3947

PROJECT SPECIFIC PLAN FOR AREA 3A/4A EXCAVATION CHARACTERIZATION AND PRECERTIFICATION

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

FOR INFORMATION ONLY

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	as low as reasonably achievable
ALS	Analytical Laboratory Services
ASL	analytical support level
AWWT	Advanced Wastewater Treatment (Facility)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CU	certification unit
DCE	1,1-dichloroethene and 1,2-dichloroethene
DNAPL	dense non-aqueous phase liquids
DOE	U.S. Department of Energy
DQO	Data Quality Objective
ECDC	Engineering/Construction Document Control
EMS	Excavation Monitoring System
FACTS	Fernald Analytical Computerized Tracking System
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GC	gas chromatograph
GPS	global positioning system
HPGe	high purity germanium
IP	Implementation Plan
IRDP	Integrated Remedial Design Package
LAN	Local Area Network
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NaI	sodium iodide
OSDF	On-Site Disposal Facility
PCE	tetrachloroethene
pCi/g	picoCuries per gram
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PSP	Project Specific Plan
PWID	Project Waste Identification Document
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RMS	Radiation Measuring Systems
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	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
SMMP	Soil and Miscellaneous Media Sampling
TCE	trichloroethene

LIST OF ACRONYMS AND ABBREVIATIONS

V/FCN	Variance/Field Change Notice
VOA	volatile organic analysis
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

This project specific plan (PSP) describes the data collection activities during and subsequent to excavation of Area 3A/4A at the Fernald Environmental Management Project (FEMP) as outlined in the Area 3A/4A Integrated Remedial Design Package (IRDP), including the Area 3A/4A Implementation Plan (IP). The majority of Area 3A/4A background information, nature and extent of contamination, and identification of contaminated soil areas is not repeated in this document since it is fully detailed in the Area 3A/4A IP. This PSP covers sampling and analytical requirements from the start of Area 3A/4A excavation through precertification sampling after all excavation is complete to the designed depth or the revised depth based on the findings from real-time field screening and/or physical sampling.

1.1 PURPOSE

The purpose of this PSP is to provide direction to all organizations responsible for the characterization of primarily post-excavation soil surfaces in Area 3A/4A during and following the remedial action excavation process. The characterization process will determine the concentrations of the constituents of concern (COCs) remaining on the post-excavation soil surfaces for compliance with the On-Site Disposal Facility (OSDF) waste acceptance criteria (WAC) or the final remediation levels (FRLs). This characterization data will be used to guide the excavation contractor. The process of determining WAC and FRL attainment is defined in the Sitewide Excavation Plan (SEP), the WAC Attainment Plan for the OSDF, and the Impacted Materials Placement Plan.

Following removal of each soil lift, the surface (sideslopes and/or excavation floor) will be surveyed with real-time instruments (*in situ* gamma spectroscopy instrumentation) and/or physical sampling to determine if the soil meets the OSDF WAC. If an excavation has been completed to the design depth, then precertification characterization will be performed with *in situ* gamma instrumentation as described in Section 2.0 of this PSP.

There are generally four excavation situations or phases that will require characterization of the excavated soil surface using real-time *in situ* gamma instruments or physical sampling as follows:

- Following the removal of surface concrete, asphalt or gravel/fill material to assess the excavated soil surface for above-WAC and/or above-FRL soil for COCs,

- Following removal of a 3±1 foot horizontal soil lift (floors and/or sideslopes of excavations) in some contamination zones, to assess the excavation surface for above-WAC soil and/or above-FRL soil,

- Following the presumed removal of all above-FRL soil from an excavation area, precertification characterization will be initiated for FRL attainment; this step may be partially fulfilled during the real-time scanning and sampling under the above bullet,

- During and following trench excavations to remove below-grade utilities; purpose of characterization is for both WAC and/or FRL attainment.

This PSP serves an additional purpose for radiological surveys of material in between the lift scans that may indicate potential above-WAC radiological concerns (suspect material, etc.) or safety and health concerns. These areas or objects will be treated as suspect above-WAC material areas and measured with the appropriate real-time *in situ* gamma instrumentation (Section 2.0). Additionally, this PSP covers the collection of water samples from the excavation areas for characterization prior to pumping the water to the Advanced Wastewater Treatment (AWWT) Facility for treatment.

The field execution of this characterization program presents some unique safety issues for the characterization field staff requiring a heightened level of awareness from all field personnel. Section 4.0 describes safe work zones and general personal protective equipment (PPE) requirements that must be followed to maintain worker safety.

As excavation progresses, access to the sides and bottom of the excavation is critical to obtaining reliable characterization data. A safe slope configuration must be maintained in areas requiring access by field personnel on foot or driving motorized scanning equipment.

The use of new scanning equipment to aid in accessing areas is introduced in this PSP. The excavator mounted Excavation Monitoring System (EMS) is the primary tool for Area 3A/4A characterization based on its ability to:

- Reach across radiation boundaries to access radiological controlled areas without physically placing equipment or personnel in these areas, thus reducing the potential for equipment contamination,

- Maneuver in deep excavations where other real-time equipment cannot access, and

- Scan trenches without placing personnel or equipment inside the trench;

thereby facilitating the application of as low as reasonably achievable (ALARA) principles by reducing the exposure of personnel in contamination areas.

The use of the field portable gas chromatograph is also introduced in this PSP. This equipment will allow rapid turn-around time for organic analysis results [i.e., 1,1- and 1,2-dichloroethene (DCE), trichloroethene (TCE), and tetrachloroethene (PCE)], thus minimizing delays for the excavation contractor. Section 2.6.5 provides a description of this equipment.

1.2 SCOPE

Area 3A/4A comprises approximately 48 acres in the eastern half of the Former Production Area and is generally bounded by 1st Street to the south, "E" Street to the east, the Impacted Material Haul Road to the north, and "B" Street to the west (Figure 1-1). Most of the buildings in this area have been dismantled. The remaining structures will be decontaminated and dismantled prior to commencement of work in the specific occupied area.

The scope of this PSP includes the characterization requirements that will be necessary from the start of excavation in Area 3A/4A through completion of excavation and precertification of the final grade soils. The characterization activities will include real-time *in situ* gamma measurements combined with physical sampling as necessary to determine the final disposition of soils. The results of this characterization process will determine the classification of soils for disposition or further treatment within the following categories that will be transported to the OSDF or placed in stockpiles:

- Above-WAC for radiological COCs
- Above-WAC for organic COCs
- Below-WAC for organic COCs but possibly Resource Conservation and Recovery Act (RCRA) material
- Below-WAC for radiological and organic COCs (destined for the OSDF).

Additionally, the *in situ* gamma methods and physical sampling and analysis process described in this PSP will be used to determine if the planned final excavation grade is below the FRLs through a precertification process. If the final excavation grade is not below-FRL, additional excavation will occur until below-FRL levels are achieved.

Contaminants detected by real-time field screening for this area include total uranium, thorium-228, thorium-232, radium-226 and radium-228 (thorium-228 and radium-228 are inferred concentrations). Technetium-99 concentrations are determined via physical sample analysis performed at the on-site laboratory. DCE, TCE, and PCE concentrations of organic compounds are determined using the field portable gas chromatograph.

The schedule for implementation of this PSP is expected to begin in the fall of 2001 and continue through 2003. Soil and material identified as above-WAC, from a RCRA characteristic area, or contaminated with organics (DCE, TCE, or PCE) will be targeted for removal as early as possible to minimize cross contamination.

Field conditions may arise during the excavation of Area 3A/4A, which warrant a different decision process for defining the extent of contamination or for verifying that soil is below-WAC or-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 Lead will document the change and requirements through the Variance/Field Change Notice (V/FCN) process.

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	Robert Janke	Kathi Nickel
Area 3A/4A Project Manager	Rich Abitz	Jyh-Dong Chiou
Characterization Lead	Frank Miller	TBD
RTIMP Lead	Dale Seiller	TBD
Field Sampling Lead	Tom Buhrlage	Jim Hey
Surveying Lead	Jim Schwing	Andy Clinton
WAO Contact	Linda Barlow	TBD
Construction Lead	Lee McDaniel	Frank Flack
Laboratory Contact	Denise Arico	Brenda Collier
Data Validation Contact	Jim Chambers	Erik Corbin
Field Data Validation Contact	Andy Sandfoss	Jim Chambers
Data Management Lead	Frank Miller	TBD
Radiological Control Contact	Corey Fabricante	Mike Schneider
FACTS/SED Database Contact	Krista Blades	TBD
Quality Assurance Contact	Reinhard Friske	Mike Godber
Safety and Health Contact	Debra Grant	Jeff Middaugh

FACTS – Fernald Analytical Computerized Tracking System
RTIMP – Real-Time Instrumentation Measurement Program
SED – Sitewide Environmental Database
WAO – Waste Acceptance Organization

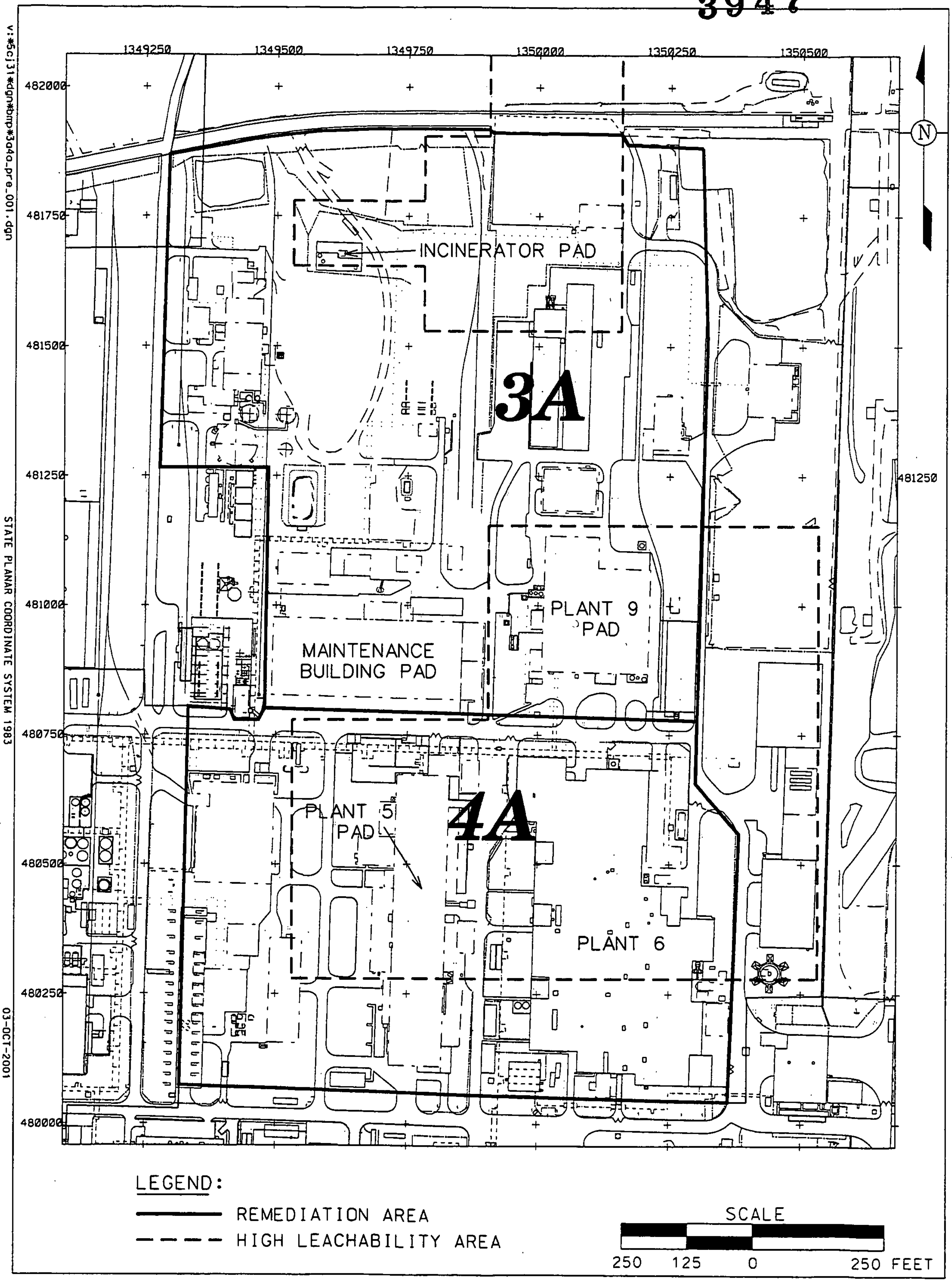


FIGURE 1-1. AREA 3A/4A

2.0 EXCAVATION CHARACTERIZATION PROGRAM

This section addresses the characterization approach, the sampling and monitoring requirements unique to specific contamination zones and the specific equipment and instrumentation methods to be utilized under this PSP. Sections 2.2 through 2.5 provide the sampling and monitoring requirements for each type or phase of excavation (e.g., sequential excavation of soil lifts, utility trenches below the design grade, etc.) anticipated for Area 3A/4A. Section 2.6 addresses the general methods and specific requirements common for the sampling and monitoring operations including the *in situ* gamma spectrometry equipment, the field portable gas chromatograph, methods for systematic grid sampling, and physical sampling methods.

2.1 AREA-SPECIFIC CONSTITUENTS OF CONCERN

The Area 3A/4A IP provides detailed assessment of remedial investigation/feasibility study (RI/FS) and predesign characterization data and the final determination of the COCs. Table 2-1 summarizes the primary and secondary COCs, their WAC and FRL limits, and the planned method of determining if the excavated soil surfaces meet the applicable limits. Table 2-2 summarizes the above-WAC areas of soil in Area 3A/4A including the COCs and approximate design depth of excavation as documented in the IP. Figure 1-1 defines the areas of high leachability located in Area 3A/4A. Figure 2-1 defines the above-WAC and above-FRL areas at the Incinerator Pad. Figure 2-2 defines the RCRA characteristic area behind the Maintenance Building.

