4692

PROJECT SPECIFIC PLAN FOR AREA 6, PHASE I PRECERTIFICATION REAL-TIME SCAN AND PHYSICAL SAMPLING

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JANUARY 21, 2003

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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FOR AREA 6, PHASE I
PRECERTIFICATION REAL-TIME SCAN
AND PHYSICAL SAMPLING

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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ISSUE AND REVISION SUMMARY

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LIST OF ACRONYMS AND ABBREVIATIONS

A6PI	Area 6, Phase I
ASL	analytical support level
ccpm	corrected counts per minute
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CU	certification unit
DOE	U.S. Department of Energy
DQO	Data Quality Objectives
EMS	Environmental Monitoring System
EPA	U.S. Environmental Protection Agency
FACTS	Fernald Analytical Computerized Tracking System
FEMP	Fernald Environmental Management Project
FRL	final remediation level
FTF	Fire Training Facility
GIS	Geographic Information System
GPS	global positioning system
HPGe	high-purity germanium detector
IRDP	Integrated Remedial Design Package
LAN	Local Area Network
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
μg/mg	micrograms per milligram
mg/kg	milligrams per kilogram
NaI	sodium iodide
OEPA	Ohio Environmental Protection Agency
ONAR	Old North Access Road
pCi/g	picoCuries per gram
PID	photoionization detector
ppm	parts per million
PSP	Project Specific Plan
QA/QC	Quality Assurance/Quality Control
RSS	Radiation Scanning System
RTIMP	Real Time Instrumentation Measurement Program
RTRAK	Radiation Tracking System
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SDFP	Soil and Disposal Facility Project
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SPL	Sample Processing Laboratory
TAL	Target Analyte List
TAT	Turnaround Time
V/FCN	Variance/Field Change Notice
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization
WPRAP	Waste Pits Remedial Action Project

1.0 INTRODUCTION

1.1 BACKGROUND

As described in the Sitewide Excavation Plan (SEP), the Fernald Environmental Management Project (FEMP) has been divided into ten areas for remediation of soil and at- and below-grade structures and debris, as required under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Area 6 includes the former Waste Pits and surrounding land, along with the northern and eastern perimeters of the former Production Area. This precertification effort will focus on Area 6, Phase I (A6PI), which has recently been defined within Area 6.

A6PI spans approximately 15.74 acres, and includes: the former Fire Training Facility (FTF); the gravel access road Waste Pits Remedial Action Project (WPRAP) gravel access road; the field between the gravel road and Area 1, Phase III; and the Old North Access Road (ONAR). A6PI also includes an approximately 2-acre field west of the WPRAP exclusion fence that is non-conterminous with the above portions of A6PI. This area was defined within the larger parcel of land between WPRAP and Paddys Run, and excludes fill areas along the rail spur and Paddys Run stream. The portions of the FEMP site included in A6PI are shown on Figure 1-1.

Surface features in A6PI include the FTF and the ONAR. All other portions of A6PI are open fields. The FTF will undergo a remedial soil excavation as identified in the Integrated Remedial Design Package (IRDP) for the Solid Waste Landfill and FTF. Excavation plans for the ONAR will also be submitted to U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (OEPA) in the near future.

Several historical land uses are evident within A6PI. From a production standpoint, the FTF was used for fire training throughout most of the production years. This area was subject to a removal action (Removal Action 28) during the early 1990s. Also, the ONAR was used throughout the production years, and was the first access road for the site at the onset of construction in 1951. Contamination beneath this road is unlikely since the soil has been protected by pavement since production began. Though not directly related to former production operations, several soil disturbances are evident based on a review of aerial photographs. The area was first disturbed in ca. 1960 for the purpose of diverting the flow of Paddys Run to the west. This activity resulted in the fill area present along Paddys Run just west of A6PI. Several other sporadic disturbances are evident in A6PI, presumably to excavate material for waste pit construction/capping; and it is unclear if any fill material placed in this area. Finally, the open field north of the WPRAP gravel access road was subjected to a surface (less than 1 foot) soil excavation in 1997. This soil was used as fill material to support construction of the nearby WPRAP railroad facilities and did not involve the placement of fill material in A6PI. The current topography and surface features of A6PI are shown in Figure 1-2.

