5210

PROJECT SPECIFIC PLAN FOR AREA 6 SOLID WASTE LANDFILL EXCAVATION CHARACTERIZATION

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD CLOSURE PROJECT
FERNALD, OHIO

DECEMBER 2003

U.S. DEPARTMENT OF ENERGY

20600-PSP-0005
Revision 1
FINAL

TABLE OF CONTENTS

Page

1.0 Introduction 1-1
1.1 Purpose 1-1
1.2 Scope 1-1
1.3 Key Personnel 1-1
2.0 Solid Waste Landfill Background 2-1
3.0 Excavation Control Approach 3-1
3.1 Area Specific Constituents of Concern (ASCOCS) 3-1
3.2 Excavation Types 3-2
3.2.1 Above-WAC Excavation Zones 3-2
3.2.2 Above-FRL Contamination Zone (Presumed Below-WAC) 3-3
3.2.2.1 Real-Time Scanning in Above-FRL Zones 3-2
3.2.2.2 Physical Sampling in Above-FRL Zones 3-2
4.0 Instrumentation and Techniques 4-1
4.1 Measurement Instrumentation and Techniques 4-1
4.1.1 Real-Time 4-1
4.1.1.1 Sodium Iodide Data Acquisition (RSS EMS) 4-1
4.1.1.2 HPGe Data Acquisition 4-1
4.1.1.3 Excavation Monitoring System 4-2
4.1.1.4 Radon Monitor 4-2
4.1.2 Surface Moisture Measurements 4-2
4.2 Real-Time Measurement Identification 4-3
4.3 Real-Time Data Mapping 4-4
4.4 Real-Time Surveying 4-4
4.5 Physical Sampling Procedures 4-5
4.6 Physical Sampling Identification 4-5
5.0 Quality Assurance/Quality Control Requirements 5-1
5.1 Quality Control Samples - Real-Time Measurements and Physical Samples 5-1
5.2 Data Validation 5-1
5.2.1 Physical Sample Data Validation 5-1
5.2.2 Real-Time Data Verification/Validation 5-1
5.3 Applicable Documents, Methods and Standards 5-2
5.4 Surveillances 5-2
5.5 Implementation of Field Changes 5-3

TABLE OF CONTENTS
(Continued)

Page

6.0 Safety and Health 6-1
7.0 Equipment Decontamination 7-1
8.0 Disposition of Wastes 8-1
9.0 Data and Records Management 9-1
9.1 Real-Time 9-1
9.2 Physical Samples 9-1
References R-1

APPENDICES

Appendix A DQO SL-048, Delineating the Extent of Constituents of Concern During Remediation Sampling

Appendix B DQO SL-055, Real-Time Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

Appendix C DQO SL-054, Real-Time Instrumentation Measurement Program - Precertification Monitoring

LIST OF TABLES AND FIGURES

Table 1-1 Key Personnel
Figure 1-1 Location Map for the Solid Waste Landfill

LIST OF ACRONYMS AND ABBREVIATIONS

ALS	Analytical Laboratory Services
ASCOC	area-specific constituent of concern
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EMS	Excavation Monitoring System
FACTS	Fernald Analytical Computerized Tracking System
FCP	Fernald Closure Project
FRL	final remediation level
GC	gas chromatography
GPS	Global Positioning System
HPGe	high-purity germanium (detector)
LAN	Local Area Network
NaI	sodium iodide
OSDF	On-Site Disposal Facility
PPE	personal protective equipment
ppm	parts per million
PSP	Project Specific Plan
PWID	Project Waste Identification Document
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Real-Time Radiation Tracking System
RWP	Radiological Work Permit
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SDFP	Soil and Disposal Facility Project
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SWL	Solid Waste Landfill
V/FCN	Variance/Field Change Notice
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

This project specific plan (PSP) describes the field characterization methods and data collection activities necessary to support excavation control of the solid waste within the Solid Waste Landfill (SWL).

1.1 PURPOSE

The purpose of this PSP is to provide specific direction regarding real-time radiological characterization and soil sampling during excavation of the solid waste within the SWL. This detailed information includes lift scan requirements, sample identification, criteria for collecting physical samples, constituents of concern, etc.

1.2 SCOPE

The area included within the scope of this PSP is the solid waste within the SWL (Figure1-1). The schedule for beginning implementation of this PSP is October 2003. This PSP is not considered a work authorization document per SH-0021, Work Permits. Work authorization documents per SH-0021 may include applicable Environmental Services procedures, Fluor Fernald work permits, Radiological Work Permit (RWP), penetration permits, and other applicable permits.

1.3 KEY PERSONNEL

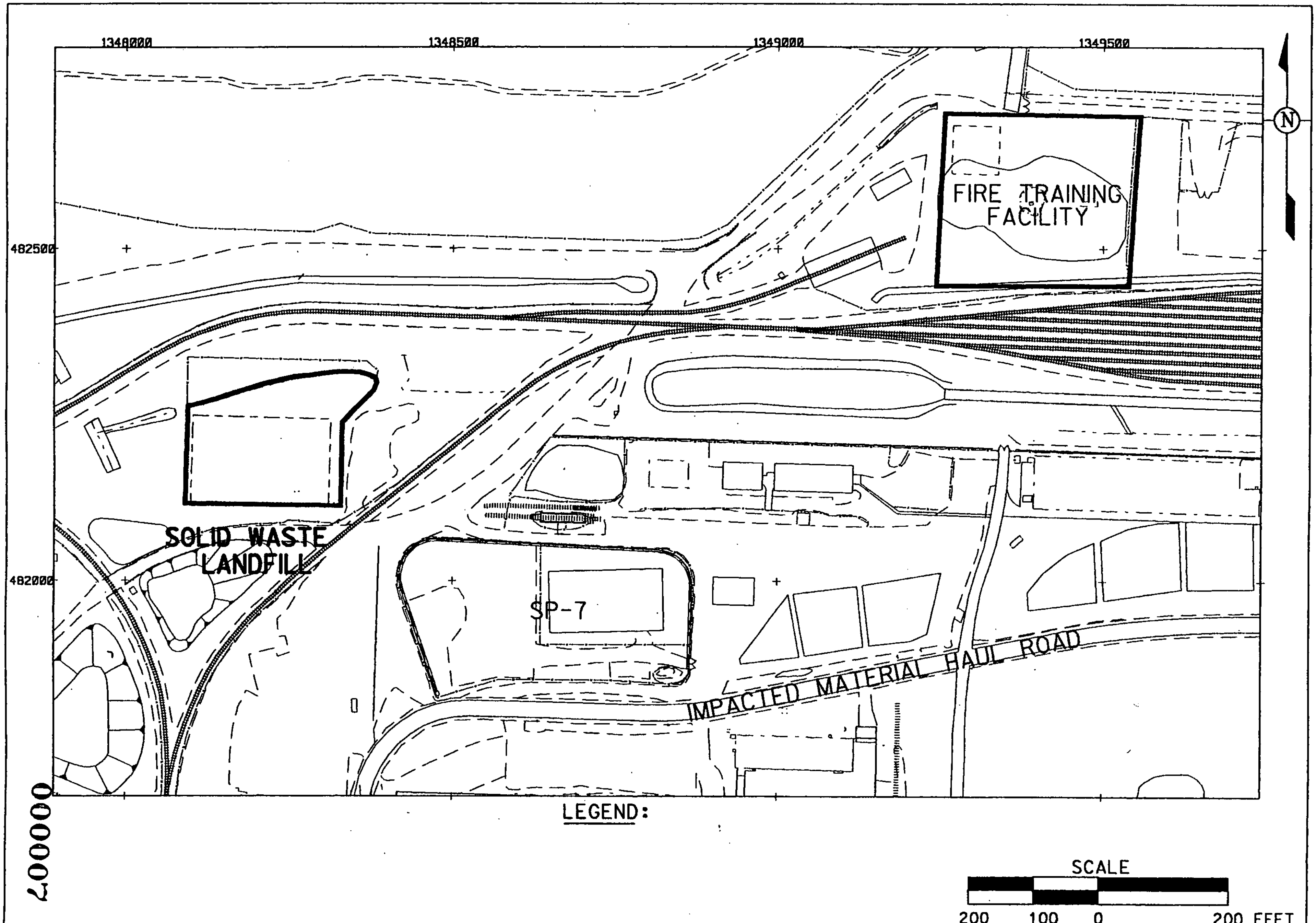
The team members responsible for coordination of work in accordance with this PSP are listed in Table 1-1.

TABLE 1-1

KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Johnny Reising	TBD
SDFP Project Manager	Jyh-Dong Chiou	Rich Abitz
Characterization Manager	Frank Miller	Rich Abitz
RTIMP Lead	Brian McDaniel	Dale Seiller
Field Sampling Lead	Tom Buhrlage	Jim Hey
Surveying Lead	Jim Schwing	Andy Clinton
WAO Contact	Greg Ancona	Linda Barlow
Construction Lead	Grant Hale	Charles Carney
Engineering Lead	Tony Snider	Dave Russell
Laboratory Contact	Heather Medley	Kathy Leslie
Data Validation Contact	Jim Chambers	Andy Sandfoss
Field Data Validation Contact	Dee Dee Edwards	Andy Sandfoss
Data Management Lead	Krista Flaugh	Denise Arico
Radiological Control Contact	Corey Fabricante	Mike Schneider
FACTS/SED Database Contact	Kym Lockard	Susan Marsh
Quality Assurance Contact	Reinhard Friske	Dick Scheper
Safety and Health Contact	Gregg Johnson	Jeff Middaugh

FACTS – Fernald Analytical Computerized Tracking System
RTIMP – Real-Time Instrumentation Measurement Program
SDFP – Soil and Disposal Facility Project
SED – Sitewide Environmental Database
WAO – Waste Acceptance Organization



000007

5210

v:#2fm12#dgn#swl_fff.dgn
STATE PLANAR COORDINATE SYSTEM 1983

13-OCT-2003

FIGURE 1-1. LOCATION MAP FOR THE SOLID WASTE LANDFILL

2.0 SOLID WASTE LANDFILL BACKGROUND

The SWL covers a flat, rectangular area approximately one acre in size and has been inactive since 1986 (Figure 1-1). Although its operational history is not well documented, limited existing records indicate that dumping commenced in mid-1974. The facility was planned as a sanitary landfill for non-burnable trash. Materials reportedly buried include non-burnable and non-radioactive solid wastes (cafeteria waste, rubbish, etc.), non-radioactive construction-related rubble, medical wastes, and double-bagged, bulk quantities of non-radioactive asbestos.