2.2 EXCAVATION CHARACTERIZATION BENEATH FLOORS, ROADS AND FOUNDATIONS

Approximately 20 percent of the surface area of Area 3A/4A was surveyed using *in situ* gamma spectrometry under past predesign investigations as illustrated in Figure 2-8 of the Area 3A/4A IP. Approximately 80 percent of the remaining surface area is covered by existing buildings, concrete pads/floors, and asphalt or gravel roadways. This remaining newly exposed surface soil area must be scanned with *in situ* gamma instruments following removal of this overlying structural material and will be gamma scanned in sections as removal of this overlying material progresses over the course of approximately one year. In particular, gamma scans beneath building foundations and below-grade structures will be performed as individual plant buildings or below-grade structures are scheduled for excavation (e.g., Plant 4, 5, 6 and 9). Near 100 percent coverage will be achieved during the gamma scan in accordance with the User Guidelines, Measurement Strategies, and Operational Factors for

Deployment of *In Situ* Gamma Spectroscopy at the Fernald Site (hereafter referred to as the User's Manual).

If the newly exposed soil surface to be scanned is located in a defined radiologically contaminated area per the IP, then the area must be surveyed to confirm and delineate any above-WAC uranium on the exposed soil/fill surface to determine the proper disposition of the first planned lift of excavated soil. Sodium iodide (NaI) Radiation Measurement Systems (RMS) will be used to scan the surface soil/fill areas for identification of above-WAC soil boundaries, if any. This equipment includes the Real-Time Radiation Tracking System (RTRAK), GATOR, Radiation Scanning System (RSS), and the EMS, all of which will utilize the action level of 721 parts per million (ppm) uranium. If the NaI the action level is reached, the high-purity germanium (HPGe) detector may be used to acquire additional *in situ* gamma measurements to confirm the potential above-WAC uranium areas, or the area may directly undergo excavation, if other information indicates the area is still above-WAC (such as staining, process residue, etc). The preferred equipment to be used in areas where access may be limited due to the soil/fill surfaces consisting of walls or steep surfaces left by the removal of footers, foundations, or gravel bases is the EMS. If the EMS is not available for use in these areas (being employed in another area), then another RMS, the HPGe tripod, or a combination of equipment will be used for the initial gamma scan for the WAC uranium determination. The HPGe utilizes an action level of 400 ppm uranium as a trigger (at 1 meter height and a 5-minute acquisition time) to identify potential above-WAC uranium areas.

If either the NaI or HPGe action levels are reached (721 ppm for NaI and 400 ppm for HPGe), the potential above-WAC uranium area may be confirmed with the HPGe at the 31-cm or 15-cm height, depending on the size of the potential above-WAC area. At either the 31-cm or 15-cm height an action level of 928 ppm indicates above-WAC uranium. Obtaining confirmation of the suspect above-WAC measurement is at the discretion of the Characterization Lead or designee. The decision process for any unique field condition will be documented in applicable field activity logs and, if determined to be appropriate by the Characterization Lead or designee, with a V/FCN as described in Section 3.4.

If the newly exposed soil surface (after removal of concrete, etc.) to be scanned is located in a below-FRL area for all radiological COCs as defined in the IP, then the newly exposed soil/fill surface will be gamma scanned using NaI and HPGe equipment for precertification (see Section 2.5).

2.3 EXCAVATION LIFT CHARACTERIZATION

As described in the IP, the excavation design for Area 3A/4A involves the removal of several zones of contaminated soils requiring segregation during the excavation process. The excavation will generally proceed in 3±1 feet soil lifts with real-time characterization following the removal of each lift. Regardless of the thickness of the above-WAC zones of contamination (a few zones are ≤ 2 feet), the characterization strategy described in this section will be applied. The excavation strategy relies on *in situ* gamma measurements and physical sampling within these zones to aid in the definition of waste streams. Therefore, this section has been developed to address the unique monitoring and sampling requirements for each type (COCs) of contaminant zone and level of concentration (above-WAC, above-FRLs, RCRA soil, etc.) for a particular lift of soil. Excavation of subsequent soil lifts is expected to be performed only after *in situ* gamma data or analytical results are reviewed and soil disposition is determined.

Table 2-2 lists the known areas of above-WAC soil within Area 3A/4A. As expected, uranium comprises most of the above-FRL zones which are widespread throughout Area 3A/4A. Many of the above-FRL zones are extensions of the above-WAC uranium areas and are illustrated in Figure 2-21 of the IP.

2.3.1 General Characterization Approach for All Contamination Zones

The characterization requirements for each type of contaminant zone, including the types of samples and measurements, are summarized in Table 2-3. Table 2-3 is intended to serve as a guide for the characterization strategy. This table specifies when the excavation floor versus sideslopes of each excavation lift needs to be sampled or measured using *in situ* gamma instruments. The purpose of sideslope measurements and/or sampling is to determine if the lateral extent of contamination has been captured with the excavation limits. The excavation floor requires characterization to determine if any areas of above-WAC COCs or above-FRL COCs are present, dependent on the particular type/level of contamination zone, in order to ensure proper segregation of soils during excavation or to ensure that FRLs have be attained.

In Situ Gamma Measurements

As detailed in Table 2-3, scanning with a NaI detector system using one of the mobile RMS units will be performed on either the excavation sideslopes, excavation floor or both for each soil excavation lift, regardless of the type of contamination zone. Moreover, upon reaching the design depth specified in the IP for any contamination zone (above-WAC or above-FRL, organic or radiological), both the excavation floor and sideslopes will require a gamma scan. The GATOR is capable of providing coordinate (X and Y) and elevation (Z) data so that design grade depth can be confirmed.

The RMS NaI equipment includes the RTRAK, RSS, GATOR, and EMS. The EMS consists of an excavator equipped with a NaI detector for scanning measurements (or an HPGe for static measurements), laser range finder, and global positioning system equipment for use in areas not accessible by other RMS units. For identification of above-WAC uranium (1,030 ppm), an action level of 721 ppm is utilized for the NaI detection systems to trigger additional *in situ* gamma measurements for confirmation or further delineation of above-WAC uranium areas.

If the RMS equipment is unavailable and therefore, cannot be used to perform the initial gamma scan, then HPGe tripod measurements will be employed to provide maximum coverage (goal of 99.1 percent in accordance with the User's Manual) of the excavation sideslopes and/or floor as required.

If the NaI scans or the static HPGe measurements indicate below-WAC but above-FRL concentrations of uranium in the soil, further confirmation and delineation with the HPGe may be required. This confirmation and delineation process is documented in the User's Manual (Section 3.4). Confirmation measurements are made to verify above-FRL radiological COC concentrations are present, and delineation measurements are made to determine the boundary of the above-FRL area. Confirming and delineating the extent of contamination with HPGe measurements is at the discretion of the Characterization Lead or designee. Conditions may arise which warrant a different decision process for defining the extent of contamination. The decision process for the unusual condition will be documented in applicable field activity logs and, if determined to be appropriate by the Characterization Lead or designee, with a V/FCN as described in Section 3.4.

<u>Physical Sampling for Specific COCs</u>

As summarized in Table 2-3, physical sampling as part of the excavation monitoring process is required in above-WAC technetium-99 zones and in volatile organic contamination zones. Physical samples are required on the excavation sideslopes, excavation floor, or both, depending on the zone of contamination. The collection of physical samples will be documented in applicable field logs and with a V/FCN. 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. The specific requirements are described below in the sections pertaining to the above-WAC and above-FRL organic and technetium-99 contamination zones.

2.3.2 Characterization of Above-WAC Organic Soil and RCRA Soil Zones

Table 2-2 summarizes the locations of the above-WAC organic soil zones defined in the Area 3A/4A IP. These zones are limited to the Incinerator Pad (Figure 2-1), the Maintenance Building Pad (Figure 2-2), and an area around the eastern side of Plant 6.

In these areas, the sideslopes of each excavation lift will be surveyed using a photoionization detector (PID). If the action level for the PID is exceeded, then a physical sample for field gas chromatograph (GC) analysis may be collected and analyzed to determine if the soil contains above-WAC organic COCs. The PID survey methodology and action level for screening for potential above-WAC organic soil is described in Section 2.6.8. (Alternatively, the decision to advance excavation based on the PID data may be made by the Characterization Lead. This soil will be dispositioned as above-WAC organic soil).

If results from the GC analyses indicate the presence of above-WAC organics, then the sideslopes of the excavation will be expanded. Additional surveying, sampling, and excavation will occur until the results indicate that the soil is below-WAC. Commencement of excavation of another lift will occur following confirmation that the sideslopes of the excavation are below-WAC. PID surveying of the bottom (floor) of each lift is not necessary until excavation has reached the design grade of the above-WAC organic or RCRA zone.

When the excavation design depth in an above-WAC organic area has been reached, PID surveying of the excavation bottom, as well as the sideslopes corresponding to the final lift elevation will be performed. If the action level for the PID is exceeded, then the area may directly undergo excavation or a physical sample for field GC analysis may be collected and analyzed to determine if the soil contains above-WAC COCs. If above-WAC organics results from this physical sample are found then the area will be delineated through additional sampling and field GC analysis, and another lift or localized area will be excavated. This excavation and surveying will continue until all above-WAC organic soil is removed, at which time the excavation will shift to the above-FRL zone, if present.

Additionally, upon reaching the final design depth in the above-WAC organics contamination zone, the floor will be visually sectioned into quarters. A physical sample for field GC organic analysis will be collected from the centerpoint of each quadrant. This sample data will be used for WAO soil disposition purposes. If another method of documenting that the soil is below-WAC is developed that is acceptable to WAO, this method may be employed instead of the previously described method.

In order to ensure that no above-WAC uranium is present at the lateral extent of each excavation lift, NaI scanning will be required on the sideslope of each excavation lift. Once the design grade is reached, NaI scanning will also be required on the excavation floor to ensure that no above-WAC uranium remains. (Additionally, the NaI data from the floor scan will be evaluated against the FRLs for uranium, radium and thorium to the extent possible with respect to the NaI detection limits, as described in Section 2.5, Precertification). If above-WAC uranium is detected during NaI scanning on the sideslopes and/or excavation floor (at design grade), confirmation with HPGe and, if necessary, delineation of the above-WAC uranium will be performed. Excavation of this soil will then be conducted followed by another round of NaI scanning over the newly excavated area.

Additionally, if the NaI scanning data is not downloaded to the SED, upon reaching the final design depth in the contamination zone, the floor will be visually sectioned into quarters. *In situ* gamma equipment (data must be able to be downloaded to the SED) will be used to obtain a measurement from the centerpoint of each quadrant. This sample data will be downloaded to the SED and used for WAO soil disposition purposes. If another method of documenting that the soil is below-WAC is developed that is acceptable to WAO, this method may be employed instead of the previously described method.

2.3.3 Characterization of Above-WAC Technetium-99 Zones

Areas and zones contaminated with above-WAC technetium-99 require physical sampling and laboratory analyses for confirmation during and following completion of excavation. Section 2.6.8 provides the methodology for determining sample locations based on a systematic grid. The samples will be analyzed at the on-site laboratory to determine if the material is above-WAC for technetium-99.

Following the removal of each excavation lift of soil in technetium-99 zones, the sideslopes require physical sampling for above-WAC technetium-99 and NaI scanning for above-WAC uranium. If the results indicate that above-WAC technetium-99 contamination or above-WAC uranium is still present on the sideslopes of any excavation, then the sideslopes of the excavation will be further excavated and expanded. Additional sampling will occur until the laboratory results indicate that the soil is below-WAC for technetium-99, at which time the next excavation lift will be removed.

Once the design depth of the excavation is reached both the excavation floor and sideslopes will need to be physically sampled for technetium-99 and scanned with the NaI system for above-WAC uranium. If the results from the analyses of these samples indicate that the excavation floor (at design grade) has above-WAC technetium-99 results, then another lift or a localized area will be excavated. If additional sampling is required to bound the above-WAC technetium-99 soil, the requirements will be documented through the V/FCN process. The excavation and sampling process will continue until results indicate that above-WAC technetium-99 soil has been removed. If above-WAC uranium is detected during NaI scanning on the sideslopes or excavation floor (at design grade), confirmation with HPGe and, if necessary, delineation of the above-WAC uranium may be performed. Excavation of this soil will then be conducted followed by another round of NaI scanning over the same excavation area.

Additionally, if the NaI scanning data is not downloaded to the SED, upon reaching the final design depth in the contamination zone, the floor will be visually sectioned into quarters. *In situ* gamma equipment (data must be able to be downloaded to the SED) will be used to obtain a measurement from the center point of each quadrant. This sample data will be downloaded to the SED and used for WAO soil disposition purposes. If another method of documenting that the soil is below-WAC is developed that is acceptable to WAO, this method may be employed instead of the previously described method.

Since the FRL concentration of technetium-99 [30 picoCuries per gram (pCi/g)] is slightly greater than the WAC concentration (29.1 pCi/g), if the above-WAC technetium-99 soil has been removed, then further precertification sampling of technetium-99 is not required.

2.3.4 Characterization of Above-WAC Uranium Zones

The areas and zones of above-WAC uranium are extensively documented in the IP and summarized in Table 2-2. If the area or zone being excavated contains above-WAC uranium, then the sideslopes of each excavation lift will be scanned, as accessible using the RMS equipment. Section 2.6 provides a description of the NaI scanning methodology. The preferred equipment to be used in areas where access may be limited due to the soil/fill surfaces consisting of walls or steep surfaces is the EMS. If the EMS is not available for use in these areas, then the HPGe tripod will be utilized to characterize the accessible areas with nearly 99.1 percent coverage per the User's Manual. Any sideslope measurements indicating above-WAC uranium will be further excavated and scanned until below-WAC uranium results are achieved, at which time excavation of another lift will occur.

When the design depth is reached, a NaI scan will be performed on both the sideslopes and the excavation floor. The preferred equipment to be used in areas where access may be limited is the EMS. If the EMS is not available for use in these areas, then another RMS, the HPGe tripod, or a combination of equipment will be utilized to obtain as close to complete coverage (per the User's Manual) as possible of the sideslopes and floor. Any floor or sideslope measurements indicating above-WAC for uranium will be further excavated and scanned until below-WAC uranium results are achieved.

Additionally, upon reaching the final design depth in the above-WAC uranium contamination zone, the floor will be visually sectioned into quarters. *In situ* gamma equipment (data must be able to be downloaded to the SED) will be used to obtain a measurement from the center point of each quadrant. This sample data will be downloaded to the SED and used for WAO soil disposition purposes. If another method of documenting that the soil is below-WAC is developed that is acceptable to WAO, this method may be employed instead of the previously described method.