1.2 PURPOSE

The objectives of precertification activities, as detailed in this project specific plan (PSP), are to: 1) provide information to establish A6PI certification unit (CU) boundaries, 2) evaluate any patterns of residual surface soil contamination in A6PI, and 3) determine if further soil excavation is necessary for A6PI to pass certification. These objectives will be accomplished through two separate phases of precertification, as described in Section 2.0. Additionally, several soil borings will be collected from A6PI west of Pit 5, as described in Section 3.0. The purpose of these soil borings is to better assess the soil conditions in this portion of the site, particularly with regard to any fill material and the subsurface levels of contamination.

As a whole, precertification data will be used to determine if certification sampling can begin in A6PI. If data indicate constituent of concern (COC) concentrations are low enough to likely pass certification statistical analysis, then certification sampling will be initiated under a separate PSP. Otherwise, soil impacted above the final remediation levels (FRLs) will be removed before certification activities begin.

1.3 SCOPE

The scope of this PSP covers A6PI precertification surface scanning activities including confirmation measurements and, if necessary, hot spot delineation. It also covers the collection of soil borings in the part of A6PI west of WPRAP to assess potential fill material. Because the FTF and ONAR are still awaiting remedial excavation, the precertification real-time scan of these areas will only take place after the excavation has achieved the design grade.

All precertification activities will be consistent with the SEP. Details of the real-time scanning approach are consistent with the User Guidelines, Measurement Strategies, and Operational Factors for Deployment of *In Situ* Gamma Spectrometry at the Fernald Site (User's Manual) and Real Time

Instrumentation Measurement Program (RTIMP) Protocols. All scanning will be conducted using Ohio Environmental Protection Agency and U.S. Environmental Protection Agency approved real-time, gamma-sensitive detectors. All scanning and sampling field activities must be consistent with the SEP, the Sitewide CERCLA Quality Assurance Project Plan (SCQ), Data Quality Objectives (DQO) SL-054, Revision 1 (for real-time scanning) and DQO SL-048, Revision 5 (for physical sampling). Both of these DQOs are included in Appendix A.

1.4 KEY PERSONNEL

Key personnel responsible for performance of the project are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Robert Janke	Kathi Nickel
SDFP Management	Jyh-Dong Chiou	Tom Beasley
Characterization Manager	Frank Miller	Eric Kroger
RTIMP Manager	Rich Abitz	Dale Seiller
RTIMP Field Lead	Brian McDaniel	TBD
Field Sampling Manager	Tom Buhrlage	Jim Hey
Surveying Manager	Jim Schwing	Andy Clinton
Analytical Lab Contact	Heather Medley	Denise Arico
Data Management Contact	Eric Kroger	Krista Blades
Data Validation Contact	Jim Chambers	Andy Sandfoss
Field Data Validation Contact	Dee Dee Edwards	Andy Sandfoss
FACTS/SED Database Contact	Cara Sue Schaefer	Susan Marsh
WAO Contact	Linda Barlow	TBD
QA/QC Contact	Reinhard Friske	Mike Godber
Health and Safety Contact	Gregg Johnson	Jeff Middaugh/ Pete Bolig

FACTS – Fernald Analytical Computerized Tracking System
QA/QC – Quality Assurance/Quality Control
SDFP – Soil and Disposal Facility Project
SED – Sitewide Environmental Database
WAO – Waste Acceptance Organization