During a 1992 trenching investigation, burnable wastes (bagged trash and wood), possible burnable trash (respirator cartridges, asphalt roofing materials, autoclaved medical wastes, fire hoses, and rubber hoses/belts), and non-burnable wastes (unidentified high activity radioactive waste, medicine vials, bagged asbestos, ceramic tiles, possible magnesium fluoride, glass acid bottles, steel cables/cans, paint cans and copper tubing) were encountered.

Extent of Contamination

The SWL was sampled to determine the extent of contamination within the SWL in order to characterize the area for excavation of the solid waste. The sample results obtained under the On-Site Disposal Facility (OSDF) Miscellaneous Areas and Predesign PSPs indicated that all above-final remediation level (FRL) contamination has been bound at depth for the entire SWL footprint and total uranium is known to be the only above-waste acceptance criteria (WAC) constituent in the SWL, which is bound at maximum depth of 7.0 feet. The entire excavation will go to a depth of approximately 25 feet. Following the excavation of the solid waste, additional predesign will be performed on the area along with the Area 6 General Area.

3.0 EXCAVATION CONTROL APPROACH

This section describes the general approach for real-time measurements and/or sampling in the two types of SWL excavation zones, the known above-WAC zone and the remaining excavation area requiring below-WAC confirmation measurements.

3.1 AREA SPECIFIC CONSTITUENTS OF CONCERN (ASCOCS)

The preliminary list of ASCOCs found in the Sitewide Excavation Plan (SEP) Table 2-7, data from the predesign investigation of the SWL, and historical information from the SWL resulted in the following list of primary and secondary constituents of concern (COCs):

Primary COCs

- Radium-226
- Radium-228
- Thorium-228
- Thorium-232
- Total Uranium

Secondary COCs

- Aroclor-1254
- Aroclor-1260
- Benzo(a)antrhacene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Arsenic
- Beryllium
- Carbazole
- Dibenzo(a,h)anthracene
- Fluoride
- Heptachlorodibenzo-p-dioxins
- Indeno(1,2,3-cd)pyrene
- Neptunium
- Octachlorodibenzo-p-dioxins
- Technetium-99

The data collected in the SWL was compared to the OSDF WAC and the only constituent that was above-WAC was total uranium. The only constituents driving the above-FRL excavation are total uranium and benzo(a)pyrene. Therefore, excavation control sampling will be for those two COCs only.

3.2 EXCAVATION TYPES

The types of excavation areas identified in the removal of the solid waste within the SWL are those that are either above-WAC (total uranium) or above-FRL (total uranium or benzo(a)pyrene). Real-time scanning for total uranium, radium-226, radium-228, thorium-228, and thorium-232 will be performed for both above-WAC uranium areas and above-FRL uranium areas as described in Sections 3.2 and 4.0. Physical sampling for excavation control for above-FRL benzo(a)pyrene contamination will be performed per Section 4.5.

3.2.1 Above-WAC Excavation Zones

Above-WAC excavation control is performed per real-time protocol located in the User's Manual. If the area being excavated contains above-WAC uranium, then the side slopes of each excavation lift (3 feet of soil, +/- one foot) will be scanned as accessible using the real-time equipment as described in Section 4.0. Alternatively, the entire above-WAC uranium zone may be excavated followed by an Excavation Monitoring System (EMS) scan of the sidewalls if feasible (i.e., if all sidewalls and floor are within the EMS's reach). The EMS will be used as described in Section 4.0. If real-time scanning is not possible due to the moisture content in the ground (i.e., wet field conditions in the area), physical samples, per Section 4.5, for total uranium will be taken and analyzed to replace the real-time scanning at a frequency of one sample every 20 feet with a minimum of two locations per side slope and two locations on the floor at representative spacing on the floor at design grade. This frequency may be increased at the discretion of the Characterization manager or designee depending on the topography and field conditions of the area. Any side slope measurements indicating above-WAC uranium will be further excavated and scanned until below-WAC uranium results are achieved. If real-time scanning is not possible, physical samples, per Section 4.5, for total uranium will be taken and analyzed to replace the real-time scanning at a frequency of one sample every 10 feet with a minimum of two locations per side slope and two locations on the floor at representative spacing o the floor. This frequency may be increased at the discretion of the Characterization Manager or designee depending on the topography and field conditions of the area. When above-WAC design depth is reached, excavation will proceed as necessary to the final design grade.

3.2.2 Above-FRL Contamination Zone (presumed below-WAC)

3.2.2.1 Real-Time Scanning in Above-FRL Zones

Following the excavation of a lift (3 feet of soil, +/- one foot) in a general contamination zone, the side slopes and floor of the excavation will be scanned per real-time protocols found in the User's Manual. At design depth, the floor and remaining side slopes of the excavation will be scanned per RTIMP Protocols.

If real-time scanning is not possible due to the moisture content in the ground (i.e., wet field conditions in the area), physical samples for total uranium will be taken per Section 4.5 and analyzed to replace the real-time scanning at a frequency of one sample every 50 feet with a minimum of one location per side slope and two locations at representative spacing on the floor. This frequency may be increased at the discretion of the Characterization Manager or designee depending on the topography and field conditions of the area.

3.2.2.2 Physical Sampling in Above-FRL Zones

The floor and side slopes of the final grade at mean sea level 570 feet will be required to have physical samples collected for benzo(a)pyrene, which is a semi-volatile, analysis. The physical samples to be collected on the floor of the excavation will be collected by laying out a systematic grid (20 feet by 20 feet blocks) either by land survey methods or by manual field measurement methods over the excavated floor area. The intersection points of each block will be marked. A physical sample will be collected from the center point of the grid block. If the floor of the excavation is less than 40 feet in any direction, then two samples at representative spacing will be collected. The physical samples to be collected on the side slopes of the excavation will be collected at a frequency of one sample every 20 feet with a minimum of one location per side slope. The frequency of the floor samples or the side slope samples may be increased at the discretion of the Characterization Manager or designee depending on the topography and field conditions of the area.

4.0 INSTRUMENTATION AND TECHNIQUES

4.1 MEASUREMENT INSTRUMENTATION AND TECHNIQUES

4.1.1 Real-Time

4.1.1.1 Sodium Iodide Data Acquisition (RSS EMS)

The overall use of this *in situ* gamma spectroscopy equipment for characterization is described in detail in the User's Manual. The Radiation Scanning System (RSS) and Excavation Monitoring System (EMS) are platforms for the sodium iodide (NaI) detector. The EMS is discussed in Section 4.1.1.3. The RSS is a modified jogging stroller and is utilized for smaller areas and gradual slopes. Each equipment type is equipped with an onboard Global Positioning System (GPS), which is used to obtain positioning information (i.e., northings and eastings) for each spectrum acquired.

The NaI detector has a minimum detection concentration (8-sec aggregate of two scans) sufficient to measure 3xFRL for total uranium [at 82 parts per million (ppm) FRL], thorium-232 (thorium-228 and radium-228 concentrations are inferred), and 7xFRL for radium-226. The NaI detector is mounted at a fixed height of 31 cm on the various platforms. The NaI equipment action level for total uranium WAC identification is 721 ppm, which requires confirmation and delineation by the high-purity germanium (HPGe) detector with an acquisition time of five minutes.

4.1.1.2 HPGe Data Acquisition

The HPGe systems include a tripod mount and an HPGe equipped EMS, both of which are used in a static mode. The EMS is further described in Section 3.1.1.3. Heights of this equipment are adjustable, thus allowing adjustment of the field of view for the instrument. HPGe measurements are used in conjunction with GPS northing, easting, and elevation coordinates for each excavation lift. The HPGe detector is used to determine if at 3xFRL conditions exist for total uranium, thorium-232 (thorium-228 and radium-228 concentrations are inferred), and radium-226.

The preferred equipment for use in areas which are difficult to access is the NaI equipped EMS. However, if the EMS is out of service for an extended period of time, the HPGe tripod may be utilized for initial surface scanning. In this case, for the uranium WAC, an action level of 400 ppm at a height of 1 meter requires further confirmation and delineation using the HPGe equipment. At the discretion of the Characterization Manager and RTIMP, these readings may be obtained at the detector height of 31 cm if a smaller field of view is required. The 99.1 percent coverage option (see Section 4.10 of the User's Manual) will be employed for the initial scan of the required area.

If the WAC action level of the NaI equipment (721 ppm) is reached, HPGe measurements may be performed to confirm the NaI measurement, or the area excavated without further confirmation at the direction of the Characterization Manager. If HPGe confirmation measurements are taken and the 31 cm HPGe measurement meets or exceeds its action level (928 ppm) the area is identified as above-WAC and excavated.

RTIMP measurement requirements for excavation control will be performed per the RTIMP protocols found in the Users Manual. However, conditions may arise which warrant a different decision process for defining the extent of contamination (i.e., cost effectiveness, need for timely response, obvious discoloration in the soil, brown/clear glass, process residue or other suspect above-WAC material may require immediate excavation). The decision process for the unusual condition will be documented in applicable field activity logs and, if determined to be appropriate by the Characterization Manager or designee, with a Variance/Field Change Notice (V/FCN) as described in Section 5.5.

4.1.1.3 Excavation Monitoring System

The EMS consists of either a NaI detector or an HPGe detector mounted to the boom of an excavator. The boom has an approximately 25 foot reach and can be used to allow the detector access into areas that would otherwise be inaccessible or difficult to access (e.g., trenches, deep holes) using the conventional mobile NaI or HPGe equipment. The EMS is equipped with an on-board GPS to allow for speed and location determination (i.e., northings and eastings) as well as a laser range finder for distance measurements to the surface being measured.

4.1.1.4 Radon Monitor

A background radon monitor will be set up in the vicinity of the area in which HPGe measurements are to be obtained, if radium-226 measurements will be determined. This monitor will be used to obtain background radon information from the time data collection begins until after the final measurement is completed. The monitor will be placed in one location for the day, where it will be set at the same height as the detector being used to collect the soil radiation measurements. The background radon data will be used per Section 5.3 of the User's Manual to correct the radium-226 data.

4.1.2 Surface Moisture Measurements

Surface moisture measurements are used to correct *in situ* RTIMP equipment gamma spectroscopy measurement data in order to report data on a dry weight basis prior to mapping. Surface moisture measurements will be collected with an *in situ* moisture measurement instrument (i.e., Zeltex® Infrared Moisture Meter) within eight hours of the collection of gamma spectroscopy measurement data. Moisture measurements may be taken more frequently if ambient weather or soil moisture conditions change or are expected to change, including watering for dust control. Field conditions, such as weather, will be noted on the applicable electronic field worksheet. No RTIMP measurements will be taken on standing water. If conditions prevent the use of a field moisture instrument, a default moisture value of 20 percent (which will overcorrect data in dry conditions and undercorrect in wet conditions) may be used. Field moisture measurements and moisture-corrected data are discussed in detail in Sections 3.8 and 5.2 of the User's Manual.

