormal distributions or the **Median** for nonparametric tests (Wilcoxon/Sign Tests).			
UCL	Upper Confidence Limit on the Estimated Mean to compare against the FRL (Normal or Lognormal assumptions only). If the UCL is greater than or equal to the FRL than the analyte fails certification; otherwise the analyte passes.			
Prob.	The nonparametric probability that the true median is less the the FRL (nonparametric only). If this is greater than or equal to (1-Conf.Level) than the analyte fails certification; otherwise the analyte passes.			
Pass/Fail	Pass or Fail based on appropriate result of either the UCL comparison or the Probability comparison.			
Max Result	The maximum report result, irrespective of the data qualifier.			
2x Rule P/F	If the maximum value is greater than or equal to 2xFRL then the analyte **Fails** hot-spot criteria; if not it **Passes**.			
a posteriori Sample Size Calculation	a posteriori sample size calculation to determine if sufficient number of samples were collected to adequately assess certification.			
	If the a posteriori sample size calculation is greater than the actual sample size then the analyte **Fails** the sample size requirements; if the sample size calculation is less than or equal to the actual sample size then there were sufficient samples taken (**Pass**).			

TABLE 7-3

REMEDIAL ACTION COMPLETION REPORTING

Item	Certification Report* (Project-Level)	Remedial Action Report (Operable Unit-Specific)	Sitewide Closeout Report (All Operable Units)
1. Chronology of events/summary of site conditions	Area-specific summary of major events associated with the remedial action	Site-wide summary of major events associated with the remedial action	Summary of site conditions from the RI/FS phase through completion of remedial action
2. Demonstration of QA/QC and performance standards	Provides analytical assurance that the remedial action in an area is complete with a summary of the construction quality control plan	Demonstrates site-wide analytical assurance that the remedy is complete and summarizes the construction quality control plan	Demonstrates that QA/QC protocol was followed and sampling and analyses protocol was followed
3. Final inspection	Summarize pre-final inspection	Summarize final inspection (including as-built drawings)	Summarize site-wide final inspections
4. Certification that the remedy is operational and functional	Provide area-specific certification	Provide site-wide soil excavation certification	Provide assurance that site-wide post-remedial operation and maintenance plans are in place and effectively maintain the protectiveness of the remedy
5. Project costs	Provide project costs	Provide overall remedial action costs and compare to original cost estimates	Not applicable

6. Protectiveness	Not applicable	Not applicable	Summarize results of the post-remedial site-wide risk assessment

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* SCEP Certification Reports may also provide some of the information necessary to complete the Remedial Action Reports for Operable Units 2, 3, and 5.