Current design of the boundaries of above-WAC uranium contamination pockets slated for excavation is based on a less than WAC uranium point, resulting in a conservatively bound above-WAC area. Further delineation of an above-WAC uranium contamination area may be performed in order to reduce the amount of soil being excavated and dispositioned as above-WAC soil. In an area previously destined for excavation as an above-WAC area, the gamma *in situ* equipment may be utilized on the sideslopes and floor in order to more exactly define the extent of the above-WAC uranium contamination. *In situ* gamma results will not override any data obtained from predesign. This refined area will then be excavated, thus minimizing the amount of soil being dispositioned as above-WAC soil. Agency concurrence must be obtained for any changes in the disposition of soil.

2.3.5 Characterization of Above-FRL/Below-WAC Uranium Zones

The vast majority of contaminated soil in Area 3A/4A falls into the category of above-FRL for uranium. If the area being excavated is above-FRL for uranium but below-WAC for uranium, then both the sideslopes and bottom of each excavation lift must be scanned using the RMS equipment. Section 2.6 provides the specifications for conducting the NaI scanning. The NaI scan is designed to ensure that the soil surfaces to be subsequently excavated contain no uranium at above-FRL levels. If above-FRL uranium results are detected on the floor or sideslopes of the lift, then this area must be confirmed and delineated using HPGe detector measurements.

Once the final design depth is reached for an above-FRL uranium zone, then the entire excavation sideslopes and floor will be scanned with the intent of evaluating the data for both above-FRL levels for uranium (as well as thorium and radium). Any uranium levels above the detection limit of the NaI detector [nominally 246 ppm or three times (3x) the FRL of 82 ppm] may indicate the potential for above-FRL uranium present at the design depth of the excavation. These potential above-FRL hot spots at the design depth will be confirmed and delineated with HPGe if necessary, and excavated. When below-FRL levels for uranium are achieved, then precertification measurements will be commenced per Section 2.5.

If any above-WAC uranium is detected with the NaI scanning equipment, the soil will be excavated and dispositioned as above-WAC uranium soil, and the scanning to identify above-FRL uranium resumed.

2.3.6 Characterization of Above-FRL Organic Zones

The above-FRL organic zones of contamination consist of the Incinerator Pad area, an area around the eastern side of Plant 6 and the Maintenance Building Pad area (possibly surrounding the RCRA soil). These zones will require the use of PID instruments for volatile organic field surveys, physical samples for analysis via field GC and the EMS system (HPGe or NaI detectors) or other RMS instruments for radiological scans for above-WAC uranium.

During sequential lift excavations in above-FRL organic zones, a PID will be used to identify areas needing physical sampling to confirm that no above-WAC organic soil exists on the surface of the exposed soil lift (sideslopes and excavation floor). If the action level for the PID is exceeded, then the area may be excavated further or a physical sample for field GC analysis may be collected and analyzed per Section 2.6.5. (At the time this PSP was being developed, the PID action levels for the COCs were being determined based on the instrument model's response factors and the COC ionization potentials). Prior to the excavation of the next soil lift, the field GC results will be evaluated to determine if above-WAC organic soil is present. If the bottom of the lift is found to contain above-WAC organic COCs then these areas will be further delineated through sampling as necessary and marked for soil segregation purposes. If the sideslopes of the lift are found to contain above-WAC organic COCs then these areas will be excavated laterally. The PID surveying process and potential sampling will be repeated to confirm that no above-WAC organic soil remains.

When design depth is reached, physical volatile organic samples will be collected from the sideslopes and bottom of the excavation and analyzed with the field portable GC to determine that the soil is below-FRL for the volatile organic COCs. The location of the physical sample will be determined by surveying a 20-foot by 20-foot grid with a PID and selecting the location of highest PID measurement above background. If no above background measurements are obtained with the PID, then the location of the physical sample point will be the centerpoint of the 20-foot by 20-foot grid. The methodology is discussed in detail in Section 2.6.8. If above-FRL organics results are detected then the area of contamination must be delineated and excavated until below-FRL results are achieved.

In situ gamma measurements (NaI or HPGe) will be performed on both the sideslopes and floor of each excavation lift, as accessible. The purpose of this scan is to ensure that no above-WAC uranium levels exist on the surface of each excavation lift (floor and sideslopes) prior to excavation and stockpiling. As with other excavation zones, any above-WAC uranium area will be excavated and segregated.

2.3.7 Sampling of Excavation Water for Volatile Organic COCs

Excavation water is the mixture of surface water and perched groundwater that collects to create ponded water in the excavation. All excavation water will go through either Phase I or Phase II treatment at the AWWT Facility.

Excavation water will be sampled and analyzed using the portable GC to determine if Phase II treatment [> 50 micrograms per liter (µg/L) for any single constituent] is required (as described in Section 3.4 of the IP) in the following situations:

- As identified in the IP, there are three known volatile organic compound (VOC) contamination zones (i.e., Plant 6, Incinerator Pad, RCRA Soil Area 5 near the Maintenance Building). The contaminants are above-WAC PCE at Plant 6, above-WAC PCE and DCE at the Incinerator Pad, and TCE at RCRA Soil Area 5. Excavation water in these zones will be sampled by collecting a water sample from the bottom of the pooled water [COCs are dense non-aqueous phase liquids (DNAPLs) and should pool below the water level]. This sample will be analyzed on a field GC unit for PCE, TCE, and/or DCE prior to the discharge event. Table 2-2 summarizes the analytes for each of the affected areas.

- If any of the excavation water exhibits any suspect appearances (e.g., sheen/coloration on the water surface, chemical odor), then this location will be sampled for the VOC COCs.

The VOC water samples will be collected from the bottom (COCs are DNAPLs and should pool below the water level) of the pooled water at the water's edge near the sideslope known to have contained the highest level of organic contamination based on either PID readings of the sideslopes during excavation or based on the predesign investigation data. Sample collection may be performed by hand (filling of VOA vials) or by using a Teflon ladle with an extension handle per Procedure SMPL-02, Liquids and Sludge Sampling, except requirements concerning generation of the chain of custody. A chain of custody form is not required for GC samples since the field analyst operating the portable GC unit is considered part of the field characterizing team. The sample remains in physical possession of the team until it is exhausted or disposed. If the sample must be transferred to a person who is not part of the field characterizing team (e.g., onsite laboratory, radiological technician, etc.) then a chain of custody must be generated per Procedure EW-0002, Chain of Custody/Request for Analysis Record for Sample Control for the GC sample. Table 2-4 summarizes the sample container and preservative requirements. The sampling identification system described in Section 2.6.9 will be followed. The field GC data will be evaluated to determine disposition requirements as defined in the IP.

2.4 UTILITY TRENCH CHARACTERIZATION (BELOW DESIGN DEPTHS)

2.4.1 Applicability

The potential exists for contamination to be located beneath and adjacent to below-grade piping and utility corridors in Area 3A/4A. Approximately 60 percent of the utility lines will remain after the general excavation has reached the design grade. At the design grade, *in situ* gamma measurements will be used to precertify this surface including the soil overlying the below-grade piping. These utilities lie below the design grade (precertified) and will be removed using a backhoe and trenching techniques. Per the IP, *in situ* gamma measurements will be used to determine if the soil and bedding material removed from the trench meet the OSDF WAC and site FRLs. Physical sampling may also be required if suspect soil or utility bedding material is encountered during excavation that may indicate chemical contamination (e.g., organics) as discussed below. Additionally, the surface area above the utilities may be precertified with *in situ* gamma spectroscopy measurements prior to initiating the trench work through the routine process of scanning all design grade surfaces following large-area excavations.

2.4.2 *In Situ* Gamma Measurements of Trench Excavations

The objective of the *in situ* gamma measurements is to determine if the trench pipe bedding material meets the OSDF WAC and if the underlying soil (trench bottom) meets the radiological FRLs for precertification purposes.

The preferred method for gamma measurements of the trench excavations is through the use of the EMS equipped with a NaI detector in a mobile scanning mode. The use of the EMS NaI detector has the advantage of covering more trench area in less time in comparison to static HPGe. Similarly, the EMS equipped with a HPGe detector offers safer work practices for detector mobility and trench accessibility. Use of the EMS equipped with either a NaI or HPGe detector in Area 3A/4A will rely on the operating procedure and the User's Manual for operational instructions and guidelines. (Action levels for above-WAC determination are the same as described in Section 2.2.)

As an alternative, if the EMS NaI or HPGe system is unavailable, the HPGe tripod measurements will be utilized at trench excavations. The optional use of the HPGe system for utility trench excavations is conceptually illustrated in Figure 2-3. A trench excavation will involve removal of soil overlying the pipe followed by the removal of the pipe, itself along with the surrounding bedding material. During excavation of the pipe bedding material, the excavator will excavate a bucket-load of soil from the pipe bedding material at 50-foot intervals along the trench. This bucket-load of bedding material will be placed next to the trench (downgradient direction) to form a circular pad with a 3-foot diameter and minimum 6-inch thickness for HPGe measurements at a 15cm detector height.

The same process described above will be followed for the native soil underlying the bedding material, at the same 50-foot intervals. The HPGe tripod measurement over the formed circular pad (positioned upgradient from the trench) will determine if this soil meets the radiological FRLs. The trench will be backfilled pending the results of the HPGe measurement on the soil pad.

2.4.3 Physical Sampling at Utility Trench Excavations

Physical sampling at utility trench excavations will be conducted at the circular soil pad described above (the trench base soil underlying the pipe and bedding material) and possibly from the bedding material as well. A sample of bedding material may be required for WAC attainment purposes if significant pipe leakage is evident. Following assessment by the Characterization Lead, this situation and the associated sampling requirements will be documented in a V/FCN. Standard sample collection methods and equipment will be used as identified in Procedure SMPL-01.

A soil sample will be collected from each circular soil pad following confirmation that the HPGe measurement indicates results are below the radiological FRLs. The physical sample will likewise determine if the trench base soil meets the radiological and chemical FRLs. These samples collected for trench certification purposes will be documented in a Certification PSP for the area.

2.5 PRECERTIFICATION OF FINAL EXCAVATION GRADES

Precertification will be performed at the base of all excavations once the design grade elevation has been reached, or a lower elevation if additional above-WAC and/or above-FRL soil areas required additional excavation. Precertification may be performed after the excavation contractor has moved from the general area (to minimize the disturbance of soil following precertification) or precertification may be performed without delay when design grade is reached (to avoid having to pump water that may accumulate in the excavation). The purpose of precertification scanning activities are to: 1) evaluate any patterns of residual surface soil contamination, 2) determine if soil excavation is necessary to pass certification, and 3) provide information to aid in establishing certification unit (CU) boundaries for the future CDL.

If *in situ* gamma measurements indicate COC concentrations are low enough to likely pass certification statistical analysis, then certification sampling will be initiated under a separate PSP. If not, the contaminated soil will be delineated and excavated appropriately prior to the initiation of certification activities.

For all precertification radium-226 measurements (HPGe or NaI equipment) a background radon monitor will be set up to correct the radium-226 measurement per Section 5.3 of the User's Manual. Additionally, a duplicate HPGe field measurement must be obtained for every 20 HPGe measurements obtained in an excavation area for quality control purposes.

Precertification requirements for technetium-99 and volatile organics COC are discussed in Sections 2.3.3 and 2.3.6, respectively.

2.5.1 Initial Precertification NaI Scan at Base of Design Grade

This section is written based on the presumption that an *in situ* gamma scan for above-WAC detection and above-FRL detection (based on the detection limits for NaI detectors) has been performed followed by any additional delineation and excavation of contaminated soil as follows. As part of the Excavation Lift Characterization phase of this PSP, a gamma scan will have been performed at the final design grade surface, or deeper, of each excavation area to verify that all above-WAC uranium soil was removed.

Additionally, any soil having radiological COC concentrations (uranium, thorium and radium) above the detection limit of the detector system, and thus indicating above-FRL, will also have been delineated and excavated.

If all radiological COC results are below applicable detection limits, then the characterization process will shift to the precertification phase. At this point HPGe measurements will be employed in each excavation area for either near 100 percent coverage or partial coverage (dependent on the uranium FRL for the area) at the areas of highest gross gamma counts based on the gamma scan. The coverage requirements will be based on whether the area has a uranium FRL of 20 ppm (high leachability zone) or 82 ppm (low leachability zone) as described in the sections below.

The precertification strategy relies on all of the NaI or HPGe surface scan data collected from a general excavation area throughout the duration of excavation activities, including the final scan data from the excavation floor as well as the scans performed on the sideslopes as excavation progressed. All of these data batches collected over several days or weeks will be assessed in their entirety to select locations for precertification HPGe measurements. However, it should be noted that the soil surfaces where much of the previous *in situ* gamma readings were collected will likely have been excavated as the excavation progressed deeper in order to maintain safe slopes. Therefore, the previous data should only be used as a guide to select the precertification HPGe locations. Alternatively, the Characterization Lead may determine that the entire sideslope of an excavation be re-scanned with the NaI system in order to initiate the precertification phase for selection of HPGe measurement locations.

2.5.2 Precertification HPGe Measurements in 20 ppm FRL (Uranium) Areas

The high-leachability soil areas where the applicable uranium FRL is 20 ppm will require 99.1 percent coverage with HPGe due to the fact that the NaI systems (RTRAK/RSS) cannot detect this concentration. In accordance with the User's Manual, a triangular grid system will be applied to each area to achieve nearly 99.1 percent coverage using a 1-meter detector height and an acquisition time of 15 minutes (Section 3.3.2 of the User's Manual). At the discretion of the Characterization Lead, a detector height of 31 cm may be used in some areas based on the size and number of elevated total activity zones and/or total uranium locations. If the HPGe identifies a total uranium, thorium-228, thorium-232, radium-226 or radium-228 concentration greater than the 2xFRL, additional readings will be obtained for further investigation as described below under the hot spot delineation discussion.

2.5.3 Precertification HPGe Measurements in 82 ppm FRL (Uranium) Areas

The areas having a uranium FRL of 82 ppm will involve a different precertification strategy than applied in the 20-ppm FRL areas. In the 82-ppm FRL areas, the NaI two-point running average results will be reviewed to determine the highest values to select the locations for precertification HPGe measurements. (This section assumes that any hot spots, using the NaI data that indicated any readings above the detection limits for the instrument, have already been further delineated and excavated as necessary). Since the CU boundaries will not be established under this Area 3A/4A PSP, the number of precertification HPGe measurements in each excavation area will be a function of the excavation area size. The Characterization Lead will make the determination of precertification HPGe locations using the following guidelines. At a minimum, one precertification HPGe measurement will be taken for every 62,500 ft^2 of surface area (the size of a Group 1 CU which is nominally 250 feet by 250 feet). The Characterization Lead will make the determination of where the precertification HPGe measurements will be located and the total number necessary within each 62,500 ft^2 area to adequately precertify the area. This decision will be based on the distribution and range of two-point running average values obtained during the NaI scan, the accessibility and surface condition of the area, and the overall assessment of the NaI scan results with respect to total uranium, thorium-228, thorium-232, radium-226, and/or radium-228 FRLs.