4.2 REAL-TIME MEASUREMENT IDENTIFICATION

NaI WAC naming conventions:

1. Area; A6 = Area 6
2. Specific Area; SWL = Solid Waste Landfill
3. Special Designator:
   - SF = Initial Surface Scan
   - L# = footprint of excavation lift
   - FG = Final Grade
   - SM = Special Material
4. NaI used, RTRK, EMS, GATOR, RSS1, orRSS2
5. Batch number

For example: A6-SWL-SF-RSS1-0999

NaI Precertification naming conventions:

1. Area; A6 = Area 6
2. Specific Area; SWL = Solid Waste Landfill
3. NaI used, Real-Time Radiation Tracking System (RTRAK) or RTRK, EMS, GATOR, RSS1, or RSS2
4. Batch number

For example: A6-SWL-RSS1-0999

HPGe WAC naming conventions:

1. Area; A6 = Area 6
2. Specific Area; SWL = Solid Waste Landfill
3. Elevation:
   - SF = Initial Surface Scan
   - L# = footprint of excavation lift
   - FG = Final Grade
   - SM = Special Material
4. Next sequential measurement for the area
5. QC, if necessary, (e.g., D = duplicate)

For example: A6-SWL-SF-1

HPGe Precertification naming conventions:

1. Area; A6 = Area 6
2. Specific Area; SWL = Solid Waste Landfill
   Phase:
   P1 = Phase One
   P2 = Phase Two confirmation
   P2HS = hot spot delineation
   P3 = hot spot removal verification

4. Next sequential measurement for the area
5. QC, if necessary, (e.g., D = duplicate)

Examples: A6-SWL-P1-1, A6-SWL-P1-1-D, A6-SWL-P2-2

HPGe Radon Monitor naming conventions:

1. Area; A6=Area 6
2. Specific Area; SWL = Solid Waste Landfill
3. Radon (RN)
4. Next sequential number of the background radon measurements collected for a specific area

For example: A6-SWL-RN-1

4.3 REAL-TIME DATA MAPPING

As the Survey and RTIMP Teams acquire measurements, the data will be electronically loaded into mapping software. A set of maps or HPGe data summary printouts will be generated for the RTIMP and Characterization Manager or designees. These maps or printouts will reflect areas requiring further action (i.e., precertification etc.).

4.4 REAL-TIME SURVEYING

The RTIMP Lead will coordinate with the Surveying Lead to survey the defined lift area and its boundary, determine the elevation. Northing (Y), Easting (X), and elevation (Z) coordinate values (Ohio South Zone, #3402) will be determined using standard survey practices and standard positioning instrumentation (electronic total stations and GPS receivers). An average elevation will be generated for the excavation lift area scanning footprint. This average elevation will normally include only the horizontal areas of the lift, not side slopes. Actual topographical contours will be used for the surface scan at final excavation grade to demonstrate below-WAC attainment. Field locations (i.e., lift area boundaries, measurement locations, grid points, above-WAC delineation if necessary) will be marked in a manner easily identifiable by all field personnel using survey stakes or flags. Survey information (coordinate data) will be downloaded into the Sitewide Environmental Database (SED) at the completion of each survey job (or at the end of each day) and transferred electronically to the Survey Lead. This information will be forwarded to the RTIMP and Characterization Manager or designees.

4.5 PHYSICAL SAMPLING PROCEDURES

All physical soil samples will be collected using methods for surface soil collection specified in the Fernald Closure Project (FCP) SMPL-01 procedure "Solids Sampling". The sampling design and frequencies for above-WAC areas and above-FRL area are discussed in Sections 3.3 and 3.4 respectively. Sample identification for these samples will follow the guidelines described in Section 4.6. The collection of physical samples will be documented in applicable field logs and with a V/FCN per Section 5.5. Either the Fluor Fernald Surveying and Mapping group or the Soil Sampling group using GPS equipment will survey the northing and easting of each physical sample location. The survey information will be reported to the Characterization Lead or designee and will be entered into the SED.

4.6 PHYSICAL SAMPLING IDENTIFICATION

All excavation control physical samples collected for laboratory analysis or archiving will be assigned a unique sample identifier. This identifier will be made up of the following components and designators that will be used in some combination for the WAC and FRL measurements. Note that this list may be expanded and all of the identifiers shall be defined in the V/FCNs.

1. Area: A6 = Area
2. Excavation Control: EC = Excavation Control Sampling
3. Specific Area Description: SWL = Solid Waste Landfill
4. Stage/Situation:
   - SF = Scanning or sampling done at the surface
   - L = Lift or additional grade sequence (designates the lift, additional grade below design grade, or additional grade starting as 1 and the following as 2, etc.)
   - DG = Design Grade
   - AG = Additional Grade (if further excavation required beyond design grade, and before final grade)
   - FG = Final Grade (following any excavation required beyond design grade)
   - PC = Precertification (following evaluation of design grade or final grade data)
   - SM = Special Material (starting as 1 and the following as 2, etc.)
   - W = Water (Starting at 1 and the following as 2, etc.)
5. Location Number of the Stage/Situation: Designates the sequential numbering of the stage/situation. The first measurement in each category taken from within the excavation area is -1 (dash precedes the number) and any subsequent measurements in the same category and excavation area are numbered sequentially (-2, -3, -4, etc.)

6. Λ: The Λ is placed between the location number for the stage/situation and the analysis type identifier. When used, the information to the left of this symbol identifies the location number and allows the automatic assignment of the location identification number to be transferred to the appropriate field/table in the SED. The Λ is not used if the sample does not have coordinates such as water samples and trip blanks, a "-" is used instead.

7. Analysis Type:
S = semi-volatiles (benzo(a)pyrene)
U = uranium (replace real-time scanning in above-WAC areas)
R = additional rads with/without uranium
RTL = Replace real-time lift scan requirements in meets-WAC areas
V = archive samples

8. Quality Designators (as necessary):
D = duplicate measurement
X = rinsate

Using these guidelines and the character number limit of the SED (boring identifiers to 15 characters and sample identifiers to 20 characters), the unique identification scheme for the various measurement techniques is as follows:

Example: A6EC-SWL-L1-8^U, where

A6 = Area 6
EC = Excavation Control Sampling
SWL = Solid Waste Landfill
L1 = first soil lift from surface elevation
8 = eighth location from lift 1
^ = used to differentiates between the boring (location) ID and the sample ID
U = uranium (replace real-time scanning in above-WAC area)

Example: A6EC-SWL-FG-3^RTL, where

A6 = Area 6
EC = Excavation Control Sampling
SWL = Solid Waste Landfill
FG = Final Grade
3 = third location
^ = is used to differentiates between the boring (location) ID and the sample ID
RTL = replace real-time lift scan in meets-WAC area

5.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

5.1 QUALITY CONTROL SAMPLES - REAL-TIME MEASUREMENTS AND PHYSICAL SAMPLES

One duplicate HPGe measurement will be collected for every 20 HPGe measurements performed. The duplicate will be collected immediately after the initial measurement at the same acquisition time and detector height. In accordance with Data Quality Objectives (DQO) SL-054 and SL-055, RTIMP measurements will be classified as Analytical Support Level (ASL) A or B depending on validation needs. In accordance with DQO SL-048, analytical data from physical sampling will adhere to ASL B requirements.

No quality control samples, including duplicates and rinsates, are necessary for physical samples collected under this PSP.

5.2 DATA VALIDATION

5.2.1 Physical Sample Data Validation

In accordance with the requirements of DQOs SL-048 (see Appendix A), all field data will be validated. As applicable, all laboratory analytical data will require a certificate of analysis. If validation is required, it will be documented in a V/FCN.

If any sample collection or analysis methods are used that are not in accordance with the Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), the Project Manager and Characterization Manager must determine if the qualitative data from the samples will be beneficial to the decision making process. If the data will be beneficial, the Project Manager and Characterization Manager will ensure that:

- The PSP is varianced to include references confirming that the new method is sufficient to support data needs,
- Variations from the SCQ methodology are documented in the PSP, or
- Data validation of the affected samples is requested or qualifier codes of J (estimated) and R (rejected) be attached to results as appropriate .

5.2.2 Real-Time Data Verification/Validation

Data verification is performed per DQO SL-055 (Appendix B), DQO SL-048 (Appendix C), SCQ Appendix H, and RTIMP Protocols. Data validation is performed per the SCQ, Appendix H. All real-time data collection (NaI and HPGe) will be collected and reported at ASL A or B, depending on validation needs per DQO SL-055.

5.3 APPLICABLE DOCUMENTS, METHODS AND STANDARDS

To assure consistency and data integrity, field activities in support of this PSP will follow the requirements and responsibilities outlined in controlled procedures and manufacturer operational manuals. Applicable procedures, manuals, and documents include:

- 20100-HS-0002, SDFP Integrated Health and Safety Plan
- ALS 9501, Shipping Samples to Off-Site Laboratories
- ALS 9503, Processing Samples through the Sample Processing Laboratory
- ALS 9505, Using the FACTS Database to Process Samples
- ALS 7532, Analytical Laboratory Services Internal Chain of Custody
- ADM-02, Field Project Prerequisites
- EW-0002, Chain of Custody/Request for Analysis Record for Sample Control
- EW-1021, Preparation of the PWID Report
- EW-1022, On-Site Tracking and Manifesting of Bulk Material
- FD-1000, Sitewide CERCLA Quality (SCQ) Assurance Project Plan
- FD-1000 Addendum H, In-Situ Gamma Spectroscopy Addendum to the Sitewide CERCLA Quality Assurance Project Plan
- Fernald Closure Project Approved Laboratories List
- RTIMP-M-003, RTIMP Operations Manual
- Sitewide Excavation Plan (SEP)
- SMPL-01, Solids Sampling
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site (User's Manual)
- RM-0020, Radiological Control Requirements Manual
- RM-0021, Safety Performance Requirements Manual
- RTIMP Quality Assurance Plan
- WAC Attainment Plan for the OSDF

5.4 SURVEILLANCES

Project management has ultimate responsibility for the quality of the work processes and the results of the scanning and sampling activities covered by this PSP. Project management can schedule independent assessments of the work processes or operations to assure quality of performance. Assessment will encompass project requirements as defined in this PSP and the SCQ.