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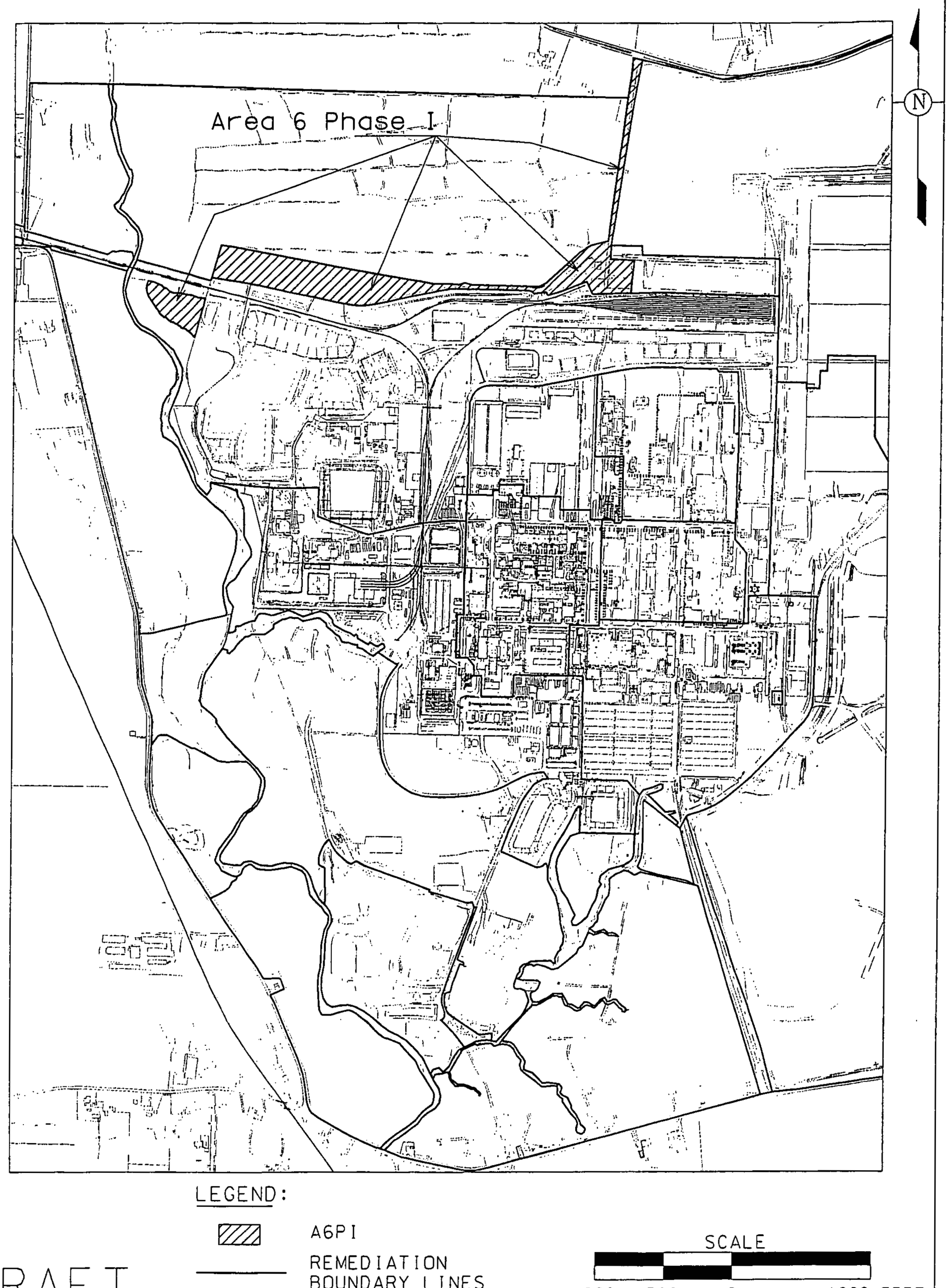

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FIGURE 1-1. AREA 6, PHASE I LOCATION MAP