If any precertification HPGe measurement result is 2xFRL (at any detector height) at a 15-minute acquisition time, then the area will be considered a "hot spot" requiring delineation as described below.

2.5.4 Delineating Hot Spots Following Precertification HPGe Measurements

If a hot spot is identified during the precertification HPGe measurements (31-cm and/or 1-meter detector heights), then the area will be further delineated for excavation using the HPGe at a detector height of 15 cm and an acquisition time of 15 minutes. The results of the 1-meter and 31-cm HPGe readings at the hot spot along with surrounding HPGe results will affect how the delineation is carried out as determined by the Characterization Lead; however, the strategy must be consistent with guidelines documented in Section 3.3.3 of the User's Manual. Details of the hot spot delineation will be documented in a V/FCN.

During any hot spot delineation activity using the HPGe involving the determination of radium-226, a background radon monitor (HPGe) will be established near the area at the same elevation grade and detector height per Section 5.3 of the User's Manual.

2.6 MEASUREMENT INSTRUMENTATION AND TECHNIQUES

2.6.1 Sodium Iodide Data Acquisition (RTRAK, RSS, GATOR)

The overall use of this *in situ* gamma spectroscopy equipment for characterization is described in detail in the User's Manual. The RTRAK, RSS, GATOR, and EMS are all platforms for the NaI detector. The EMS is discussed in Section 2.6.3. The RTRAK is a modified diesel powered farm tractor. It is typically utilized for larger (approximately 0.25 acre and larger) flat areas that are readily accessible. The GATOR is a modified diesel-powered six-wheel utility vehicle and is utilized for both larger and smaller areas. The GATOR is capable of determining coordinates (X and Y) and elevation (Z) for measurement locations. The RSS is a modified jogging stroller and is utilized for smaller areas, gradual slopes, or areas not accessible by the RTRAK or GATOR. 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 RTRAK, RSS, or GATOR will be used to evaluate residual soil contamination.

The NaI detector has a minimum detection concentration of 246 ppm and can measure the COC at 3xFRL for total uranium (at 82 ppm FRL), thorium-232, and radium-226 (thorium-228 and radium-228 concentrations are inferred). The NaI detector is mounted at a fixed height of 31 cm on the various platforms. The NaI equipment single measurement action level requiring confirmation and delineation by the HPGe for total uranium WAC levels is 721 ppm with an acquisition time of 15 minutes.

2.6.2 HPGe Data Acquisition

The HPGe systems include an HPGe equipped EMS and tripod mount, both of which are used in a static mode. The EMS is further described in Section 2.6.3. 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 and easting coordinates and the approximate elevation for each excavation lift. The HPGe detector has a minimum detection concentration of approximately 6 ppm and can measure the COC at 3xFRL for total uranium, thorium-232, and radium-226 (thorium-228 and radium-228 concentrations are inferred).

The preferred equipment for use in areas which are difficult to access is the NaI equipped EMS. If the EMS is unavailable, the HPGe tripod will 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 Lead 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 Users 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 at the 1 meter detector height may be performed to confirm the NaI measurement, or the area excavated without further confirmation. If HPGe confirmation measurements are taken and the HPGe measurement meets or exceeds its action level (400 ppm) the area is identified as above-WAC and excavated.
If the area is small in size, confirmation measurements may be acquired using a HPGe detector height of 31 cm or 15 cm with a spectral acquisition time of 5 minutes at the suspect above-WAC location. If either the 31-cm or 15-cm confirmation measurement exceeds the action level of 928 ppm, then the area exceeding the action level shall excavated.

Confirming an above-WAC area with 15-cm and 31-cm HPGe measurements is at the discretion of the Characterization Lead or designee. 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 Lead or designee, with a V/FCN as described in Section 3.4.

Use of the HPGe during Precertification activities is described in Section 2.5.

2.6.3 Excavation Monitoring System

The Excavation Monitoring System (EMS) consists of either a NaI detector or an HPGe detector mounted to the boom of an excavator. The boom has an approximately 30 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 tripod 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.

2.6.4 Radon Monitor

A background radon monitor will be set up in the vicinity of the area in which HPGe and NaI 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 radioum-226 data.

2.6.5 Field Portable Gas Chromatograph

A field portable GC will be utilized in Area 3A/4A for analysis of the volatile organic COCs in the organic soil contamination areas as well as excavation water samples. The field GC will allow for rapid analytical turnaround, typically within a few hours of receipt in the field lab, which will minimize contractor delays regarding additional excavation or removal of excavation water as necessary. A manual headspace method analysis will be used in this application that involves the introduction of water to the soil sample of known mass, followed by mixing and controlled heating then withdrawal of the headspace gas which is injected directly to the instrument.

The on-site laboratory's method, Analytical Laboratory Services (ALS) Method 6549, Analysis of VOCs in Field Samples by Manual Headspace using a Field Portable GC, will be utilized for all analyses. Specifically, a PerkinElmer Voyager® portable GC will be used in conjunction with the ALS method.

This method is intended to result in Analytical Support Level (ASL) B level data once the hard copy of analytical data is produced through an interface with a computer and the stored data can be downloaded and printed utilizing the appropriate software programs (e.g., *SiteChart*® software created by PerkinElmer Photovac). The analytical results will be provided to the Characterization Lead immediately following the field analyses through the use of either a laboratory logbook or instrument data form generated in the field.

The field GC procedure is specifically designed for the following four volatile organic COCs:

- 1,1-Dichloroethene (1,1-DCE)
- 1,2-Dichloroethene (cis and trans isomers)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE).

The detection limits for soil samples will be well below each of the COC's respective FRL, the lowest of which is 0.41 milligrams per kilogram (mg/kg). For water samples, a detection limit of 50 μg/L for each COC is anticipated. At the time this PSP was being developed, laboratory testing was being performed to determine more exact detection limits for soil and water samples.

Quality control (QC) practices for the field GC will consist of an instrument calibration twice daily (start and end of day) and several prepared control samples. These QC samples include the analysis of a calibration verification check standard, a matrix spike, laboratory duplicate, and method blank sample for every ten field samples analyzed or daily if there are less than ten sample analyses per day.

Potential interference for the operation of the field GC includes exhaust from combustion engines and any other sources of volatile organic compounds in the ambient air. The method blank will serve to detect these interferences if present.

2.6.6 Surveying

Fluor Fernald Construction personnel will inform the Characterization Lead or designee when excavation of a lift area is complete and ready for *in situ* gamma spectroscopy measurements. The Characterization Lead will coordinate with the Surveying Lead to survey the defined lift area and its boundary, determine the elevation, and coordinate with the RTIMP Lead for the deployment of the appropriate real-time equipment. 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 sideslopes. 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 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 Leads or designees.

2.6.7 Surface Moisture Measurements

Surface moisture measurements are used to correct *in situ* 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., Troxler® moisture gauge or Zeltex® Infrared Moisture Meter) within 8 hours of the collection of the *in situ* 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.

In addition, at least one surface moisture measurement will be collected for each excavation lift that is approximately 0.5 acre (100 feet by 200 feet) in size or smaller. More than one moisture measurement can be collected for each lift if the surface moisture appears visibly different over the lift area. If more than one moisture measurement is obtained, the average of the measurements will be used to correct NaI real-time data for the lift. If a large difference in measurements is noted by the RTIMP Lead or designee, the data will be re-evaluated. When the HPGe is being used for confirmation, delineation or suspect above-WAC materials or areas, one surface moisture measurement will be collected and recorded at each HPGe measurement location.

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 data in wet conditions) may be used. The percent moisture information will be used to correct RTIMP data. Field moisture measurements and moisture-corrected data are discussed in detail in Sections 3.8 and 5.2 of the User's Manual.

2.6.8 Physical Sampling Approach and Methods

The PID will be used to survey the sideslopes of each excavation lift and the bottom and sideslopes at design depth grade of the excavation in above-WAC organics contamination zones. In above-FRL organics contamination zones, the PID will be used to survey the sideslopes and bottom of each excavation lift. These requirements are described in Table 2-3. In these areas, the collection of a physical sample for analysis with the field GC may be required when the action level of the PID is exceeded. This methodology is describe in Section 2.6.8.1 for above-WAC organics areas and Section 2.6.8.2 for above-FRL organics areas.

A physical sample for GC analysis is required from the floor and sideslopes at design depth in the above-WAC organics contamination zone. The results of this GC analysis are for WAO purposes. The methodology for this sampling is described in Section 2.6.8.1.

Physical samples for field GC analysis are required when the design depth of the excavation is reached in the above-FRL organics contamination zone. The results of this GC analysis are to determine that the soil is below-FRLs for the COCs. Section 2.6.8.2 describes this approach.

Section 2.6.8.3 describes the collection of physical samples for technetium-99 analysis.

The location of any physical samples will be surveyed. The collection of these physical samples will be documented by the Characterization Lead with a V/FCN as described in Section 3.4.

2.6.8.1 Sample Collection for Above-WAC Organics Determination

In above-WAC organic areas designated as requiring PID surveying in Table 2-3, the sideslopes of each excavation lift and the bottom and sideslopes at design depth grade of the excavation will be surveyed using a PID. No grid layout is necessary for this above-WAC organic screening, however the technician will utilize a method for tracking the area surveyed at their discretion. All PID measurements during the walkover survey will be taken at a height of three inches or less above the surface of the soil being monitored. As a general rule, the walkover survey rate will be equivalent to covering a 20-foot by 20-foot area in approximately 5 minutes. If the WAC action level for the PID is exceeded, then the Characterization Lead may direct further excavation or may request the collection of a physical sample for field GC analysis from the location (within the top three inches of soil surface) which exceeded the PID WAC action level. The location of the PID survey result exceeding the action level sample will be documented on the appropriate field log. If a physical GC sample is collected, this location will be documented on the appropriate field log and surveyed for coordinates and elevation. This physical sample will be analyzed to determine if the soil contains above-WAC COCs. Further excavation may be required based on the results of the field GC per Section 2.3.2 and Section 2.3.6.

Additionally, at design depth in an above-WAC organic area, physical GC samples must be collected for WAO purposes. The floor of the excavation will be visually divided into quarters and a physical sample collected from the centerpoint of each quarter. The sample will be analyzed with the field GC and the results assessed for WAO purposes.

PID surveying will be done in accordance with Procedure EQT-04. GC samples will be collected in accordance with Procedure SMPL-01 except requirements concerning generation of the chain of custody. A chain of custody form is not required for GC samples since the field analyst operating the portable GC unit is considered part of the field characterizing team. The sample remains in physical possession of the team until it is exhausted or disposed. If the sample must be transferred to a person who is not part of the field characterizing team (e.g., on-site laboratory, radiological technician, etc.) then a chain of custody must be generated per Procedure EW-0002, Chain of Custody/Request for Analysis Record for Sample Control, for the GC sample. The volatile organic analyses of the samples using the field GC will be done in accordance Section 2.6.5 and the referenced methods.

2.6.8.2 Sample Collection for Above-FRL Organics Determination

In the above-FRL organic areas designated as requiring PID surveying for above-WAC determination in Table 2-3, the sideslopes and bottom of each excavation lift will be surveyed using a PID. No grid layout is necessary for this above-WAC organic screening, however the technician will utilize a method for tracking the area surveyed at their discretion. All PID measurements during the walkover survey will be taken at a height of three inches or less above the surface of the soil being monitored. As a general rule, the walkover survey rate will be equivalent to covering a 20-foot by 20-foot area in approximately 5 minutes. If the WAC action level for the PID is exceeded, then the Characterization Lead may direct further excavation or may request the collection of a physical sample for field GC analysis from the location (within the top three inches of soil surface) which exceeded the PID WAC action level. The location of the PID survey result exceeding the action level sample will be documented on the appropriate field log. If a physical GC sample is collected, this location will be documented on the appropriate field log and surveyed for coordinates and elevation. This physical sample will be analyzed to determine if the soil contains above-WAC COCs. Further excavation may be required based on the results of the field GC per Section 2.3.2 and Section 2.3.6.

Confirmatory volatile organic physical sampling will be required on the floor and sideslopes at design depth in above-FRL organics contamination zones as summarized in Table 2-3. This physical sampling will be accomplished by:

- Surveying and lay-out of a grid over the excavation area,
- Performing a walk-over survey with a PID in each grid block and marking the highest result location, and
- Collecting physical samples for volatile organic field GC analysis within each grid block.

A systematic grid of 20-foot by 20-foot blocks will be established over the excavated area using either land survey methods or manual field measurement methods. The grid squares or blocks will encompass the floor of the excavation as well as the sloped sideslopes up to the elevation that corresponded to the top of the lift prior to excavation. The boundary or intersection points of each grid block will be marked in the field to guide the sampling team. At a minimum, particularly for very small excavation areas, five (5) physical samples should be collected from each excavation area to include a sample from each excavation face or plane (e.g., one sample from each sideslope and one sample from the excavation floor).

To identify any areas of volatile organic compounds emanating from the recently excavated soil surface, a walkover survey of each grid block will be performed using a PID in accordance with Procedure EQT-04. This PID field survey will be performed under conditions that meet the manufacturer's operating specifications. The person performing the PID survey will attempt to conduct a five-minute survey within each 20-foot by 20-foot grid block, covering as much of the grid block as possible within the limits of the instrument's recommended survey rate. The PID measurement will be taken at a height of three inches or less above the surface of the soil being monitored.

The highest PID survey reading obtained within each grid block will be marked or flagged by the sampling team for collection of a physical soil sample for field GC analysis of the volatile organic COCs. This sample will be collected from the top 3 inches of soil surface and placed in a volatile organic analysis (VOA) sample container in a manner to minimize any headspace as described in SMPL-01. Analysis will be performed within the hold time specified in Table 2-4.