5.5 IMPLEMENTATION OF FIELD CHANGES

Field conditions may arise that warrant a different decision process for defining the extent of contamination or for verifying that soil is below-WAC or below-FRL concentrations. Factors that will be considered under special circumstances include safety of the workers, cost effectiveness, the need for a timely response, and impending weather conditions. In the event that a change in the characterization approach is needed, the Characterization Manager or designee will document the change and requirements through the V/FCN. In the event that changes need to be implemented expeditiously, verbal or electronic mail authorization will suffice followed by the written authorization on the V/FCN within seven working days. Changes to the PSP will also be noted in the applicable Field Activity Logs. Additionally, V/FCNs that are considered to be significant will require approval from the regulatory agencies in accordance with SDFP agreements.

As part of the excavation control process, the collection of physical samples will be documented in applicable field logs and with V/FCNs. Additionally, the Data Group Form, FS-F-5157 will be generated per Procedure EW-1021, Preparation of the Project Waste Identification and Disposition (PWID) Report, following the generation of data from the analysis of physical samples.

Two non-significant variances, 20600-PSP-0005-1 and 20600-PSP-0005-2, have already been documented to Revision 0 of this document. These variances were to document fieldwork to replace the real time scanning. Additional variances to this document will restart with one and be sequentially numbered.

6.0 SAFETY AND HEALTH

The SWL is known to contain asbestos material, which is mixed with the solid waste that is being excavated from the area. Additional controls and training may be required for entry into the area during the excavation process. Coordinate with representatives of the Health and Safety Department and Industrial Hygiene Department for requirements for entry of this area.

All FCP employees, visitors, vendors, and contractors associated with these activities must abide by site work permits, Environmental Services Project procedures and/or a Construction Traveler prepared by Fluor Fernald. Applicable work permits will be obtained per SH-0021, Work Permits, by the Soil Sampling Manager or designee. All work performed on this project will be performed in accordance with applicable Environmental Services procedures, RM-0020 (Radiological Control Requirements Manual), RM-0021 (Safety Performance Requirements Manual), Fluor Fernald work permits, Radiological Work Permit (RWP), penetration permits, and other applicable permits. Concurrence with applicable safety permits (as indicated by the signature of each field employee assigned to this project) is required by each employee in the performance of their assigned duties. Additional safety information can be found in the SDFP Integrated Health and Safety Plan (20100-HS-0002). In addition to permits, procedures, and the requirements of this document, Fluor Fernald and any subcontractors will comply with all federal, state, and local requirements (e.g., OSHA). **A safety briefing will be conducted prior to the initiation of field activities.**

Fluor Fernald managers and supervisors are responsible for ensuring that all field activities comply with the environmental Safety and Health (S&H) requirements and ensuring compliance with the Work Plan. All personnel have stop-work authority for imminent safety hazards resulting from noncompliance with the applicable S&H practices. S&H requirements and procedures for this plan will be governed by the Safety Performance Requirements Manual (RM-0021), site work permits, procedures, and the overall strategy discussed within this document.

Fluor Fernald will provide all radiological occupational monitoring, including Radiological Control Technicians (RCTs), to support remediation activities. The radiological work requirements for activities will be detailed in activity-specific RWPs. Personnel performing work under a RWP will be briefed on the specific hazards and task requirements before work begins. Radiological control personnel will evaluate the data obtained from field surveys to determine the effectiveness of the radiological controls.

Fluor Fernald will provide S&H coverage, including air sampling for non-radiological contaminants as required.

A walkdown of the area by representatives from SDFP Characterization, RTIMP, the Soil Sampling groups, or other involved groups prior to the start of fieldwork shall be conducted to identify any hazards. Hazards must be corrected/controlled prior to the start of work. No operating heavy-duty equipment within a 50-foot buffer zone will be permitted during this sampling effort.

All personnel performing measurements and physical sampling related to this project will be briefed to work control documents, including the Safe Work Plan or Traveler Package, Fluor Fernald work permits, RWP, penetration permits, other applicable permits for the area, and Environmental Services procedures. These work control documents will define required personal protective equipment (PPE) and safe work zones. Work control documents must be reviewed by Soil Sampling and RTIMP personnel to ensure that the intended work is within the scope of these documents (i.e., ensure work to be performed is addressed in the permit). These briefings will be documented. Personnel who are not documented as having completed these briefings will not participate in the execution of field activities. All personnel entering the Construction Area will obtain a pre-entry briefing on current activities or hazards that may affect their work. Additionally, prior to entry into an excavation area, the Competent Person for Excavation shall be contacted to assure that the daily inspection has been completed and the excavation is safe to enter.

RTIMP personnel are to demarcate a minimum of a 50-foot safe work zone for HPGe (tripod) measurement locations and RSS runs in the field using a sufficient number of construction cones to clearly demarcate the work zone. RTIMP personnel operating the HPGe (tripod) and RSS in the construction area are occupied with watching measurement equipment computer screens and maneuvering the equipment. RTIMP personnel may not be aware of construction equipment moving in the field and operators of the construction equipment may not see the smaller HPGe (tripod) and RSS equipment/operator. The cones will be a visible indicator to construction equipment operators of the safe zone perimeter around this equipment. A 50-foot safe work zone does not need to be established for RTRAK, GATOR, and the EMS since this equipment is larger and more visible and it is easier for the driver to watch for approaching equipment.

The Health and Safety Lead, Soil Sampling Manager or designee, and team members will assess the safety of performing sampling activities in the vicinity of each boring location. This will include vehicle/equipment positioning limitations and fall hazards. The Soil Sampling Manager or designee will ensure that each Technician performing work related to this project has been trained to the relevant sampling procedures including safety precautions. Technicians who do not sign project safety and technical briefing forms will not participate in any activity related to the completion of assigned project responsibilities. A copy of applicable safety permits/surveys issued for worker safety and health will be posted in the affected area during field activities.

All emergencies shall be reported immediately per the following:

- **Cellular phone = 648-6511 to the Site Communications Center**
- **Radio = Channel 2 by calling "CONTROL"**
- **Site phone = 911 to the Site Communications Center**

7.0 EQUIPMENT DECONTAMINATION

Decontamination is performed on the sampling equipment to protect worker health and safety and to prevent the introduction of contaminants into subsequent soil samples. Sampling equipment will be decontaminated prior to transport to the field site, between sample locations, and after sampling performed under this PSP is completed. Equipment that comes into contact with sample material will be decontaminated at Level II (Section K.11, SCQ) as described in procedures SMPL-01, Solids Sampling and SMPL-26, Liquids and Sludge Sampling for Soil and Miscellaneous Media Sampling. Other equipment that does not contact sample media may be decontaminated at Level I, or wiped down using disposable towels. Clean disposable wipes may be used to replace air-drying of the equipment.

8.0 DISPOSITION OF WASTES

During completion of physical sampling activities, field personnel may generate small amounts of soil, sediment, water, and contact waste. Management of these waste streams will be coordinated with WAO through the Project Waste Identification Document (PWID) process. Excess soil from the borings will be dispersed on the ground or gravel surface in the same general area of the boring, based on direction from WAO. Sample material, including archived samples that are no longer needed, will be managed per the applicable PWID at the direction of WAO personnel.

Generation of decontamination waters will be minimized in the field, and whenever possible, equipment will be decontaminated at the facility that discharges to the Advanced Wastewater Treatment Facility. Any water (water used for decontamination, etc.) generated during sampling must be containerized and documented on a completed Wastewater Discharge Request Form (FS-F-4045) before disposal.

Contact waste generation will be minimized by limiting contact with sample media, and by only using disposable materials, which are necessary. This waste stream will be managed with control point waste per the applicable PWID at the direction of WAO personnel.

If the field gas chromatography (GC) is used to analyze samples, all soil wastes generated from the field GC analyses will be dispositioned as directed by the excavation PWID. Any wastes generated from these analyses that may contain laboratory solvents will be taken to the on-site laboratory and added to the appropriate waste stream established for the laboratory. Aqueous liquid waste should be managed with water from excavations or as directed by the excavation PWID.

9.0 DATA AND RECORDS MANAGEMENT

A data management process will be implemented so information collected during the investigation will be properly managed to satisfy data end use requirements after completion of the field activities.

9.1 REAL-TIME

The RTIMP group will provide hard copy maps and/or summary reports to the Characterization Manager or designees. All real-time data collection (NaI and HPGe) will be collected and reported at ASL A or B, depending on validation needs per DQO SL-054 and SL-055. All electronically recorded field data will have the NaI or HPGe Data Verification Checklist (Section 5.4 of the User's Manual), which will be completed after each data collection event. Field documentation will be reviewed by RTIMP.

Electronically recorded data from the HPGe and NaI systems will be downloaded on a daily basis to the Local Area Network (LAN). The Characterization Manager or designee will be informed by the RTIMP Lead or designee when RTIMP equipment measurements do not meet data quality control checklist criteria. The Characterization Manager or designee will determine whether additional scanning, confirmation, or delineation measurements are required.

The original completed Excavation Monitoring Form, the real-time map(s), and HPGe summary data (if applicable) will be forwarded to WAO for placement in the WAO project files. Copies of other field documentation may be generated and provided to the Characterization Manager upon request and maintained in SDFP project files until archived. RTIMP will maintain all the real-time files. The survey data will be maintained by the Survey Lead or designee. All records associated with this PSP should reference the PSP number and eventually be archived. Real-time data is linked to this PSP via the electronic spreadsheet.

9.2 PHYSICAL SAMPLES

As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on a Field Activity Log, which should be sufficient for accurate reconstruction of the events without reliance on memory. Sample Collection Logs will be completed according to protocol specified in Appendix B of the SCQ and in applicable procedures. These forms will be maintained in loose-leaf form and uniquely numbered following the sampling event. A copy of the field logs will be sent to the Characterization Manager upon request.

All field measurements, observations, and sample collection information associated with physical sample collection will be recorded, as applicable, on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form, as required. The method of sample collection will be specified in the Field Activity Log. Borehole Abandonment Logs are required. The PSP number will be on all documentation associated with these sampling activities.

Samples will be assigned a unique sample number as explained in Section 4.6. This unique sample identifier will appear on the Sample Collection Log and Chain of Custody/Request for Analysis and will be used to identify the samples during analysis, data entry, and data management.

All physical samples will be collected and reported at ASL B unless otherwise specified in a V/FCN. Field data packages will consist of the chain of custody form, field activity logs, and sample collection logs. Technicians will review all field data for completeness and accuracy and then forward the field data package to the Field Data Validation Contact for final review. All field data packages associated with physical sampling will be independently validated. Standard required information will be entered into the SED. The original field data packages will be filed and controlled by the Sample and Data Management department.