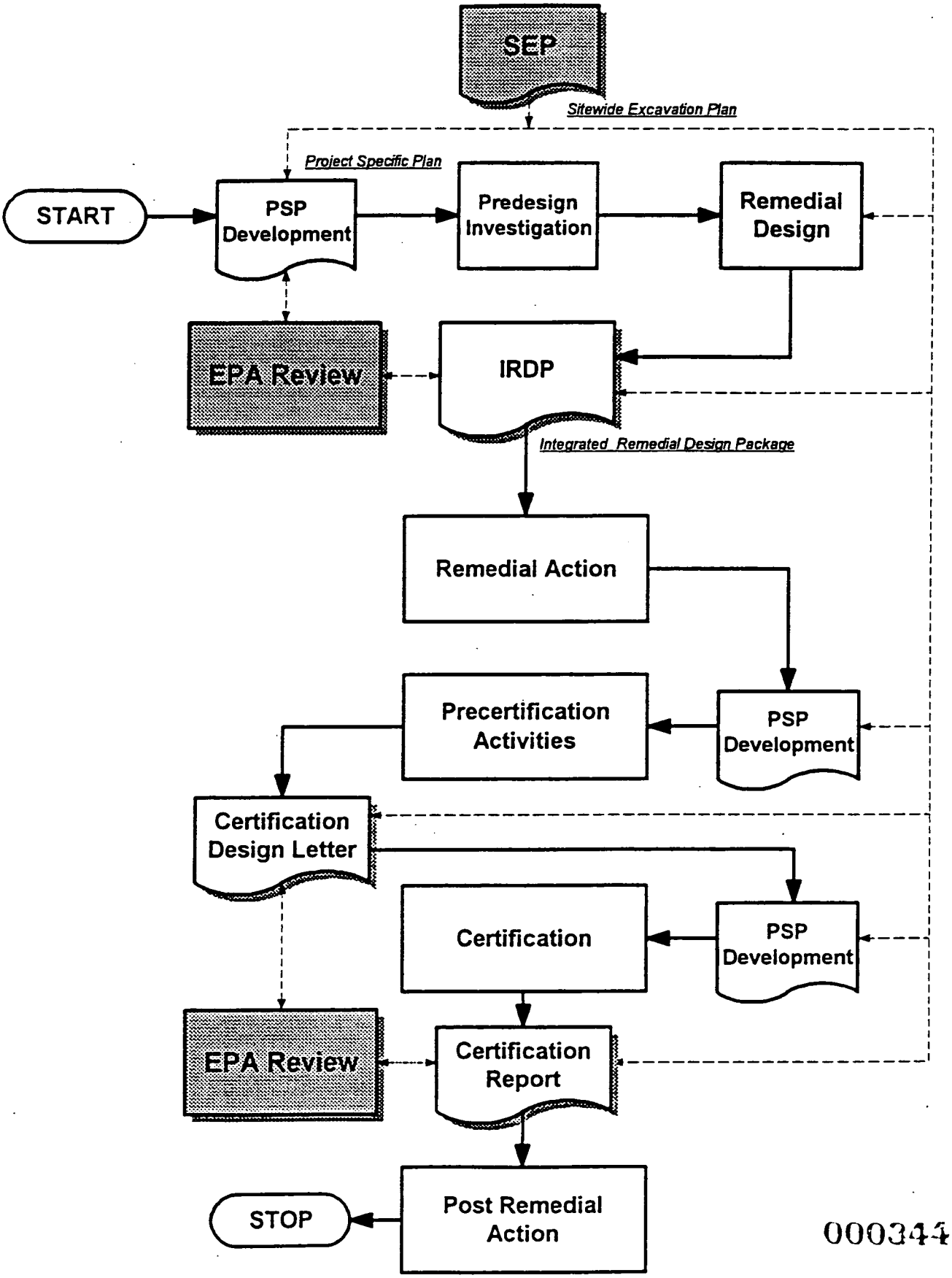

FIGURE 7-1 GENERAL AREA-SPECIFIC SOIL REMEDIATION PROCESS

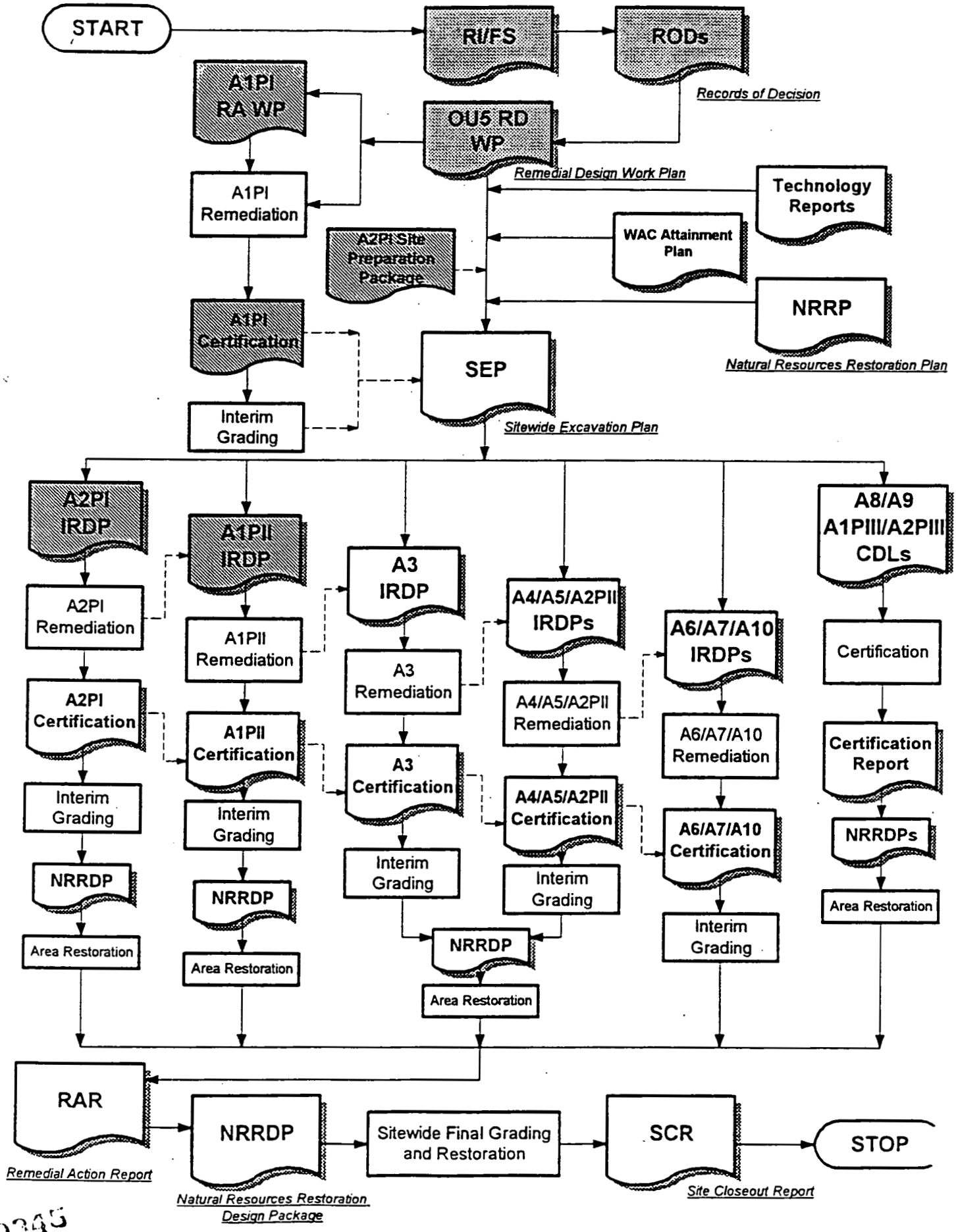

FIGURE 7-2 PHASING OF THE SITE-WIDE SOIL REMEDIATION AND DELIVERABLES