If no elevated PID measurements are detected during the survey of a particular grid block, then the sampling team will select the center point within the grid block for sample collection using the aforementioned collection/containerization methods. Any grid block containing standing water will be pumped out to allow for the PID survey and sample collection to the extent practical as determined by the Characterization Lead. If the volume of water is not conducive to removal (too shallow), the VOA soil sample may be collected from beneath the water surface, if possible, for the affected grid blocks.

Due to the anticipated difficulty in accessing some excavated areas (steep and possibly wet side slopes), it is essential that only a limited number of field personnel enter the area to minimize the risk of injury. Therefore, the method for establishing the systematic grid within the excavation area will be determined on a case-by-case basis. The grid may be established and laid out by the land survey team, using the appropriate grid block size as directed by the Characterization Lead, using GPS, total station or other type survey instruments and procedures. Alternatively, the sampling team may lay out the grid using conventional or physical distance measurements (wheel measurement or tape measure) which will provide adequate accuracy for confirmatory grid sampling purposes. If this approach is used, the sampling team will create a field sketch of the excavation area and approximate location of the grid across the area. At a minimum, the sample points that exceed the FRL limit will be surveyed to record the northing and easting coordinates and elevation.

PID surveying will be done in accordance with EQT-04. GC samples will be collected in accordance with Procedure SMPL-01 except requirements concerning generation of the chain of custody. A chain of custody form is not required for GC samples since the field analyst operating the portable GC unit is considered part of the field characterizing team. The sample remains in physical possession of the team until it is exhausted or disposed. If the sample must be transferred to a person who is not part of the field characterizing team (e.g., on-site laboratory, radiological technician, etc.) then a chain of custody must be generated per Procedure EW-0002. The volatile organic analyses of the samples using the field GC will be done in accordance Section 2.6.5 and the referenced methods.

2.6.8.3 Sample Collection for Technetium-99 Determination

Since technetium-99 cannot be measured with the HPGe, physical samples must be obtained from areas where technetium-99 was a COC. Areas requiring technetium-99 sampling may include sideslopes of each lift and sideslopes and bottom when design depth is reached. See Section 2.3.2 and Table 2-3 for applicability of technetium-99 sampling.

A 20-foot by 20-foot systematic grid system will be established over the excavation area (sideslopes or floor/sideslopes as appropriate). A physical sample for technetium-99 analysis will be collected from the 0 to 6-inch depth from the approximate center point of each grid block.

Due to the anticipated difficulty in accessing some excavated areas (steep and possibly wet side slopes), it is essential that only a limited number of field personnel enter area to minimize the risk of injury. Therefore, the systematic grid will be laid out by the sampling team using conventional or physical distance measurements (wheel measurement or tape measure), which will provide adequate accuracy for confirmatory grid sampling purposes. The final sample collection points (center point of each grid) will be surveyed to record the coordinate location. Alternatively, if a particular excavated area is sufficiently dry and accessible with minimal risk, the land surveying and mapping personnel may determine the center point sample locations in lieu of manual field distance measurements.

The sample collection methods detailed in Procedure SMPL-01 will be followed for the collection of these samples. A chain of custody must be generated per Procedure EW-0002 for technetium-99 samples. The container and sample handling requirements for technetium-99 are summarized in Table 2-4. Sample identification for these technetium-99 samples will follow the system described in Section 2.6.9.

2.6.9 Measurement Identification

All excavation monitoring measurements (both real-time monitoring and physical samples) will be assigned a unique identification for data tracking purposes. There are three essential components in the numbering scheme:

- Excavation area
- Measurement Instrumentation
- Measurement type.

These components, combined with additional designators and differentiated by their location (northing, easting, and elevation) and time, will allow for unique identification. Following is a list of components and associated designators that will be used in some combination for all WAC, FRL, and precertification measurements.

1.	Excavation area:	3A = Remediation Area 3A 4A = Remediation Area 4A
2.	Measurement Instrumentation:	RSS = NaI Gamma scan by RSS RTK = NaI Gamma scan by RTRAK GTR = NaI Gamma scan by GATOR EMN = Excavation Monitoring System (with NaI detector) EMH = Excavation Monitoring System (with HPGe detector) HPG = Gamma scan by High Purity Germanium Detector G = Portable Gas Chromatograph LTC = Laboratory technetium-99 analysis RDN = Radon monitor
3.	Measurement Type:	SF = Scanning or sampling done at the surface or following removal of surface concrete, asphalt or gravel L = Lift (where used) SS = Side Slope 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)
TW = Trench Wall
TM = Trench Bedding Material
TA = Additional excavation below trench bedding material (if required)
TF = Trench final grade
SM = Special Material
WA = Excavation water from Incinerator Pad area
WB = Excavation water from Maintenance Building area
WC = Excavation water from Plant 6 area

4.	Lift or additional grade sequence	Designates the lift, additional grade below design grade (where required, or additional trench floor excavation (where required) sequence with the first completed lift, additional grade, or additional trench floor excavation starting as 1 and the following as 2, etc.
5.	HPGe, EMH, GC, Radon, Tc-99, or SM Measurement Number:	Designates the sequential numbering of High-Purity Germanium Detector, Excavation Monitoring System (with HPGe detector), field-portable Gas Chromatograph, Radon Monitor, laboratory Tc-99, or Special Material measurements from the excavation. The first measurement in each category taken from within the excavation area is 1 and any subsequent measurements in the same category and excavation area are numbered sequentially (2, 3, 4, etc.)
6.	RMS Batch Number (if applicable):	Sequential numbering of RMS analytical runs. Separate sequence numbering will apply to each NaI scanning system, including RSS, RTRAK, GATOR, and EMS (when equipped with NaI detector)
7.	Quality Designators (as necessary):	D = duplicate measurement
8.	Trench Wall Orientation (as required):	E = east W = west S = south N = north

Using these guidelines, the unique identification scheme for the various measurement techniques is as follows:

A) Area 3A RTRAK surface measurement identification using designation categories 1, 2, 3 and 6.

Example: 3A-RTK-SF-3481, where:

3A = Excavation Area
RTK = NaI Gamma scan by RTRAK
SF = Surface area (or area formerly covered with gravel, asphalt, or concrete)
3481 = RTK batch number

B) Area 4A RSS slope surface measurement identification using designation categories 1, 2, 3, 4 and 6.

Example: 4A-RSS-SS-L2-3491, where:

4A = Excavation Area
RSS = Gamma scan by RSS
SS = Side slope area, following:
L2 = second lift from surface elevation
3491 = RSS batch number

C) Area 3A HPGe design grade measurement identification using designation categories 1, 2, 3, 4 and 5.

Example: 3A-HPG-DG-L4-21, where:

3A = Excavation Area
HPG = Gamma scan by HPGe
DG = Design grade surface, following:
L4 = fourth lift from surface elevation
21 = twenty-first HPGe measurement of 3A excavation area

D) Area 4A Excavation Monitoring System scan with HPGe detector measurement of trench wall using designation categories 1, 2, 3, 5, 7 and 8.

Example: 4A-EMH-TW-8-N-D, where:

4A = Excavation Area
EMH = Excavation Monitoring System scan using HPGe detector
TW = Trench wall
8 = eighth EMS HPGe measurement of 4A excavation area
N = north wall of trench
D = duplicate measurement

E) Area 3A field portable GC measurement of trench bedding material using designation categories 1, 2, 3 and 5. Note: Dashes are omitted in sample measurement identifications using the portable gas chromatograph due to sample ID limitation of eight characters in system software.

Example: 3AGTM12, where:

3A = Excavation Area
G = Portable gas chromatograph measurement
TM = Trench bedding material
12 = twelfth gas chromatograph measurement of 3A excavation area

F) Area 4A physical laboratory technetium-99 final grade measurement identification using designation categories 1, 2, 3 and 5.

Example: 4A-LTC-FG-9, where:

4A = Excavation Area
LTC = Laboratory measurement for technetium-99
FG = Final grade of excavation area
9 = ninth laboratory technetium-99 measurement in 4A excavation area

G) Area 4A special material measurement identification using designation categories 1, 2, 3 and 5.

Example: 4A-HPG-SM-5, where:

4A = Excavation Area
HPG = Gamma scan with High Purity Germanium detector
SM = Special material
5 = fifth HPGe measurement in 4A excavation area

H) Area 3A Radon Monitoring measurement identification using designation categories 1, 2 and 5.

Example: 3A-RDN-A-3, where:

3A = Excavation Area
RDN = Radon monitor measurement
A = 100 cm detector height (B=31 cm, C=15 cm detector height)
3 = third radon monitor measurement in 3A excavation area

I) Area 3A Excavation Water measurement identification using designation categories 1, 2, 3 and 5.
Note: Dashes eliminated for portable GC measurement identifications.

Example: 3AGWA6, where:

3A = Excavation Area
G = Portable gas chromatograph measurement
WA = Excavation water from Incinerator Pad area
6 = sixth portable GC measurement in 3A excavation area.

J) Area 4A subsurface soil organics sample using designation categories 1, 2, 3, 4 and 5. Note: Dashes eliminated for portable GC measurement identifications.

Example: 3AGL384, where:

3A = Excavation Area
G = Portable gas chromatograph measurement
L3 = third soil lift from surface elevation
84 = eighty-fourth portable GC measurement within the 3A excavation area

2.7 DATA MAPPING

As the Survey and RTIMP Teams acquire measurements, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps or HPGe data summary printouts will be generated for the RTIMP and Characterization Leads or designees. Maps will be generated depicting the following, unless otherwise specified by the Characterization Lead or designee:

2.7.1 Surface Scan Coverage Map(s)

- RMS Total Uranium Map (single spectra coverage) – used for WAC determination
- RMS Total Counts Map (single spectra coverage) – used to determine where HPGe measurements will be taken for FRL determination
- COCs Concentration Maps – radium-226 and thorium-232 (2-point NaI running average to determine potential hot spots exceeding 3xFRL) depicting 1xFRL, 2xFRL, and 3xFRL concentrations in all areas. Total uranium concentrations will be depicted at 1xFRL, 2xFRL, and 3xFRL inside and outside the high leachability areas
- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement.

Note: HPGe location map can be combined with the previous maps if needed.

2.7.2 HPGe Confirmation/Delineation Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement.

2.7.3 Hot Spot Post Removal Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement.

The map and/or HPGe Data summary printouts will be used to provide the Characterization Lead or designee with information to determine if additional scanning or confirmation measurements are required.

TABLE 2-1
AREA 3A/4A COCS, LIMITS AND CHARACTERIZATION METHODS

Area 3A/4A COCs	COC Category	WAC Maximum Concentration	FRL
Total Uranium (inside a high-leachability area)	Primary	1030 mg/kg	20 mg/kg
Total Uranium (outside a high-leachability area)	Primary	1030 mg/kg	82 mg/kg
Thorium-228	Primary	N/A	1.7 pCi/g
Thorium-232	Primary	N/A	1.5 pCi/g
Radium-226	Primary	N/A	1.7 pCi/g
Radium-228	Primary	N/A	1.8 pCi/g
Technetium-99	Secondary	29.1 pCi/g	30 pCi/g
Tetrachloroethene (PCE)	Secondary	128 mg/kg	3.6 mg/kg
Trichloroethene (TCE)	Secondary	128 mg/kg	25 mg/kg
1,1- and 1,2-Dichloroethene (DCE)	Secondary	11.4 mg/kg	0.41 mg/kg
Aroclor-1254	Secondary	N/A	0.13 mg/kg
Beryllium	Secondary	N/A	1.5 mg/kg

[a] Portable GC is capable of detection limits below the DCE, TCE and DCE FRLs; samples will not be collected during precertification phase since achievement of the FRLs would have been confirmed during the sampling event at the design depth of the above-FRL organics zone.

TABLE 2-2
AREA 3A/4A ABOVE-WAC AREAS, RCRA SOIL AREAS AND COCS

Location	Contaminant	Depth Interval
Area 3A		
Northeast Corner – South of Haul Road	Total Uranium	0-2 feet
Southeast Corner Plant 9	Total Uranium Technetium-99	0-12 feet
Between Plant 9 and Plant 6	Total Uranium Technetium-99	0-2.5 feet
Incinerator Pad – Northwest Upper Corner	Total Uranium	0-5 feet
Incinerator Pad – Southwest Upper Corner and Technetium-99 Corner	Total Uranium Technetium-99	0-1 foot
Incinerator Pad – Shallow Above-WAC Organic Area	1,2-Dichloroethene 1,1-Dichloroethene Tetrachloroethene	0-2 feet
Incinerator Pad - Deep Above-WAC Organic Area	1,2-Dichloroethene 1,1-Dichloroethene Tetrachloroethene	6-14 feet
Incinerator Pad - North and East	Total Uranium Technetium-99	0-2 feet
Maintenance Building – Storage Pad (RCRA Soil)	Trichloroethene	2-9 feet
Area 4A		
Northeast Plant 6	Total Uranium Technetium-99	0-6 feet
North Central Plant 6	Total Uranium Technetium-99	0-2 feet
South Plant 6	Total Uranium Technetium-99	0-11 feet
East Plant 6	Total Uranium Technetium-99 Tetrachloroethene	0-11 feet
Shallow East Plant 6	Total Uranium	0-2 feet

TABLE 2-3
EXCAVATION MONITORING/SAMPLING REQUIREMENTS

Type of Contamination Zone	Types of Samples/Measurements and Data Use		
	Sideslope of Each Excavation Lift	**Floor of Each Excavation Lift**	**Floor/Sideslope at Design Depth for Contamination Zone**
Above-WAC Organics (RCRA Characteristic Area)	• PID (for WAC)*** • NaI for Uranium WAC*	• None	• PID (for WAC)*** • VOC Sample (GC) (for WAO purposes, required for floor only) • NaI for Uranium WAC*
Above-FRL Organics	• PID (for WAC)*** • NaI for Uranium WAC*	• PID (for WAC)*** • NaI for Uranium (WAC)	• VOC Sample (GC) (for FRL)** • NaI for Uranium WAC*
Above-WAC/FRL Tc-99	• Physical Tc-99/Lab (for WAC) • NaI for Uranium WAC*	• None	• Physical Tc-99/Lab (for WAC) • NaI for Uranium WAC*
Above-WAC Uranium	• NaI for Uranium WAC	• None	• NaI for Uranium WAC • NaI or HPGe (for Uranium WAC) (for WAO purposes)
Above-FRL Uranium	• NaI for Uranium WAC*	• NaI for Uranium (WAC)	• NaI for Uranium WAC/FRL*

* During NaI uranium WAC scan, the data collected will be evaluated later for precertification purposes by reviewing concentrations of thorium-232 and radium-226, as well as thorium-228 and radium-228 based on equilibrium, in comparison to their respective FRLs.