Laboratory analytical data packages will be filed and distributed in accordance with existing data management procedures. All analytical data and data validation qualifiers will be transferred (from FACTS) or entered into the SED per existing procedures. The Data Management Contact or designee will evaluate the data and if needed a data group form will be completed for each material tracking location (as identified by WAO) and transmitted to WAO for WAC documentation.

REFERENCES

U.S. Department of Energy, 2003, "Implementation Plan for Area 6 Solid Waste Landfill and Fire Training Facility," Final, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2002, "Project Specific Plan for Predesign Sampling in the Solid Waste Landfill and the Fire Training Facility," Revision 0, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2001, "Project Specific Plan for Sampling of Miscellaneous Areas for OSDF WAC Attainment," Revision 0, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1998, "Sitewide Excavation Plan," Final, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

APPENDIX A

DQO 048
Delineating the Extent of Constituents of Concern During Remediation Sampling

Control Number ________

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

Approval: (signature on file) Date: 2/25/99
James E. Chambers
DQO Coordinator

Approval: (signature on file) Date: 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all soil and soil field QC samples collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

    - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

    - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI [ ] FS [ ] RD [X] RA [ ] R,A [ ] OTHER [ ]

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.: ____________

---

2. Media Characterization: (Put an X in the appropriate selection.)

Air [ ] Biological [ ] Groundwater [X] Sediment [X] Soil [X]

Waste [X] Wastewater [ ] Surface water [ ] Other (specify) _____

---

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A [ ] B [X] C [ ] D [X] E [X]

Risk Assessment
A [ ] B [ ] C [ ] D [ ] E [ ]

Evaluation of Alternatives
A [ ] B [ ] C [ ] D [ ] E [ ]

Engineering Design
A [ ] B [X] C [ ] D [X] E [X]

Monitoring during remediation
A [X] B [X] C [ ] D [X] E [X]

Other
A [ ] B [ ] C [ ] D [ ] E [ ]

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

---

5. Site Information (Description):

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	[X] *	2. Uranium	[X] *	3. BTX	[ ]
Temperature	[X] *	Full Radiological	[X] *	TPH	[ ]
Specific Conductance	[X] *	Metals	[X] *	Oil/Grease	[ ]
Dissolved Oxygen	[X] *	Cyanide	[ ]		
Technetium-99	[X] *	Silica	[ ]		

4. Cations	[ ]	5. VOA	[X] *	6. Other (specify)
Anions	[ ]	BNA	[X] *	
TOC	[ ]	Pesticides	[X] *	
TCLP	[X] *	PCB	[X] *	
CEC	[ ]	COD	[ ]	

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection		Refer to SCQ Section
ASL A		SCQ Section:
ASL B	X	SCQ Section: App. G Tables G-1&G-3
ASL C		SCQ Section:
ASL D	X	SCQ Section: App. G Tables G-1&G-3
ASL E	X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [X] Grab [X] Grid [X]

Intrusive [X] Non-Intrusive [ ] Phased [ ] Source [ ]

DQO Number: SL-048, Rev. 5

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

---

8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[X]*	Container Blanks	[X]++
Field Blanks	[X]+	Duplicate Samples	[X]***
Equipment Rinsate Samples	[X]***	Split Samples	[X]**
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]
Other (specify)			

- * For volatile organics only
- ** Split samples will be collected where required by EPA or OEPA.
- *** If specified in PSP.
- \+ Collected at the discretion of the Project Manager (if warranted by field conditions)
- \+\+ One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	[X]	Matrix Duplicate/Replicate	[X]
Matrix Spike	[X]	Surrogate Spikes	[ ]
Tracer Spike	[ ]		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX B

DQO 055
Real-Time Excavation Monitoring For Total Uranium Waste Acceptance Criteria

Control Number ________

Fernald Environmental Management Project

Data Quality Objectives

Title: Real-Time Excavation Monitoring For Total Uranium Waste Acceptance Criteria (WAC)

Number: SL-055

Revision: 0

Final Draft: 6/8/99

Contact Name: Joan White

Approval: ____________ Date: 6/8/99
James E. Chambers
DQO Coordinator

Approval: ____________ Date: 6/8/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	6/8/99						

DATA QUALITY OBJECTIVES
Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

Members of Data Quality Objectives (DQO) Scoping Team

The members of the scoping team included individuals with expertise in QA, analytical methods, field construction, statistics, laboratory analytical techniques, waste management, waste acceptance, data management, and excavation monitoring.

Conceptual Model of the Site

Fernald Environmental Management Project (FEMP) remediation includes the construction of an on-site disposal facility (OSDF) to be used for the safe permanent disposal of materials at or above the site final remediation levels (FRLs), but below the waste acceptance criteria (WAC) for constituents of concern (WAC COCs). The WAC concentrations for several constituents, including total uranium, were developed using fate and transport modeling, and were established to prevent a breakthrough of unacceptable levels of contamination (greater than a specified Maximum Contaminant Level to the underlying Great Miami Aquifer) over a 1000-year period of OSDF performance. The WAC for total uranium and other area-specific WAC COCs as referenced in the Operable Unit 5 (OU5) and Operable Unit 2 (OU2) Records Of Decision (RODs), the Waste Acceptance Plan for the On-Site Disposal Facility (WAC Plan), and the OSDF Impacted Materials Placement Plan (IMPP), must be achieved for all soil and soil-like materials that have been identified for disposal in the OSDF.

The extent of soil contamination requiring remediation was estimated and published in both the Operable Unit 5 and Operable Unit 2 Feasibility Studies (FS). These estimates were based on modeling analysis of available uranium data from soil samples collected during the Remedial Investigation (RI) efforts and from other environmental studies conducted at the FEMP. Maps outlining boundaries of soil contamination were generated for both the Operable Unit 5 and Operable Unit 2 FS documents by overlaying the results of the modeling analysis of uranium data with isoconcentration maps of other COCs. The soil contamination maps were further modified by conducting spatial analysis on the most current soil characterization data.

A sequential remediation plan has been presented which subdivides the FEMP into ten (10) independent remediation areas. Extensive historical sampling has demonstrated that in each of these 10 areas potentially above-WAC concentrations may not be present, may be limited to one WAC COC, or consist of a subset of WAC COCs. According to the Sitewide Excavation Plan (SEP) only WAC COCs with a demonstrated or likely presence in an area will be evaluated during remedial design and implementation. This DQO will be used to define the WAC decision-making process using excavation monitoring instrumentation in areas where soil and soil-like material is being excavated and total uranium is a WAC COC.

1.0 Statement of Problem

Adequate information must be available to demonstrate excavated soils or soil-like material is acceptable or unacceptable for disposal in the OSDF, based on the total uranium WAC.

Available Resources

Time: WAC decision-making information of sufficient quality must be made available to the Project Manager (or designee), characterization representative, and Waste Acceptance Operations representative (decision makers) prior to excavation and disposition of soil and soil-like materials.

Project Constraints: WAC decision-making information must be collected and assimilated with existing manpower and instrumentation to support the remediation schedule. Successful remediation of applicable areas, including excavation and placement of soil and soil-like material in the OSDF, is dependent on the performance of this work.

Summary of the Problem

Excavated soil or soil-like material must be classified as either of the following:

1. Having concentrations of total uranium at or above the WAC, and therefore, unacceptable for disposal in the OSDF, or

2. Having concentrations of total uranium below the WAC, and therefore, acceptable for disposal in the OSDF.

2.0 Identify the Decision

Decision

The WAC decision-making process will result in the classification of defined soil or soil-like material volumes as either meeting or exceeding the 1,030 ppm total uranium WAC.

Possible Results

1. A defined volume of soil or soil-like material has a concentration of total uranium at or above the WAC. This material is classified as unacceptable for placement in the OSDF, and will be identified, excavated, and segregated pending off-site disposition.

2. A defined volume of soil or soil-like material has a concentration of total uranium below the total uranium WAC. This soil is classified as acceptable for placement in the OSDF and is transported directly from the excavation to the OSDF for placement.

3.0 Identify Inputs That Affect the Decision

Required Information

The total uranium WAC published in the Waste Acceptance Criteria Attainment Plan for the OSDF, historical data, pre-design investigation data, and in-situ gamma spectrometry information collected prior to and during excavation are required to determine whether a specified volume of soil or soil-like material meets or exceeds the total uranium WAC.

Source of Informational Input

The list of sitewide OSDF WAC COCs identified in the OU2 and OU5 RODs and the WAC Plan will be referenced. Historical area specific data from the Sitewide Environmental Database (SED) will also be retrieved and evaluated for both radiological and chemical WAC constituents. This information will be utilized to determine area specific WAC COCs.

Non-invasive real-time excavation monitoring in areas where total uranium is a WAC concern will involve measurements collected with mobile and/or stationary in-situ gamma spectrometry equipment. These measurements will be collected from the surface of each excavation lift prior to excavation. Information compiled from this real-time monitoring will be assimilated and reviewed by decision makers to classify lifts or sections of lifts as either acceptable or unacceptable for placement in the OSDF. These measurements may also be collected on soils exposed after the removal of suspect above WAC material to verify its removal.

Action Levels

To ensure no above WAC soil or soil-like material is sent to the OSDF, threshold values (trigger levels) have been set for NaI and HPGe Phase 1 and II measurements. These values are significantly lower than the 1030 ppm total uranium OSDF not-to-exceed (NTE) level. The WAC Phase I (detection phase) threshold value is 721 ppm total uranium for NaI instruments (31 cm detector height), and 400 ppm total uranium for the HPGe (1 meter detector height). The WAC Phase II (confirmation and delineation phase) threshold value is 928 ppm total uranium for the HPGe (31 cm and 15 cm detector heights).

Methods of Data Collection

WAC Phase 1 measurements will be collected to obtain as close to complete coverage of the areas of concern as possible using either the NaI Radiation Measurement Systems (RMS) or HPGe equipment to identify potential above WAC total uranium locations. WAC Phase II measurements will be collected with strategically placed HPGe equipment to confirm and delineate Phase I potential above WAC measurements, as needed. The project may decide not to collect Phase II measurements if the potential above WAC area boundary is discernable by visual observation (such as presence of process residue or other OSDF prohibited items, discoloration of soil or soil-like material, or other information).

The project will use the real-time WAC Phase I and Phase II data as ASL A, and will perform no data validation (however the data will be collected with ASL B quality control criteria, for real-time project internal quality control. All measurements will be performed in compliance with operating procedures identified in Section 7.5 of this DQO, the Real-Time User's Manual, and the SEP.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: The boundaries where excavation monitoring for total uranium will be used is limited to soils and/or soil-like material in remediation areas where total uranium is a WAC COC, excavation is planned, and material is designated for disposition in the OSDF.