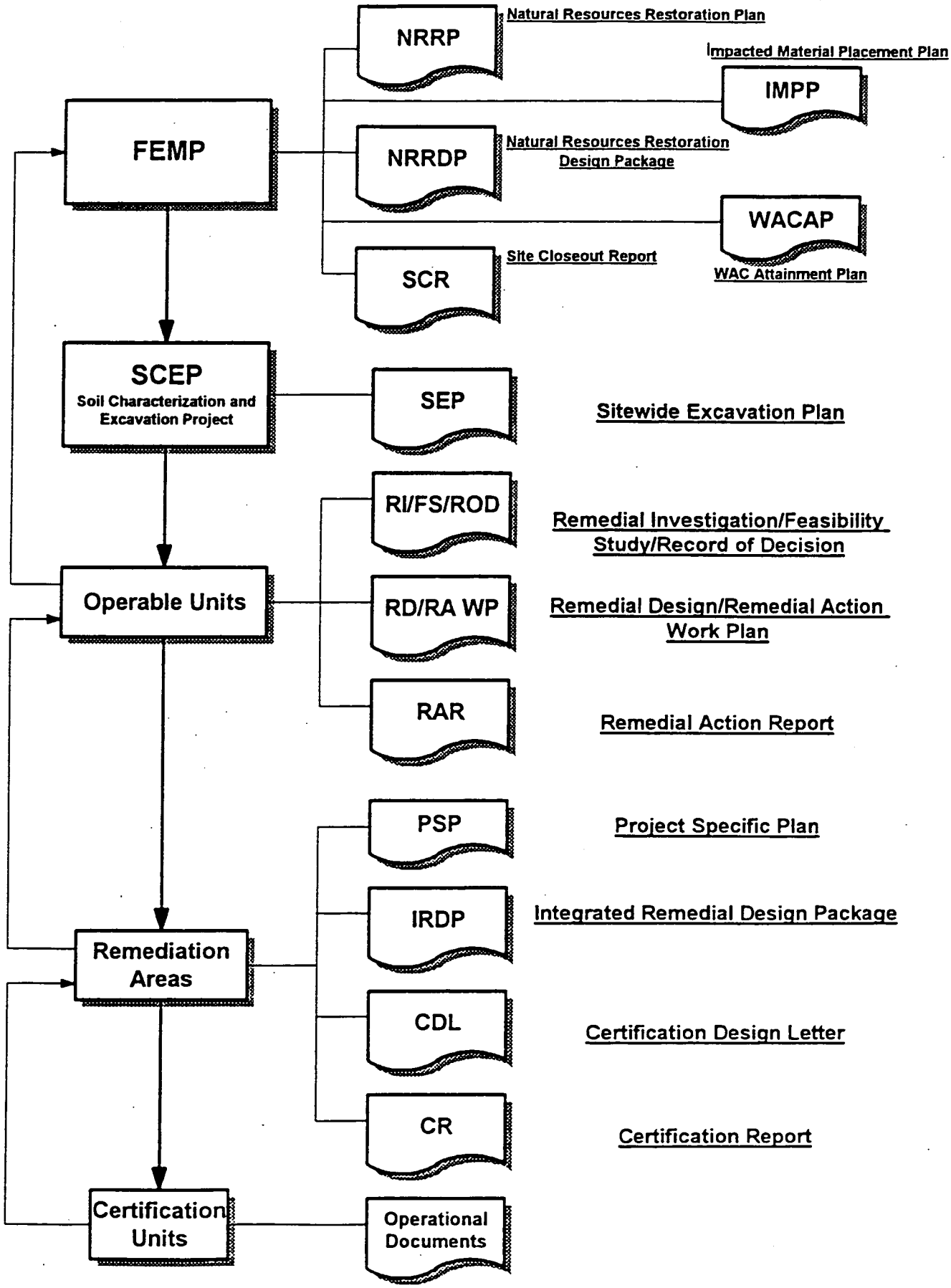

FIGURE 7-3 ORGANIZATIONAL STRUCTURE OF THE MAJOR REMEDIATION DOCUMENTS

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000343

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