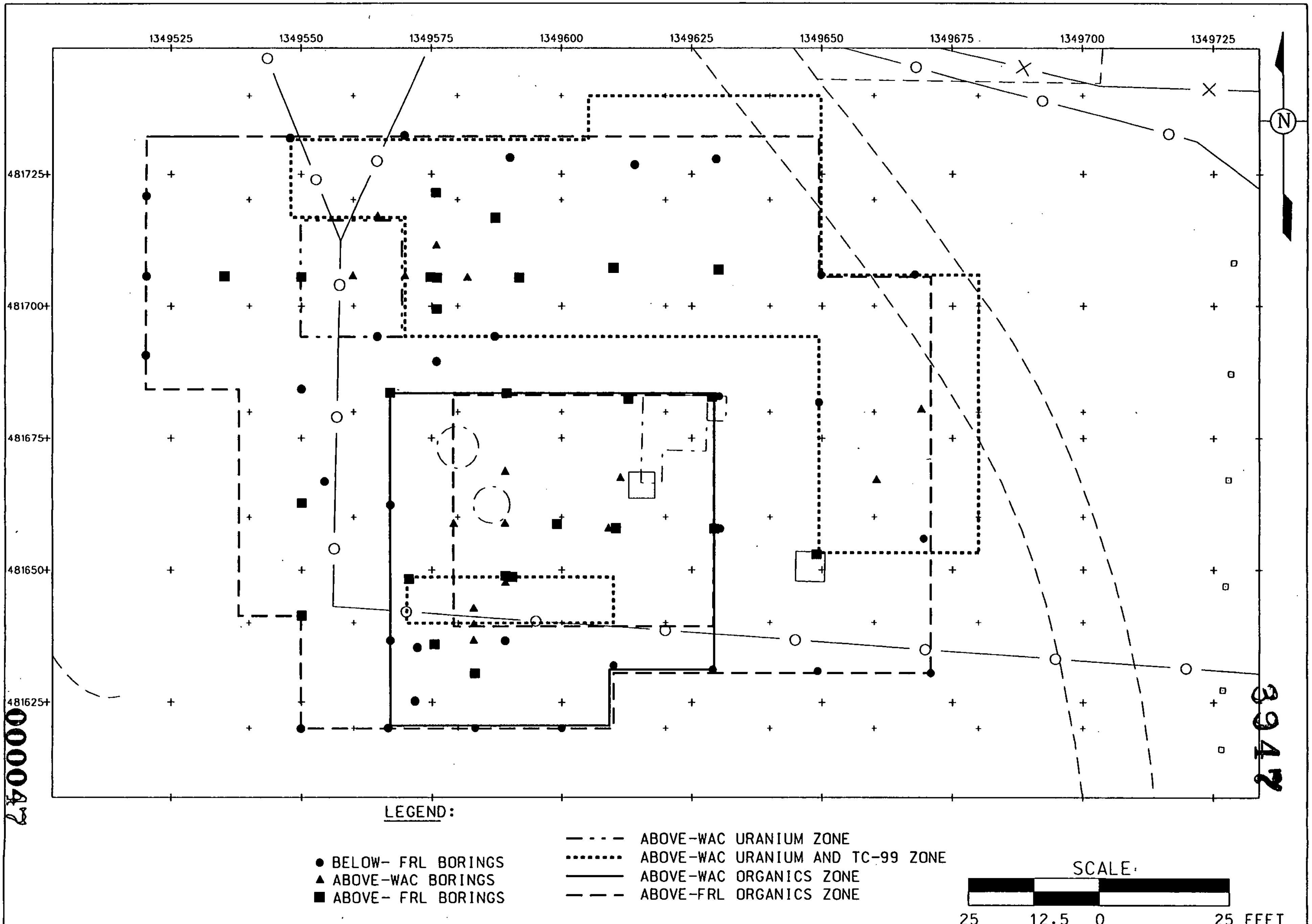
** At the design depth of above-FRL organics contamination zone, the collection of physical samples for field GC analysis is required unless further excavation beyond the above-FRL organics contamination zone is required because of the presence of another COC (e.g., above-FRL uranium contamination zone).

*** If an action level for the PID is exceeded, then further excavation may occur or a physical sample for field GC analysis may be collected at that location to determine if the soil contains above-WAC COCs.

TABLE 2-4
ANALYTICAL SUMMARY TABLE

Analysis (ASL B)	Method	Sample Matrix	Lab	Preserve	Holding Time	Container Type[a]	Sample Mass (wet)
Technetium-99	Gross Beta	Solid	On-site	None	12 months	120 ml (glass or plastic)	50 grams
VOCs: 1,1- and 1,2-Dichloroethene (DCE) Trichloroethene (TCE) Tetrachloroethene (PCE)	Field GC	Solid	Field GC	Cool 4°C	14 days	1 - 60-ml glass with teflon-lined lid	Fill to minimize headspace
VOCs: 1,1- and 1,2-Dichloroethene (DCE) Trichloroethene (TCE) Tetrachloroethene (PCE)	Field GC	Water	Field GC	Cool 4°C	7 days	2 - 40-ml glass with teflon-lined septa	120 ml

[a]Container volumes and types are for guidance only, substitutions may be made, as needed.



v:#5cj31#dgn#bmp#3a4a_pre_002.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-1. ABOVE-WAC AND ABOVE-FRL AREAS AT THE INCINERATOR PAD

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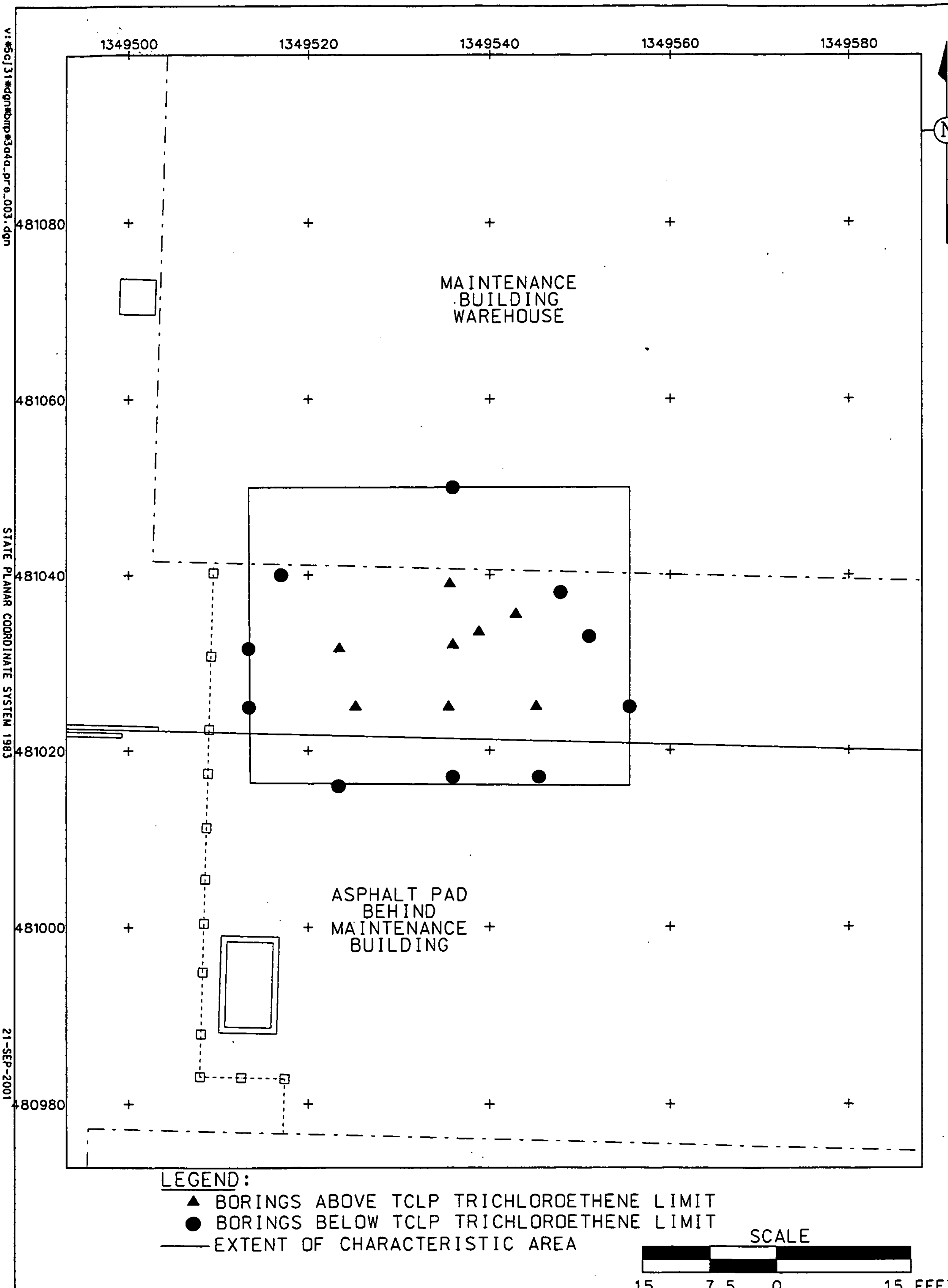
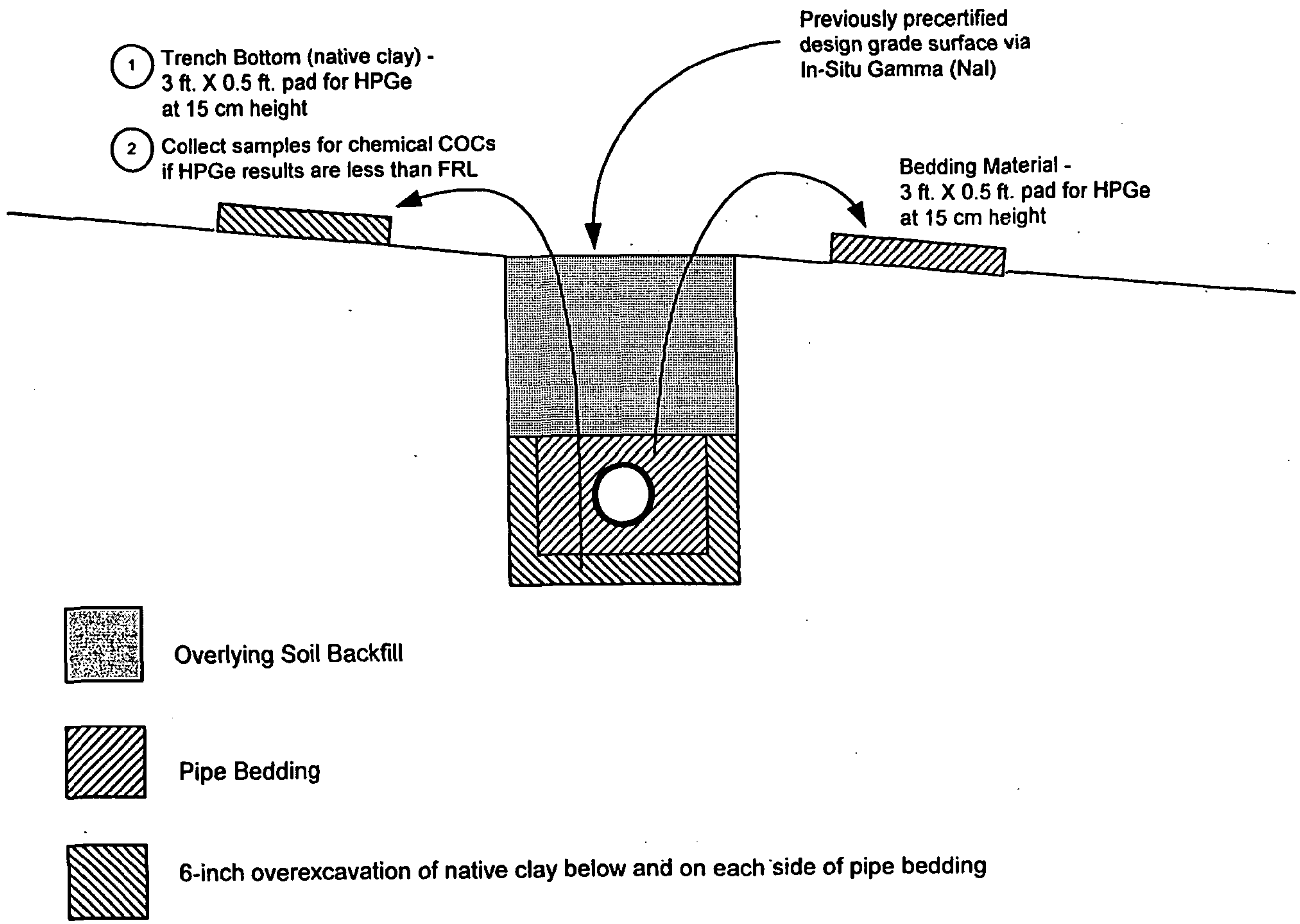


FIGURE 2-2. EXTENT OF THE CHARACTERISTIC AREA BEHIND THE MAINTENANCE BUILDING



Note: Physical sampling of bedding material required only if pipe leakage is evident. To be documented via V/FCN procedure.

FIGURE 2-3: UTILITY TRENCH CHARACTERIZATION BEYOND DESIGN DEPTH USING HPGe TRIPOD OPTION

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

3.1 *IN SITU* GAMMA MEASUREMENTS AND SAMPLING

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-056, Revision 0, and SL-055, Revision 0 (Appendix A), all precertification and all WAC attainment real-time measurements will be classified as ASL A.

For physical sampling for volatile organic COCs and technetium-99, one field duplicate sample will be collected for every 20 samples. The field duplicate will be collected using a co-located sampling point within 6 inches of the corresponding field sample location. Refer to Section 2.6.5 for laboratory quality control sample description for volatile organic COCs. No rinsates are required for any field sampling equipment, however, all equipment shall be decontaminated by Level II methods as outlined in the applicable sampling procedure.