Population of Soils:

Includes all at-and below-grade soil and soil-like material impacted with total uranium potentially exceeding the WAC and planned for disposition in the OSDF.

Scale of Decision Making

Areas designated for excavation will be evaluated as to whether the soil or soil-like material is below or above the OSDF WAC for total uranium. Excavation monitoring will be conducted on each excavation lift. Based on the information obtained as a result of reviewing and modeling existing data coupled with newly acquired excavation monitoring information, a decision will be made whether an individual excavation lift, or portion of a lift, meets or exceeds the OSDF WAC for total uranium.

Temporal Boundaries

Time Constraint: Real-time excavation monitoring information must be acquired and processed in time for review and use in decision making prior to excavation and disposition of excavated material. The scheduling of WAC excavation monitoring is directly tied to the excavation schedule. WAC excavation monitoring will be performed and a disposition decision made prior to excavation of each designated lift. Acquired information must be processed and reviewed by the project decision-makers prior to disposition of the lift being monitored. Time limits to complete measurements are specified in the excavation subcontracts.

Practical Considerations: Weather, moisture, field conditions, and unforseen events affect the ability to perform excavation monitoring and meet the schedule. To maintain safe working conditions, excavation and construction activities will comply with all FEMP and project specific health and safety protocols.

5.0 Develop a Logic Statement

Parameter(s) of Interest

The parameter of interest is the concentration of total uranium in soil or soil-like material designated for disposition in the OSDF.

Waste Acceptance Criteria Concentration

The OSDF WAC concentration is 1,030 ppm for total uranium in soil and soil-like materials. This concentration is considered a NTE level for OSDF WAC attainment, and no real-time measurement data point, as defined by the instrument-specific threshold values, can meet or exceed this level in material destined for the OSDF.

Decision Rules

If excavation monitoring results are below the total uranium WAC for a specified volume of soil or soil like material, then that soil is considered acceptable for final disposition in the OSDF. If monitoring results reveal concentrations at or above the total uranium WAC, as indicated by exceeding the instrument-specific threshold level, then the unacceptable soil will be delineated, removed, and segregated pending off-site disposal.

6.0 Limits on Decision Errors

Range of Parameter Limits

The area-specific total uranium soil concentrations anticipated in excavation areas will range from background levels (naturally-occurring soil concentrations) to concentrations greater than the total uranium WAC levels.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision makers decide a specified volume of soil or soil-like material is below the WAC for total uranium, when in fact the uranium concentration in that soil is at or above the WAC. This error would result in soil or soil like material with concentrations above the WAC for total uranium being placed into the OSDF. Since the WAC is a NTE level, this error is unacceptable.

Decision Error 2: This decision error occurs when a volume of soil or soil-like material is identified as above WAC, excavated, and sent for off-site disposition when the material is actually below the WAC for total uranium. This error would result in added costs due to the unnecessary segregation and off-site disposition of material that is acceptable for disposal in the OSDF.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentration of total uranium in a volume of soil or soil-like material is greater than the WAC. The true state of nature for Decision Error 2 is that the actual concentration of total uranium in a volume of soil or soil-like material is below the WAC. Decision Error 1 is the more severe error.

7.0 Design for Obtaining Quality Data

7.1 WAC Attainment Excavation Monitoring

WAC attainment will be based on real-time excavation monitoring using the NaI and

HPGe measurement systems. Phase I (detection phase) measurements are collected with the NaI systems using a spectral acquisition time of 4 seconds, at a detector speed of 1 mile per hour (mph), and a detector height of 31 cm. These parameters achieve the required sensitivity, and are the best compromise of practical considerations such as detector speed and time in the field. In the NaI systems, the presence of thorium contamination can cause interferences which could affect total uranium concentration calculations. Uranium results associated with thorium values greater than 500 net counts per second will be reevaluated. The threshold value (trigger level) for Phase I NaI measurements is 721 ppm for total uranium (70% of the 1,030 ppm WAC concentration for soil, arrived at by agreement with the USEPA). Phase I measurements can also be collected with the HPGe systems using a spectral acquisition time of 5 minutes, and a detector height of 1 meter (the threshold value is lower than the NaI threshold value because of the larger field of view at the HPGe 1 meter detector height). (For more information reference the *RTRAK Applicability Study, 20701-RP-0003, Revision 1, May 1998).*

At the discretion of the characterization lead, Phase II confirmation and delineation measurements may be collected using the HPGe systems with a spectral acquisition time of 5 minutes at both the 31 cm and 15 cm detector heights. The HPGe detector will be placed directly over the zone of maximum activity identified by the Phase I measurements. The threshold value (trigger level) for Phase II measurements is 928 ppm for total uranium at either detector height. Lower (more conservative) threshold values may be defined in the PSP. (For more information reference the *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006, Revision A, May 8, 1998.*)

In the event the monitoring data exceeds the trigger levels (see above), the entire vertical thickness (3 ± 1 foot) of the areal extent of above-WAC material will be removed and segregated pending off-site disposal.

7.2 Interpretation of Results

The results obtained from real-time monitoring for purposes of WAC attainment will be compared to the published OSDF WAC concentration for total uranium. If results are equal to or greater than the WAC concentration (as defined by exceeding the specific threshold value level), the decision makers may take one of the following actions:

- Determine that the entire unit volume or "lift" subjected to excavation monitoring is at or above WAC and requires segregation pending off-site disposal.
- Based on adequacy of existing information (including visual inspection), excavate and

segregate the portion of the lift material that is at or above WAC pending off-site disposition.

- Perform additional real-time monitoring to more accurately delineate the areal extent of above-WAC contamination.. Using this information, define the extent of removal efforts to be conducted.

7.3 QC Considerations

The following data management requirements will be met prior to evaluation of acquired WAC attainment information:

1) An excavation monitoring form will be completed and reviewed in the field.

2) WAC data and decision-making information will be assigned to respective soil profiles, so characterization and tracking information can be maintained and retrieved.

3) The mobile sodium iodide systems will generate ASL level A data, with no data validation. The HPGe detectors are capable of providing either ASL level A or B data, however for WAC determination only ASL A data will be generated.

4) When using the HPGe detectors, duplicate measurements will be taken at a frequency of one in twenty measurements or one per excavation lift, whichever is greater.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances shall be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Applicable Procedures

Real-time monitoring performed under the PSP shall follow the requirements outlined within the following procedures:

- ADM-16, In-Situ Gamma Spectrometry Quality Control Measurements
- EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23, Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors
- EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge

- EQT-33, Real Time Differential Global Positioning System
- EQT-39, Zeltex Infrared Moisture Meter
- EQT-40, Satloc Real-time Differential Global PositioningSystem
- EQT-41, Radiation Measurement Systems
- 20300-PL-002, Real Time Instrumentation Measurement Program Quality Assurance Plan
- EW-1022, On-Site Tracking and Manifesting of Bulk Impacted Material

7.6 References

- Sitewide CERCLA Quality Assurance Project Plan (SCQ), May 1995, FD-1000
- Sitewide Excavation Plan, July 1998, 2500-WP-0028, Revision 0
- Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility, June 1998, 20100-PL-0014, Revision 0
- Impacted Materials Placement Plan for the On-Site Disposal Facility, January 1998, 20100-PL-007, Revision 0
- Area 2, Phase 1 Southern Waste Units Implementation Plan for Operational Unit 2, July 1998, 2502-WP-0029, Revision 0
- RTRAK Applicability Study, May 1998, 20701-RP-0003, Revision 1
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, July 1998, 20701-RP-0006 Revision B

Data Quality Objectives
Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

1A. Task/Description: Waste Acceptance Criteria Monitoring

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R$_v$A ☐ OTHER

1.C. DQO No.: SL-055 DQO Reference No.: N/A

---

2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☐ Sediment ☐

Soil and Soil Like Material ☒

Waste ☐ Wastewater ☐ Surface water ☐ Other (specify) ________

---

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☐ C ☐ D ☐ E ☐

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☐ C ☐ D ☐ E ☐

Monitoring during remediation activities
A ☐ B ☐ C ☐ D ☐ E ☐

Other Waste Acceptance Evaluation
A ☒ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Specific construction work plans, Applicable or Relevant and Appropriate Requirements (ARARs) and Operable Unit 2 and Operable Unit 5 Records of Decision (ROD).

4.B. Objective: To provide data for identification of soils and soil-like materials for compliance with Waste Acceptance Criteria.

5. Site Information (Description):

The RODs specify that FEMP soils will be below the WAC for disposal in the OSDF. WAC determination will be necessary for site soils and soil like material that is scheduled for excavation and potential OSDF disposition.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	☐	2. Uranium	☒	3. BTX	☐
Temperature	☐	Full Radiological	☐	TPH	☐
Specific Conductance	☐	Metals	☐	Oil/Grease	☐
Dissolved Oxygen	☐	Cyanide	☐		
Technetium-99	☐	Silica	☐		
4. Cations	☐	5. VOA	☐	6. Other (specify)	☒
Anions	☐	BNA	☐	Moisture	
TOC	☐	Pesticides	☐		
TCLP	☐	PCB	☐		
CEC	☐				
COD	☐				

6.B. Equipment Selection and SCQ Reference:

ASL A Nal and HPGe SCQ Section: Appendix H

ASL B ____________ SCQ Section: ____________

ASL C ____________ SCQ Section: ____________

ASL D ____________ SCQ Section: ____________

ASL E ____________ SCQ Section: ____________

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased ☐ Composite ☐ Environmental ☐ Grab ☐ Grid ☐
Intrusive ☐ Non-Intrusive ☒ Phased ☐ Source ☐

DQO Number: SL-055

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the PSP.

Background samples: SED

8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	☐	Container Blanks	☐
Field Blanks	☐	Duplicate Measurements	☒*
Equipment Rinsate Samples	☐	Split Samples	☐
Preservative Blanks	☐	Performance Evaluation Samples	☐

Other (specify) ____________

*For the HPGe detectors, duplicate measurements will be made every 1 in 20 or one per lift, whichever is greater.

8.B. Laboratory Quality Control Samples:

Method Blank	☐	Matrix Duplicate/Replicate	☐
Matrix Spike	☐	Surrogate Spikes	☐

Other (specify) Per method

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX C

DQO SL-054
REAL-TIME INSTRUMENTATION MEASUREMENT PROGRAM –
PRECERTIFICATION MONITORING

5210

Control Number ________

Fernald Closure Project

Data Quality Objectives

Title: Real Time Instrumentation Measurement Program: Precertification Monitoring

Number: SL-054

Revision: 2

Effective Date: 8/11/03

Contact Name: Richard J. Abitz

Approval: ______________________ Date: 8/6/03
James Chambers
DQO Coordinator

Approval: ______________________ Date: 8/6/03
Richard J. Abitz
Environmental Services Manager

Rev. #	0	1	2				
Effective Date:	6/03/99	12/01/02	8/11/03				

ORIGINAL

000055

Data Quality Objectives
Real Time Instrumentation Measurement Program
Precertification Monitoring

1.0 Statement of Problem

This data quality objective (DQO) describes the Real Time Instrumentation Measurement Program (RTIMP) methods used to precertify remediated areas. If physical soil samples need to be collected during precertification activities, they will be collected under a separate DQO.

Conceptual Model of the Process

The general soil remediation process at the Fernald Closure Project (FCP) includes *in situ* gamma spectrometry measurements performed by the RTIMP. RTIMP supports 1) pre-design investigations that define excavation boundaries, 2) excavation activities to demonstrate that contaminated soil meets the On Site Disposal Facility (OSDF) waste acceptance criteria (WAC) for uranium, and 3) precertification activities to demonstrate that remediated areas are free of uranium (U), thorium (Th) and radium (Ra) concentrations that exceed 3 times their respective final remediation levels (FRLs). Item 3 is the subject of this DQO.

Precertification measurements of U-238 (used to calculate total uranium), Th-232, and Ra-226 activity in surface soil are performed with mobile sodium iodide (NaI) and stationary high purity germanium (HPGe) detectors. Measurements can be made over a barren excavated surface or where vegetation is present on undisturbed soil. If vegetation is present, the only requirement is that personnel and equipment can traverse the area in a safe and efficient manner, which may require some cutting of the vegetation prior to performing the measurements.

RTIMP measurements are collected according to procedures in the RTIMP Operations Manual (RTIMP-M-003) and protocols discussed in the *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site* (User's Manual), and the *Sitewide Excavation Plan* (SEP). The RTIMP Protocols in the User's Manual provide detail on the 3 phases of precertification monitoring, which can be summarized as follows:

- Phase 1 measurements consist primarily of scans with a mobile NaI detector over as much of the area as possible. In zones that are inaccessible to the mobile equipment that houses the NaI detectors, stationary HPGe detectors are used to obtain the remaining Phase 1 measurements. Target parameters for the NaI and HPGe measurements are gross gamma (only NaI), total uranium, Th-232 and Ra-226 activity. Action levels for NaI measurements correspond to the highest gross gamma activity in each batch file (see Methods of Data Collection in Section 3), total uranium and Th-238 activities that exceed 3-times their respective FRL, and Ra-226 activity that exceeds its FRL by a factor of 7 (7xFRL). For HPGe measurements, the action levels for total uranium, Th-232 and Ra-226 activities are set to 3-times their respective FRL. Phase I action levels dictate the location of Phase 2 measurements.

- Phase 2 measurements are performed only with HPGe detectors. Measurements are collected at Phase 1 locations that correspond to the NaI action levels of highest gross gamma activity, total uranium or Th-232 activity greater than 3xFRL, and/or Ra-226 activity that exceeds 7xFRL. For HPGe Phase I locations, Phase 2 measurements are performed if total uranium, Th-232 or Ra-226 activity exceeds 3xFRL (i.e., a hotspot). The objective of Phase 2 measurements is to screen the locations that exceed Phase I action levels and to confirm and delineate any hotspots that may be present at these locations. If hotspots are absent, certification activities can begin in the area. When hotspots are found, they are excavated and removed prior to performing Phase 3 measurements.

- Phase 3 measurements are performed only with HPGe detectors, and only if hotspots were identified and removed during Phase 2 activities. The area impacted by the hotspot removal is covered with a triangular grid and each node (4-meter nodes) is measured to confirm that total uranium, Th-232 or Ra-226 activity is below 3xFRL (i.e., the hotspot is removed). If Phase 3 measurements confirm that the hotspot has been removed, certification activities can begin. When Phase 3 measurements indicate a hotspot remains in the area, additional Phase 2 measurements are performed to delineate the extent of the contamination.

Available Resources

Time: Precertification of remediated areas must be completed in a timely manner by the RTIMP field team to provide information required for the Certification Design Letter.

Project Constraints: Soil remediation activities must be consistent with the SEP and be completed in accordance with the Fluor Fernald Closure Plan. Precertification activities must be performed with existing manpower and equipment, with reasonable consideration given to the replacement or repair of equipment that fails. Certification of all site property as meeting the FRLs, and regrading of remediated areas to meet final land use commitments, is dependent on successful completion of the RTIMP precertification work.

Personnel: The RTIMP requires a staff of individual trained to internal procedural requirements and methods to maintain efficient operations under the current accelerated schedule. The staff size is dependent on the number of soil remediation areas requiring RTIMP services at any point in time. Personnel are distributed as follows: Manager, Field Operations Supervisor, Systems Supervisor, Technical Support Scientist and field technicians.

Equipment: The RTIMP maintains approximately six NaI and seven HPGe systems. Each system is comprised of a detector, a multi-channel analyzer, a portable PC, and associated electronic components (e.g., cables and batteries). Global Positioning Systems (GPS) are used with the NaI and HPGe detectors to determine the geographic coordinates of the measurements. The NaI detector systems are fixed to mobile platforms that consist of a John Deere tractor (RTRAK), a Gator vehicle, three three-wheeled carts (RSSI, RSSII and RSSIII), and an excavation monitoring system (EMS) attached to a John Deere excavator. HPGe systems are placed on stationary tripods to obtain the measurements as well the EMS in a stationary mode.

2.0 Identify the Decision

Decision

In situ measurements with the NaI and HPGe gamma-ray detectors support two decisions:

Decision 1: Phase 1 measurements indicate whether the area is free of total uranium, Th-232 and Ra-226 contamination in excess of 3xFRL (i.e., hotspots are absent) when using HPGe systems. When using NaI systems, measurements can indicate whether the area is free of total uranium and Th-232 contamination in excess of 3xFRL and 7xFRL for Ra-226 contamination.

Decision 2: Phase 2 measurements confirm whether hotspots (based on Phase 1 findings) are present (>3xFRL) or absent (<3xFRL), and whether additional excavation is required to remove the contamination. If no >3xFRL hotspots are identified in Phase 1, a Phase 2 measurement will be performed at the highest gross gamma count (if using a NaI detector in Phase 1) location to determine whether or not it represents a hotspot

Results of Decision 1

When Phase 1 measurements indicate the area contains no hotspots (as discussed in Decision 1 above), no Phase 2 HPGe measurements are necessary with one exception. The Phase 1 location having the highest gross gamma count will be measured with an HPGe detector to verify that this discrete area does not exceed the 3xFRL level. If Phase 1 indicates potential hotspots (as discussed in Decision 2 above), then Phase 2 measurements must be initiated.

If Phase 1 measurements indicate no hotspots, the area is released to begin the certification process. Precertification results are provided as maps to document that total uranium, Th-232 and Ra-226 levels are below 3xFRL, and these maps are placed in the Certification Design Letter.

Results of Decision 2

Phase 2 measurements that identify hotspots are used to delineate the extent of the excavation, and the contamination is removed as additional scope under the Integrated Remedial Design Plan that is applicable to the area. Upon completion of the excavation and removal of the contaminated soil, Phase 3 measurements must be performed to verify that total uranium, Th-232 and Ra-226 levels are below 3xFRL.

If Phase 3 measurements indicate the area contains no hotspots after excavation, the area is released to begin the certification process. Precertification results are provided as maps to document that total uranium, Th-232 and Ra-226 levels are below 3xFRL, and these maps are placed in the Certification Design Letter.

If Phase 3 measurements indicate hotspots remain in the area, additional Phase 2 measurements are required to delineate the extent of the contamination. Decision 2 is then repeated until the area is released for certification.

3.0 Identify Inputs That Affect the Decision

Required Information

Information needed to make the decisions identified in Section 2 include gamma spectra collected with the NaI and HPGe detectors, soil moisture readings to correct the measurement results to dry-weight basis, log files generated from the software reduction of the spectra to reportable nuclide activity, geographic coordinates to allow the plotting of results on maps, and maps indicating the activity of the total uranium, Th-232, and Ra-226 nuclides.

Sources of Information

GammaVision software is used to collect and save the gamma spectra and geographic coordinates obtained from the GPS. The spectra are then analyzed with LabView (NaI) or EGAS (HPGe) software to quantify the activity of total uranium, Th-232, and Ra-226. Log files written by LabView and EGAS report sample identification, collection date, geographic coordinates, nuclide results and errors, and a flag column that indicates potential problems during the data reduction process. The log files are imported into Excel to check the results and flag column and then assign final quality-check codes. Maps are produced using Surfer software and the information contained in the Excel spreadsheet.

Action Levels

Action levels for the NaI measurements are the highest value for gross gamma counts in each batch file (a batch file is a continuous scan that contains hundreds to thousands of 4-second spectra), total uranium and Th-232 levels that exceed 3XFRL, and Ra-226 results that exceed 7xFRL. For HPGe measurements, action levels are set at 3xFRL for U-238, Th-232 and Ra-226.

Methods of Data Collection

NaI measurements are collected in a continuous scan mode by moving the detector and GPS antenna over the surface at a nominal speed of 1 mph. Traverses across the area are carried out in a manner that produces approximately 40 cm of overlap on each adjacent path. The detector height above the surface is 31 cm and a spectrum and GPS coordinates are collected every 4 seconds and stored in a batch file. A batch file is generated each time the NaI systems are mobilized to a work area. Procedures that describe the initiation of the NaI system and acquisition of data are contained in RTIMP-M-003, *RTIMP Operations Manual.*

HPGe measurements are obtained from a stationary tripod at a detector height of 100 cm (Phase 1) ,31 cm or 15 cm (Phases 2 and 3) for a period of 300 seconds. A larger area is evaluated with the 100 cm detector height used for Phase 1 measurements, as this initial screening assumes no hotspots are present. If measurements cannot be obtained due to unsafe conditions (e.g., trench) or standing water, measurements may be carried out at a detector height of 15 cm on small circular soil pads that are created with a backhoe and placed adjacent to the area that is inaccessible. Procedures that describe the initiation of the HPGe system and acquisition of data are contained in RTIMP-M-003, *RTIMP Operations Manual.*

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: Measurements are limited to the top 6 inches of soil in areas planned for certification, as defined in the precertification PSP.

Soil Population: All disturbed and undisturbed soil on the FCP property that has been passed into the precertification stage of remediation.