3.2 APPLICABLE DOCUMENTS, METHODS AND STANDARDS

Excavation characterization activities described in this plan shall follow the requirements outlined in the following documents, procedures, and standard methods (including the latest revision of each document):

- ALS Method 6549, Analysis of VOCs in Field Samples by Manual Headspace using a Field Portable GC
- ALS 5507, Drying and Grinding Solid Samples in Preparation for Laboratory Analysis
- 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
- EQT-04, Photoionization Detector
- 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
- RTIMP Administrative Manual, RTIMP-M-001
- RTIMP Field Manual, RTIMP-M-002
- SMPL-01, Solids Sampling
- SMPL-02, Liquids and Sludge Sampling
- Implementation Plan for Area 3A/4A
- Sitewide Excavation Plan (SEP)
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site (Users Manual)

- Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality (SCQ) Assurance Project Plan
- In-Situ Gamma Spectroscopy Addendum to the Sitewide CERCLA Quality Assurance Project Plan
- RTIMP Quality Assurance Plan
- OSDF Impacted Materials Placement Plan
- WAC Attainment Plan for the OSDF
- DQO SL-048, Delineating the Extent of Constituents of Concern in Pre-Design Investigation and Remediation Sampling
- DQO SL-054, Real Time Precertification Monitoring

3.3 SURVEILLANCES

Project management has ultimate responsibility for the quality of the work processes and the results of the scanning activities covered by this PSP. The FEMP Quality Assurance (QA) organization may conduct independent assessments of the work process and operations to assure the quality of performance. The assessment encompasses technical and procedural requirements of this PSP and the SCQ. Independent assessments may be performed by conducting surveillances.

3.4 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, a V/FCN will be developed and approved by the Characterization Lead, QA Representative, and WAO. In the event that changes need to be implemented expeditiously, verbal approval will suffice followed by the written approvals on the V/FCN within seven working days of the verbal approval. 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 Soil and Disposal Facility Project (SDFP) agreements.

4.0 SAFETY AND HEALTH

Personnel will conform to precautionary surveys by FEMP personnel representing the Utility Engineer, Industrial Hygiene, Occupational Safety, and Radiological Control. All work performed on this project will be performed in accordance with applicable Environmental Monitoring project 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. All personnel in the performance of their assigned duties require concurrence with applicable safety permits.

A walk-down of the area by representatives from SDFP Characterization, RTIMP and the EM/Soil and Miscellaneous Media Sampling (SMMP) groups may be required to determine the type of *in situ* gamma spectroscopy equipment to use and if the excavation lift area is ready measurements or physical sampling (i.e., accessible by RTIMP equipment, boundaries marked or readily visible, no operating heavy duty equipment within 50-foot buffer zone, no excessive moisture or puddles, no soft spots, free of obstructions or depressions that might damage equipment, reasonable grade and slopes).

Three safety work zones will be utilized for the Area 3A/4A excavation activities for the safety of the field characterization staff working in contaminated areas in conjunction with heavy equipment operations:

- Zone 1 - within 25 feet of active loading, dumping operations or potential airborne generating activities; defined in the field by Radiological Control and Safety and Health; requires at a minimum full anti-contamination clothing (anti-Cs), hard hat, traffic safety vest, and steel-toed shoes. The requirement for full face air purifying respirators will be evaluated by Radiological Engineering and Industrial Hygiene.

- Zone 2 - remainder of 3A/4A contamination area; denoted by Radiological Control with yellow construction type fence and/or yellow rope with radiological control signs; requires at least full anti-Cs, safety glasses, hard hat, traffic safety vest, and steel-toed shoes

- Zone 3 - outside of 3A/4A contamination area but within the 3A/4A construction area (denoted with orange construction fencing) where construction-related activities occur (i.e., equipment maintenance, fueling, unloading of supplies, etc.); defined by Safety and Health; PPE for this zone is activity driven, but generally consists of safety glasses, traffic safety vest, hard hat and steel-toed shoes.

All personnel performing measurements related to this project will be briefed on the Contractor Safe Work Plan or Traveler Package for Area 3A/4A. This briefing will be documented. Personnel who are not documented as having completed this briefing will not participate in the execution of field activities related to Area 3A/4A. 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, the Competent Person for Trenching and 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.

Section 5.0 of the Area 3A/4A IP provides direction on health and safety documentation requirements (e.g., project-specific Environmental Safety and Health and Training Requirements Matrix, contractor requirements, etc.).

All emergencies shall be reported immediately on extension 911, or to the Site Communications Center at 648-6511 (if using a cellular phone), or using a radio and contacting "CONTROL" on Channel 11.

5.0 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. Sample material, including archived certification samples that are no longer needed, will be managed per PWID #555 or 580, as appropriate. Generation of decontamination waters will be minimized in the field, and whenever possible, equipment will be decontaminated at the facility that discharges to the AWWT Facility. 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 PWID.

All soil wastes generated from the field GC analyses will be dispositioned to the above-WAC organic soil pile 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 an 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.

6.0 DATA AND RECORDS MANAGEMENT

6.1 REAL-TIME

The RTIMP group will provide hard copy maps and/or summary reports to the Characterization Lead and Data Management Contact or designees. All real-time data collection (NaI and HPGe) will be collected and reported at ASL A. All electronically recorded field data will have the RMS or HPGe Data Verification Checklist (Section 5.4 of the Users Manual), which will be completed after each data collection event. Field documentation, such as the Nuclear Field Density/Moisture Worksheet, will be reviewed by the RTIMP.

Electronically recorded data from the GPS, HPGe, and NaI systems will be downloaded on a daily basis to disks or to the Local Area Network (LAN) using the Ethernet connection. The Characterization Lead 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 Lead or designee will determine whether additional scanning, confirmation, or delineation measurements are required.

Once the electronic data has been placed on the LAN and SED, the Data Management Contact will perform an evaluation of the data. The evaluation may involve a comparison check between the typical information sheet such as the example Excavation Request, electronic data, hard copy maps and summary reports for accuracy and completeness. The evaluation will be documented on the Excavation Monitoring Real-Time Electronic Data Quality Control checklist by the Data Management Contact, dated and signed (see Figure 6-1).

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 Lead or Data Management Contact upon request and maintained in SDFP project files until archived by Engineering/Construction Document Control (ECDC). RTIMP will maintain all the real-time files and 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 forwarded to ECDC to be placed in the project file.

6.2 TECHNETIUM-99 SAMPLES

All physical samples will be collected and reported at ASL B. Field data packages will consist of the chain of custody form, field activity logs, and sample collection logs. 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. A minimum of 10 percent of data packages will be forwarded to the Remediation Data Quality group for validation at ASL B. All analytical data and data validation qualifiers will be transferred (from FACTS) or entered into the SED per existing procedures. The evaluation will be documented by the Data Management Contact or designee by electronic approval within the database and by completion of the Data Group Form.

6.3 FIELD GC SAMPLES

The analyst operating the field GC will provide hard copy printouts of the SiteChart Analysis Report and spreadsheet printouts to the Data Management Contact or designee. All Field GC data will be collected and reported at ASL B.

The Field GC Checklist will be completed by the analyst operating the field GC after each data collection event. Electronically recorded data from the field GC system will be downloaded on a daily basis to disks or to a designated directory LAN. Electronic data will consist of data files to be loaded into the SED and electronic images of printouts in specified format (.pdf). The Characterization Lead or designee will be informed by analyst, if the Field GC equipment measurements do not meet Field GC Checklist criteria. The Characterization Lead or designee will determine whether additional measurements are required.

Associated GPS or survey data for each sample location will be collected by the Survey Lead or designee. Electronic files containing survey data will be placed in a designated directory on the LAN. This survey data will be linked to the GC results prior to being loaded into the SED.

Once the electronic data (data files, electronic images of printouts, and associated GPS or survey data for each sample location) has been placed on the LAN it will be loaded into the SED. Data Management Contact or designee will perform an evaluation of the data. The evaluation may involve a comparison check between electronic data, hard copy and summary reports for accuracy and completeness. The evaluation will be documented by the Data Management Contact or designee by electronic approval within the database and by completion of the Data Group Form.

Field data packages for Field GC data will consist of field activity logs and sample collection logs. All field data packages associated with field GC sampling will be independently validated. The original field data packages will be filed and controlled by the Sample and Data Management department.

The original completed Data Group Form, hard copy printouts of the SiteChart Analysis Report and associated spreadsheet printouts will be forwarded to WAO for placement in the WAO project files. The Survey Lead or designee will maintain survey data. All records associated with this PSP should reference the PSP number and eventually be forwarded to ECDC to be placed in the project file.

PSP/Project #:____________________

Batch Numbers:____________________

HPGe file Numbers:____________________

FIGURE 6-1
EXCAVATION MONITORING REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

3947

#	ITEM TO BE CHECKED	✔ or No	Modification/Correction with explanation	Date Corrected
1	Receive the Characterization Request form, Excavation Monitoring Form (EMF), coverage maps, real-time verification checklist, and/or HPGe parameter summary report from the Characterization field personnel			
2	Verify the signatures and all blanks on the EMF are complete through Section 6 and complete on the Real-Time Verification Checklist			
3	Check loader to ensure the data transferred from the LAN to the SED (if the data files are in the SED, the loader is working properly)			
4	Check to ensure data transferred into the correct fields by looking at the data on the LAN in comparison with the data transferred to the SED (to verify this, all data fields for a few runs in each file will be reviewed)			
5	Check that the project number is correct and is consistent on the EMF, the LAN, and the SED in both the worksheet files and the results/data files			
6	Check that the EMF, the LAN, and the SED have the correct location identifier in both the worksheet files and the results/data files			
7	Check that worksheet on the LAN and in the SED have the correct elevation documented from the surveying group			
8	Verify northing and easting coordinates, look at the plotted map and the coordinates in the SED and verify the coordinates are within the boundary on the plotted map			
9	Check data files to ensure all files are received			
10	Attach this checklist and documentation for modifications to the EMF, initial and date all forms and documentation		X	X
11	Insert USE into the "QC Field" on the SED after all this has been checked and verified correct		X	X

Sign and Date____________________

PSP/Project #:____________________

Batch Numbers:____________________

HPGe file Numbers:____________________

1. If no, check with the Characterization Lead or designee to get needed forms.

2. If no, contact Characterization Lead and return EMF to be completed and/or signed.

3. If no, check with SED Database Manager (ext. 7544) to find out why.

4. If no, check with the Real-Time Field Lead to see if any additional fields were added. If so, call SED Database Manager (ext. 7544) to have the field added into the SED tables. If not, check with SED Database Manager (ext. 7544) to see why the fields loaded incorrectly.

5. If no, verify the correct project number with the Characterization Lead and insert the project number into the worksheet on the LAN and the worksheet in the SED; attach the documentation to the form.

6. If no, verify with the Characterization Lead the correct identifier and correct the identifier both in the worksheet on the LAN and in the SED; attach the documentation to the form.

7. If no, check with the Surveying group to verify the elevation; If incorrect, change the elevation in the worksheet on the LAN and in the SED and attach the documentation to the form.

8. If no, check with Characterization Lead or designee to resolve the problem.

9. Run query in SED. The number of RTRAK/RSS files can be checked with the number of records (files) listed in the SRDIG directory under Real-Time Lab View files. No sequential gaps are anticipated; if gaps are found, check with the Real-Time Field Lead. The Real-Time Field Lead will verify gaps or will investigate to find out why the files are missing. For HPGe shots, an HPGe Data Verification Checklist is attached to the EMF listing all the files. This Checklist can be used to ensure all the files were received in the SED.

Sign and Date____________________

APPENDIX A

DATA QUALITY OBJECTIVES
SL-055, REVISION 0 AND
SL-056, REVISION

Control Number 3947

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: [signature] Date: 6/8/99
James E. Chambers
DQO Coordinator

Approval: [signature] 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_vA ☐ OTHER

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

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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) ________

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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	NaI 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

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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.

Control Number 3947

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Final Remediation Level (FRL) Monitoring

Number: SL-056

Revision: 0

Effective Date: 9/01/99

Contact Name: Joan White

Approval: [signature] Date: 9/1/99
James Chambers
DQO Coordinator

Approval: [signature] Date: 9/1/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	9/01/99						

Data Quality Objectives
Real Time Final Remediation Level (FRL) Monitoring

1.0 Statement of Problem

Conceptual Model of the Site

The general soil remediation process at the Fernald Environmental Management Project (FEMP) includes real-time *in-situ* gamma spectrometry (real-time) measurements and physical sampling during different phases of the remediation process. Initially, pre-design investigations define excavation boundaries. During excavation, real-time measurements and/or sampling for waste disposition issues occurs. After planned excavations are complete, real-time measurements and/or physical sampling precertification activities are carried out to verify that residual contamination is below final remediation levels (FRLs).

This DQO describes the real-time in-situ gamma spectrometry methods used for gamma resolvable Area Specific Contaminants of Concern (ASCOC) FRL monitoring to support remedial design and precertification. Any physical soil samples collected to support remedial design will be collected under a separate DQO. Real-time FRL measurements involve field surveys of the surface soil using mobile and stationary gamma-discernable real-time equipment. Real-time FRL measurements are collected within an area when above-FRL radiological contamination is anticipated to be minimal based on process knowledge or previous investigations.

FRL scanning activities must follow the guidelines established in the *Sitewide Excavation Plan* (SEP) and the most current version of the document *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site* (hereinafter referred to as the Real Time Users Manual). As discussed in these documents, FRL measurements are conducted in two separate activities:

- FRL Phase I includes a mobile sodium iodide (NaI) detector scan of as much of the area as accessible at a 31 cm detection height at 1 mile per hour. If parts of the area of interest are inaccessible to the mobile NaI detectors, then the stationary High Purity Germanium (HPGe) detector will be used to obtain measurements in those areas. Target parameters for FRL Phase I NaI measurements are gross gamma activity and 3-times the FRL (3x FRL) values of total uranium, radium-226 and/or thorium-232, as calculated by a moving two-point average of consecutive measurements, or as indicated by 2x FRL in single measurements using the HPGe detectors at a 1 meter detector height.

- FRL Phase II includes stationary HPGe "hot spot evaluation" measurements at Phase I locations where the two-point average of total uranium, radium-226 and/or thorium-232 has identified resolvable ASCOC concentrations greater than 3-times the FRL (3x FRL) using the RMS systems, or where single HPGe measurement from Phase I are greater than 2x FRL. Target parameters for FRL Phase II are all gamma resolvable radiological ASCOCs.