Temporal Boundaries

Time Constraints: The scheduling of precertification scanning is tied to the schedule for collection of certification samples. Precertification scans must be completed after excavation, if any, and before certification activities begin. The *in situ* measurements must be checked, verified and processed into maps to allow the information to be presented in the Certification Design Letter.

Practical Considerations: *In situ* measurements cannot be collected during precipitation events or if snow or water covers the soil. Additionally, if soil moisture exceeds 40 weight percent, measurements should be delayed until the soil moisture falls below this value. Prior to performing the measurements, some areas may require cutting of grass or removal of undergrowth, fencing and other obstacles, which requires coordination with appropriate maintenance personnel.

5.0 Develop a Logic Statement

Parameters of Interest

The parameters of interest are gross counts, total uranium, Th-232, Th-228, Ra-228 and Ra-226. Activities associated with the Th-228 and Ra-228 isotopes are not measured directly, as they are assumed to be equal to the Th-232 activity (i.e., in secular equilibrium with Th-232). The total uranium value is calculated based on the U-238 activity.

Action Levels

Precertification action levels for each batch file collected with a NaI system are values corresponding to the highest gross counts (i.e., total gamma activity), 3xFRL for total uranium and Th-232, and 7xFRL for Ra-226. For HPGe detectors, the action levels are 3xFRL for total uranium, Th-232 and Ra-226.

Decision Rules

If Phase 2 results indicate hotspots are absent (i.e., contamination is below 3xFRL for total uranium, Th-232 or Ra-226), certification sampling can begin. However, when a Phase 2 measurement indicates a hotpot is present, the extent of the hotspot will be delineated and mapped to provide a record for removal of the hotspot.

After the hotspot is excavated and removed from the area, Phase 3 measurements will be taken to verify the removal of the hotspot. If Phase 3 measurements indicate the hotspot is gone, certification activities may begin. When a Phase 3 measurement records total uranium, Th-232, or Ra-226 activity above 3xFRL, additional Phase 2 measurements are performed to delineate and map the additional contamination.

6.0 Establish Constraints on the Uncertainty of the Decision

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the Phase 2 measurements indicate an area is ready for certification when the soil contains one or more of the primary radiological COCs (U-238, Th-232, Th-228, Ra-228 and Ra-226) at levels above 3xFRL (i.e., the hotspot criterion fails when it is thought to pass). This decision error could lead to the area failing certification for one or several of the primary radiological COCs. If an area fails certification, additional excavation, precertification, and certification activities would be necessary.

Decision Error 2: This decision error occurs when the Phase 2 measurements indicate the area contains a hotspot when the soil activities of the primary radiological COCs are below 3xFRL (i.e., the hotspot criterion passes when it is thought to fail). This decision error results in additional excavation and precertification activities, as well as the placement of clean soil in the OSDF.

True Nature of the Decision Errors

Because Decision Error 2 results in additional costs that are incurred before a certification pass/fail decision is made, the funds must be expended every time this decision error occurs. However, with Decision Error 1, costs are incurred only if certification fails. Therefore, Decision Error 2 is the more severe error.

7.0 Optimize a Design for Obtaining Quality Data

In situ measurements are collected with the mobile NaI detectors (ASL A) and the stationary HPGe detectors (ASL A or B). Surface moisture readings are obtained in conjunction with the NaI and HPGe measurements using the Zeltex moisture meter. The soil moisture is used to correct the measured total uranium, Th-232, and Ra-226 activities to a dry-weight basis. Measured Ra-226 activity is also subject to a radon correction to account for differences in laboratory and *in situ* results and for background radon levels when evaluating Ra-226 hotspots. The User's Manual contains a detailed discussion on Ra-226 corrections.

Sodium Iodide Detectors

The NaI systems are used to scan as much of the area as possible, taking into consideration the topography and vegetation that may limit access. During the NaI scan, the mobile platform moves at a nominal speed of 1 mph and a gamma-ray spectrum is collected every 4 seconds and synchronized with GPS coordinates to locate each measurement. The spectra and GPS information are recorded and stored on a field PC hard drive until it is transferred to the FCP Local Area Network (LAN). Quality checks are performed on the data before the results are released to the SED or used in the preparation of maps, and optimization of the system operations occurs during calibration checks, field measurements and data reduction.

Prior to and after the NaI systems are mobilized to the field, the detector is checked with a Th-232 source to verify the location of the thallium-208 (Tl-208) peak and the net counts in the area under this peak. Detector efficiency is calculated annually for the protactinium-234, bismuth-214 and Tl-208 peaks, which are used to evaluate U-238 (total uranium), Ra-226 and Th-232 activity, respectively. Descriptions and pass/fail criteria for these calibration checks are given in the RTIMP-M-003, *RTIMP Operations Manual* and Appendix H of the SCQ.

Field measurements in forested areas are carried out during winter months, when the leaf canopy is absent and GPS signals can reach the receiver. Measurements over steep terrain and in trenches are executed using the EMS and John-Deere excavator to avoid unsafe working conditions for personnel.

Individual 4-second spectra are evaluated during the data reduction process and the net gross counts for each spectrum are used to plot total gamma activity. However, a meaningful evaluation of soil contamination associated with U-238 (total uranium), Th-232 and Ra-226 activities requires that two 4-second spectra be combined to obtain a sufficient number of counts in the area of interest. This optimization of the counting statistics allows total uranium and Th-232 contamination to be evaluated at levels that correspond to 3xFRL, and for Ra-226 at values 7xFRL. More measurements can be aggregated to achieve lower detection levels, but the area evaluated becomes very large and spatial resolution is lost.

High Purity Germanium Detectors

The HPGe systems are used to verify NaI measurements, identify and delineate hotspots (if found), and confirm that the area is ready for certification activities. HPGe detectors are set on stationary tripods, as well the EMS in a stationary mode, and a gamma-ray spectrum is collected every 300 seconds. GPS coordinates at the measurement location are obtained prior to or after the measurement. The spectra and GPS information are recorded and stored on a field PC hard drive until it is transferred to the FCP Local Area Network (LAN). Quality checks are performed on the data before the results are released to the SED or used in the preparation of maps, and optimization of the system operations occurs during calibration checks, field measurements and data reduction.

Prior to and after the HPGe systems are mobilized to the field, the detector is checked with a NIST source to verify the location and resolution of the americium-241 (Am-241), cesium-137 (Cs-137) and cobalt-60 (Co-60) peaks and the net counts in the area under each of the peaks. Detector efficiency is calculated annually using numerous gamma rays associated with the decay of Am-241, Cs-137, Co-60 and europium-152. Descriptions and pass/fail criteria for these calibration checks are given in the RTIMP-M-003, *RTIMP Operations Manual and* Appendix H of the SCQ.

Field measurements include a duplicate measurement for each detector in the field every 20 measurements or daily, whichever is more frequent. When Ra-226 hotspots are being evaluated, an independent HPGe detector is set up as a radon monitor to track daily variance in Ra-226 measurements that arises from a change in the rate of radon emanation from the soil. The HPGe detector serving as the radon monitor station collects a spectrum every 300 seconds, and the station is activated before the first HPGe field measurement and shut down after the last daily field measurement. The application of this information to the correction of Ra-226 results is discussed in the User's Manual.

Individual HPGe spectra are evaluated during the data reduction process and the results from one or more gamma-ray energy lines are used to quantify U-238 (to calculate total uranium), Th-232 and Ra-226 activities. In particular, interference from nearby sources of gamma radiation can be evaluated during the data reduction process to screen out anomalous results. For example, U-238 activity, and ultimately total uranium, is calculated using a low-energy and high-energy gamma ray. If the low-energy gamma ray is less than 80 percent of the activity recorded for the high-energy gamma ray, a local uranium source may be interfering with the measurement. Optimization of the data reduction process is discussed in RTIMP-M-003, *RTIMP Operations Manual.*

Data Quality Objectives
***In Situ* Precertification Measurements**

1A. Task/Description: *In situ* precertification measurements.

1B. Project Phase: (Put an X in the appropriate selection.)

RI		FS		RD		RA	X	RvA		OTHER	

1.C. DQO No.: SL-054, Rev. 2 DQO Reference No.: Current Sampling DQO

2. Media Characterization: (Put an X in the appropriate selection.)

Air		Biological		Groundwater		Sediment	X	Soil	X
Waste		Wastewater		Surface Water		Other (specify)			

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization										Risk Assessment									
A	X	B	X	C		D		E		A		B		C		D		E	
Evaluation of Alternatives										Engineering Design									
A		B		C		D		E		A		B		C		D		E	
Monitoring during remediation activities										Other: Precertification									
A	X	B	X	C		D		E		A	X	B	X	C		D		E	

4.A. Drivers: Applicable or Relevant and Appropriate Requirements (ARARs), Operable Unit 5 Record of Decision (ROD), Appendix H of the SCQ, RTIMP-M-003, *RTIMP Operations Manual*, RTIMP User's Manual, Sitewide Excavation Plan, and various Project-Specific Plans (PSP).

4.B. Objective: To determine if the area of interest is free of hotspots (i.e., total uranium, Th-232 or Ra-226 less than 3xFRL) and likely to pass certification.

5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FCP that require remediation activities. The total uranium, Th-232 and Ra-226 levels in soil in these areas must be below the established FRLs.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1.	pH		2.	Uranium*	X*	3.	BTX	
	Temperature			Full Rad.*	X*		TPH	
	Spec. Conductance			Metals			Oil/Grease	
	Dissolved Oxygen			Cyanide				
	Technitium-99			Silica				
4.	Cations		5.	VOA		6.	Other (specify)	
	Anions			ABN			Percent Moisture	
	TOC			Pesticides				
	TCLP			PCB				
	CEC							
	COD							

* Full rad is total uranium, Th-232 and Ra-226.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Nal and HPGe	SCQ Section: Appendix H
ASL B HPGe	SCQ Section: Appendix H
ASL C	SCQ Section:
ASL D	SCQ Section:
ASL E	SCQ Section:

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased	X	Composite		Environmental		Grab		Grid	X
Intrusive		Non-Intrusive	X	Phased		Source			

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the Project-Specific Plans.
Background samples: OU5 RI/FS

7.C. Sample Collection Reference:
RTIMP-M-003, *RTIMP Operations Manual*
User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site (User's Manual)

8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks		Container Blanks	
Field Blanks		Duplicate Samples	X*
Equipment Rinsate Samples			
Preservative Blanks			
Other (specify): *Source Checks, Control Charts, Radon Monitoring, Moisture*	X*		

* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

Method Blank		Matrix Duplicate/Replicate	
Matrix Spike		Surrogate Spikes	
Other (specify):			

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.