Available Resources

Time: FRL investigation of remediation areas or phased areas must be accomplished by the field team of real-time instrumentation operators (and samplers if necessary), to provide required information in time to support the design effort.

Project Constraints: FEMP remediation activities are being performed in support of the Accelerated Remediation Plan, and soil remediation activities must be consistent with the SEP. FRL scanning, and if necessary, sampling and analytical testing, must be performed with existing manpower and instrumentation, considering instrument availability, to support the remediation and certification schedule. The results of FRL Phase I will determine Phase II HPGe measurement location and if necessary, will determine physical sample location. Design and execution of potential remediation is dependent on successful completion of this work.

Instrumentation: Real-time monitoring includes mobile sodium iodide (NaI) systems referred to as the Radiation Measurement Systems (RMS). In addition, stationary germanium detectors mounted on a tripod (the HPGe), are also used. These instruments can significantly accelerate the pace of necessary characterization by detecting soil contaminated with gamma resolvable radiological ASCOCs in a rapid and non-intrusive manner.

2.0 Identify the Decision

Decision

Delineate the horizontal extent of above-FRL (hot spot criteria) radiological contamination in the area soil. In addition, determine the need for Phase II real-time measurements to further assist in the above-FRL delineation.

3.0 Identify Inputs That Affect the Decision

Required Informational Input

Real-time FRL measurements will be used to estimate the surface soil contamination and the variation in surface soil contamination in areas scheduled for design, modeling, precertification, or certification activities. In addition, RTIMP data may be used to determine physical sampling collection location and/or a review of existing physical sample data, process knowledge, or visible observation.

Sources of Informational Input

FRL measurements for gamma discernible radiological COCs will involve measurements from mobile and stationary in-situ gamma spectrometry equipment. Physical samples may be collected to verify real-time measurements, or to investigate non-gamma resolvable ASCOCs.

Action Levels

FRLs established in the OU2 and OU5 Records of Decision are specific for radiological COC, and in some cases, vary between remediation areas. The FRLs were developed to account for health risks, cross media impact, background concentrations, and applicable or relevant and appropriate requirements (ARARs) and represent not-to-exceed contaminant-specific average soil concentrations. Real-time HPGe measurements may also be taken to support excavation to ALARA requirements. Physical samples may be used to verify HPGe readings and to precertify for non-gamma resolvable ASCOCs.

The 3x FRL concentrations/activities obtained through two-point averaging of mobile NaI measurements have been developed based on the ability of the instrumentation to resolve these levels. Refer to the Real-Time User's Manual for additional details.

Methods of Data Collection

FRL Phase I measurements will be utilized to obtain as close to complete coverage of the areas of concern. Hot spot confirmation and delineation measurements will be obtained during FRL Phase II by strategically placed stationary HPGe measurements. Analysis and data management for FRL Phase I data will be conducted at ASL A. FRL Phase II data may be conducted at either ASL A or ASL B, at the discretion of the Project. The decision to collect Phase II data at ASL A, or ASL B will depend on the Project's need for validated data. Only ASL B data is subject to validation, at project request. Real-time data collection for Phase II ASL A and ASL B measurements are identical. All measurements will be performed in compliance with operating procedures, the Real-Time User's Manual, the SEP, and the SCQ.

The FRL Phase I data will be utilized to establish general radiological concentration patterns and detect areas of elevated total gamma activity, as well as provide isotopic information for resolvable ASCOCs. The FRL Phase II HPGe gamma detectors will be used to confirm and delineate Phase I potential hot spot measurements, as needed. All real-time Phase I and Phase II measurements will be collected in accordance with the procedures identified in Section 7.0 of this DQO.

Surface physical samples may be collected to verify HPGe measurements for non-gamma resolvable ASCOCs. If physical sampling is needed, it will be identified in PSPs. The data quality of these samples will be consistent with the latest sampling DQO.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: Boundaries are limited to surface soils of areas planned for certification, and adjacent areas, as defined in the individual work plans.

Population of Soils: The soils affected are surface soils (to a nominal depth of 6 inches), which include recently excavated surfaces and undisturbed soils associated with excavation areas as designated in the individual work plans.

Temporal Boundaries

Time Constraints on Real-Time Measurements: The scheduling of FRL scanning is closely associated with the design process and excavation schedule. FRL real-time scanning must be conducted prior to design, excavation, if any, and before certification activities begin. The scanning data must be returned and processed into useable format in time for the information to be useful within the current remediation schedule.

Practical Considerations: In-situ gamma spectrometry measurements cannot be made during snow coverage or standing water conditions or during precipitation. Field analytical methods should also be limited to unsaturated soils. Most areas undergoing scanning are flat, open terrain, and are readily accessible to the equipment. Some areas may require preparation, such as cutting of grass or removal of undergrowth, fencing and other obstacles. In situ measurements will require coordination with appropriate maintenance personnel for site preparation. Physical and environmental parameters will be recorded and assessed during data collection. Refer to the Real-Time User's Manual for additional details.

5.0 Develop a Logic Statement

Parameters of Interest

For FRL Phase I, parameters of interest are gross gamma activity and 3-times the FRL values of total uranium, radium-226 and thorium-232, as calculated by a moving two-point average of consecutive readings. For FRL Phase II, parameters of interest are all HPGe-discernable radiological ASCOCs.

FRL Target Levels

For FRL Phase I, target levels are the highest gross gamma activity readings, 3x FRL for total uranium, radium-226 and thorium-232, and WAC trigger levels for total uranium. For FRL Phase II, target levels are the FRLs of all gamma discernable radiological ASCOCs including the WAC trigger level for total uranium.

Decision Rules

Following FRL Phase I, any Phase I NaI scanned areas exhibiting patterns of high gross gamma activity will be measured with the HPGe. Also, any Phase I HPGe measurements greater than 3x FRL will be scanned with the HPGe for hot spot evaluation per section 3.3 of the Real-Time User's Manual.

Following FRL Phase II, if HPGe results indicate an area could fail FRLs, the soil may be evaluated further with additional HPGe measurements or physical samples, or undergo remedial excavations. If remedial excavations are performed, the excavated area will be measured with post-excavation HPGe measurements to ensure removal of the contamination. Once the remediation is complete, FRL attainment is confirmed by the HPGe.

6.0 Establish Constraints on the Uncertainty of the Decision

Range of Parameter Limits

The range of surface soil concentrations anticipated will be from background (natural concentrations) to greater than 3X FRL.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision maker decides an area meets FRLs when the average soil concentration in an area is above the FRL, or the soil contains ASCOC concentrations above the hot spot criteria (3x FRL for hot spots $\leq 10\ m^2$, or 2x FRL for hot spots $> 10\ m^2$). This decision error would lead to the area failing certification for average radiological COC concentrations above the FRL or for hot spot criteria. If an area fails certification sampling and analytical testing, remobilization and further excavation, precertification, and certification sampling would be necessary.

Decision Error 2: This decision error occurs when the decision maker decides that additional HPGe and/or physical samples are necessary based on FRL Phase II results; or the decision maker directs the excavation (or additional excavation) of soils, when they actually have average radiological COC concentrations below the FRLs and no ASCOC hot spots (3x FRL for hot spots $\leq 10\ m^2$, or 2x FRL for hot spots $> 10\ m^2$). This would result in added sampling and analytical costs and/or added costs due to the excavation of clean soils and an increased volume in the OSDF. This is not as severe as Decision Error 1. The addition of clean soil to the

OSDF would result in further reduction, although minimally, to human health risk in the remediated areas.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentrations of radiological ASCOCs are greater than their FRLs and/or the hot spot criteria. The true state of nature for Decision Error 2 is that the true concentrations of COCs are below their FRLs and/or hot spot criteria. Decision Error 1 would be the more severe error.

7.0 Optimize a Design for Obtaining Quality Data

As discussed in Section 3.3.3 of the SEP, FRL scanning consists of two separate activities. Refer to Section 1.0 of this DQO for a general overview of FRL Phase I and FRL Phase II activities.

Real-time measurements are generated by two methods: 1) the mobile sodium iodide (NaI) detection systems which provide semi-quantitative radiological data, and 2) the stationary high purity germanium (HPGe) system that provides quantitative measurements of radiological COCs. If necessary, physical samples may also be collected for HPGe data verification, and to precertify for non-gamma resolvable ASCOCs.

Surface moisture readings are obtained in conjunction with Phase I and Phase II the NaI and HPGe system measurements using the Troxler nuclear moisture and density gauge or the Zeltex moisture meter. If conditions do not permit the use of the moisture meters, a soil moisture sample may be collected and submitted to the on-site laboratory for percent moisture analysis, or a default moisture value of 20% may be used. The soil moisture data will be used as is discussed in Sections 3.8, 4.11 and 5.2 of the Real-Time User's Manual. The gamma data will be corrected to a dry weight equivalent.

Background radon monitoring will also occur in conjunction with Phase I and Phase II NaI and HPGe system measurements, as specified in the PSP. Refer to the Section 5.3 of the Real-Time User's Manual for a discussion on radium-226 corrections.

Sodium Iodide (NaI) System

The mobile NaI detector systems are collectively called the Radiation Measurement Systems (RMS). They are used to achieve as close to complete coverage of the area as possible, taking into consideration the topographic and vegetative constraints which limit access. The NaI systems currently are used to obtain measurements over an area specified in a PSP to detect radiological total activity patterns and elevated radiological activity. The NaI detector systems are used at a 31 cm detector height at 1 mph for a 4 second acquisition with a 0.4 meter overlap, and are consistent with the Real-time User's Manual. If the total uranium FRL is 20 ppm or lower, the NaI systems should not be used for FRL attainment, the HPGe system should be used.

The mobile NaI systems are electronically coupled with a global positioning system (GPS) rover and base unit to record each measurement location. Counting and positioning information is recorded continuously on a field personal computer (PC) and stored on disk or hard drive for future downloading on the site soil database and Graphical Information System (GIS) system, or transferred directly to the Local Area Network (LAN) by Ethernet.

Information from the NaI/GPS system is recorded on the PC and transferred to the Unix system through the local area network on a regular (at least daily) basis. The information is plotted on the FEMP GIS system, or in the field using Surfer software. With the output, patterns of elevated total activity, and locations of elevated concentrations can be identified.

Data reduction is an important aspect of NaI system data use. Individual total uranium, radium-226 and thorium-232 concentrations will undergo two-point averaging. The two-point averaged values will be mapped and evaluated with respect to 3x FRL.

NaI measurements may be used for design, excavation during remediation, and precertification decision making if the measurements clearly indicate below FRL criteria have been met. They may also be used to determine the location and number of FRL Phase II HPGe measurements, if required.

<u>In-Situ HPGe Detectors</u>

The HPGe detector is used during FRL Phase I or FRL Phase II, as follows:

- During FRL Phase I, the HPGe is used in areas where topographic or vegetative constraints prevent mobile NaI detector access or if the NaI systems are out of service. The HPGe is used in a 99.1% coverage grid over the accessible area. Detector height is 1 meter with a count time of 15 minutes.

- During FRL Phase II, the HPGe detector is used at strategic locations established thorough the FRL Phase I screening. These locations are where the highest readings of gross gamma activity were identified and/or where individual ASCOC concentrations were identified as hot spots. The HPGe is used to identify radiological COC levels, which in turn provide information concerning the ability to pass FRLs. The number of Phase II HPGe measurements to delineate the hot spot boundary varies based on the size of extent of contamination. If the area potentially exceeding the 2x FRL or 3x FRL exhibits a visible contamination boundary, the Project may determine that Phase II measurements may not need to be collected.

Physical Soil Sampling

Physical samples may be collected and analyzed for target radiological COCs to verify the HPGe measurements and/or to precertify for non-gamma discernable ASCOCs. If physical samples are required, they will be collected in compliance with the applicable sampling DQO. Criteria for obtaining physical samples, such as sample density, will be specified in the PSP, if necessary. The minimum data quality acceptable for this purpose will be identified in the applicable sampling DQO. Field QC, ASL and Validation requirements will be consistent with the SCQ and SEP requirements.

Data Quality Objectives
Real Time FRL Measurements

1A. Task/Description: FRL real-time measurements.
1B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-056, Rev. 0 DQO Reference No.: Current Sampling DQO

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

Air ☐ Biological ☐ Groundwater ☐ Sediment ☒ Soil ☒

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

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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: Precertfication
A ☒ B ☒ C ☐ D ☐ E ☐

4.A. Drivers: Applicable or Relevant and Appropriate Requirements (ARARs), Operable Unit 5 Record of Decision (ROD), the Real-Time User's Manual, the Sitewide Excavation Plan and the Project-Specific Plan (PSP).

4.B. Objective: To determine if the area of interest is likely to pass FRLs for all HPGe discernable radiological COCs

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5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FEMP that require remediation activities. The RODs specify that the soils in these areas will be clean and demonstrated to be below the 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	[ ]		
Technetium-99	[ ]	Silica	[ ]		
4. Cations	[ ]	5. VOA	[ ]	6. Other (specify)	
Anions	[ ]	ABN	[ ]	Percent Moisture	
TOC	[ ]	Pesticides	[ ]		
TCLP	[ ]	PCB	[ ]		
CEC	[ ]				
COD	[ ]				

* If specified in the PSP for NaI and HPGe detectable rad's.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Mobile NaI, HPGe and HPGe*	SCQ Section: Not Applicable
ASL B HPGe*	SCQ Section: App. G , Table 1
ASL C ______	SCQ Section: ______
ASL D ______	SCQ Section: ______
ASL E ______	SCQ Section: ______

* Choosing the ASL level for Phase II FRL HPGe measurements is at the discretion of the project considering the project need for validated data.

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

Biased [X] Composite [ ] Environmental [ ] Grab [X] 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:
-EQT-22, *Characterization of Gamma Sensitive Detectors*
-EQT-23, *Operation of High Purity Germanium Detectors*
-EQT-32, *Troxler 3440 Series Surface Moisture Gauge*
-EQT-33, *Real Time Differential Global Positioning System*
-EQT-39, *Zeltex Infrared Moisture Meter*
-EQT-40, *Satloc Real-time Differential Global Positioning System*
-EQT-41, *Radiation Measurement Systems*
-ADM-16, *In-Situ Gamma Spectrometry Quality Control*
-User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006

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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	[ ]	Split Samples	[ ]
Preservative Blanks	[ ]	PE Samples	[ ]

Other (specify) Radon Monitoring, moisture *
* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

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

Other (specify) ____________________

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