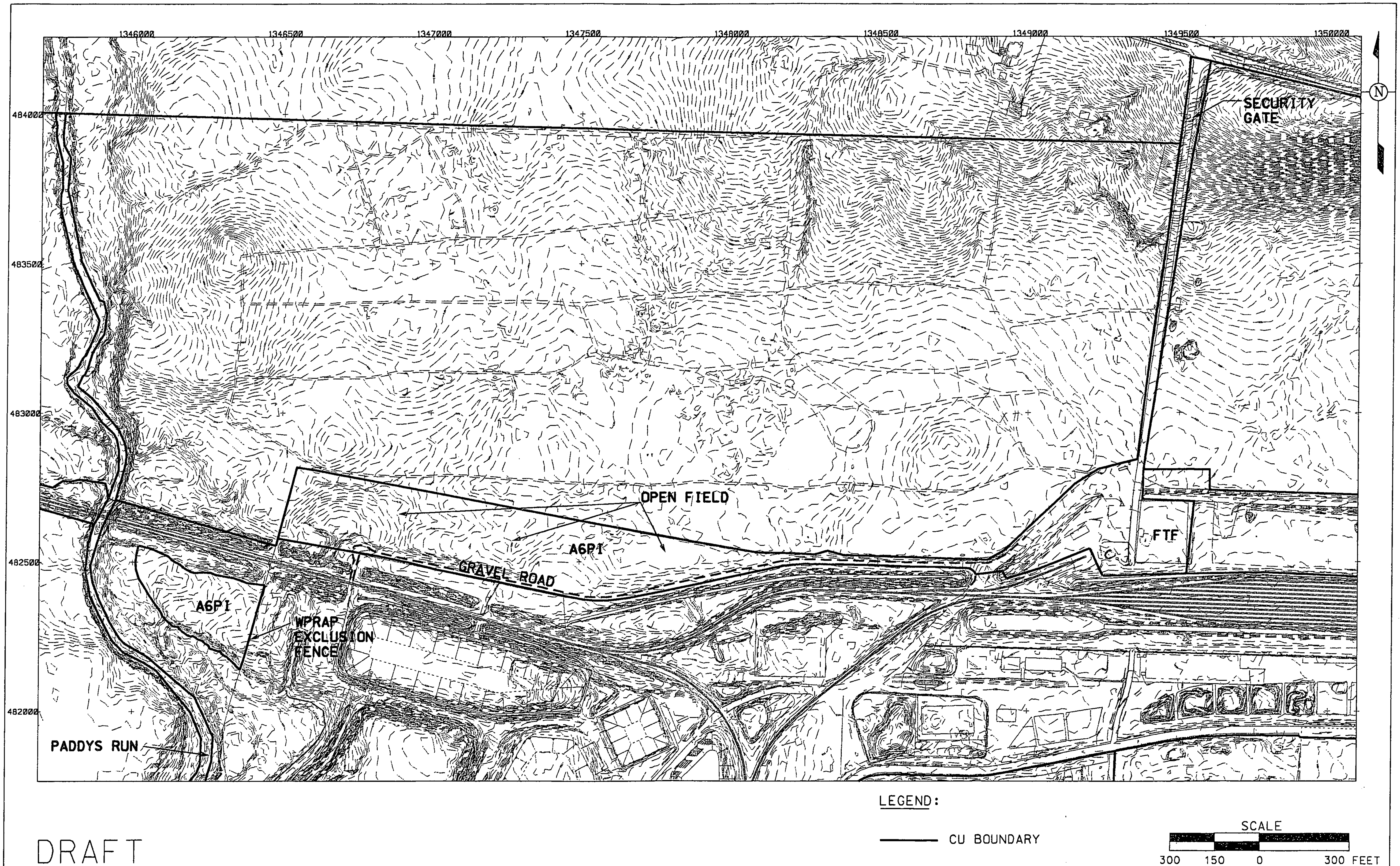

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FIGURE 1-2. A6PI TOPOGRAPHY AND SURFACE FEATURES

2.0 PRECERTIFICATION SCANNING PROGRAM

The real-time precertification scanning of A6PI will take place in phases. During Phase 1, mobile sodium iodide (NaI) detectors, including the Radiation Tracking System (RTRAK), Radiation Scanning System (RSS), the Gator, and possibly the Excavation Monitoring System (EMS) will be used to provide as close as possible to 100 percent coverage of the area, as discussed in Section 2.1. Operation of real-time equipment will be consistent with the User's Manual, RTIMP protocols and the RTIMP field manual. In areas that are physically inaccessible to the mobile NaI detectors, the high-purity germanium (HPGe) detector will be used to scan surface soil. The purpose of the Phase 1 scan is to determine gross gamma activity patterns throughout the area of interest and to determine if any "potential hot spots" are present. Potential hot spots are defined as the following:

- NaI measurements for total uranium (as calculated from uranium-238) or thorium-232 that are above three times the FRL (3x FRL);
- NaI measurements for radium-226 that are above 7x FRL; or,
- Phase 1 HPGe (1-meter detector height) measurements that are above 2x FRL for total uranium, thorium-232 or radium-228.

During Phase 2, HPGe detectors will be used to confirm potential hot spots identified by Phase 1 measurements, as discussed in Section 2.2. If a potential hot spot is confirmed [i.e., HPGe results are above 2x FRL for total uranium (as calculated from uranium-238), thorium-232 and/or radium-226], its extent will be delineated during Phase 2 with additional HPGe measurements. When potential hot spots are not identified in individual NaI batch files, a minimum of one HPGe measurement per batch file will be obtained at the location with the highest total gamma activity. If necessary, Phase 3 readings will be obtained with HPGe detectors to verify the removal of confirmed hot spots, as discussed in Section 2.3.

The real-time equipment and corresponding equipment configurations used during each phase of precertification are summarized in Table 2-1. Soil moisture measurements will be collected to support mobile NaI and HPGe measurements, as discussed in Sections 2.5 and 2.6 respectively. Radon monitoring will be conducted when HPGe measurements are obtained to confirm, delineate, and verify removal of radium-226 hot spots.

2.1 PRECERTIFICATION PHASE 1

Phase 1 scanning will consist of maximum possible coverage of A6PI using NaI detector systems to evaluate residual soil contamination patterns. Real-time coverage will be limited to the surface soil and will be as extensive as possible without jeopardizing worker safety. The mobile NaI detectors' acquisition time will be set to four seconds with a detector height of 31 cm and a nominal speed of 1.0 mile per hour. Adjacent passes will be conducted to approximate a 0.4-meter overlap, which corresponds to a separation of the centerlines of the passes by 2 meters. The RTRAK will be the primary tool used to collect NaI spectra for surface soil. Other mobile NaI detectors will be used in areas that the RTRAK cannot access, and the detector system configuration and performance of these detectors will be equivalent to the RTRAK. The onboard Global Positioning System (GPS) will be used to obtain geographical coordinates for each detector measurement.

Small portions of A6PI will likely be inaccessible to mobile NaI detectors due to steep terrain or vegetation. It is likely that the steep terrain will also prevent use of the HPGe in these areas (shown on Figure 2-1). However, if the HPGe can be safely used at the discretion of the RTIMP Lead, readings will be obtained at a detector height of 1 meter and a count time of 300 seconds (5 minutes) using a triangular grid with 11-meter nodes (approximately 95 percent coverage). If the Phase 1 HPGe measurements identify total uranium, thorium-232 and/or radium-226 activity greater than 2x FRL, further confirmation and delineation of the hot spot will take place with Phase 2 measurements.

If areas are inaccessible to all RTIMP equipment, they will not be included in precertification scanning. However, they will be visibly inspected for potential contamination and, if suspect staining or materials are found, will be scanned with hand-held friskers to assess nuclide activity. In addition, at least one certification sample will be located in a biased manner within each inaccessible area.

The data obtained from the Precertification Phase 1 scan will be used to determine contamination patterns. Total gamma activity and a two-point moving average of consecutive NaI measurements for total uranium, thorium-232 and radium-226 will be mapped, along with any Phase 1 HPGe readings, to determine if potential hot spots (as defined in Section 2.0) are present. These data, along with other information as discussed in Section 3.3.3.2 of the SEP, will be considered when establishing CU boundaries in A6PI. After reviewing the mapped data, the Characterization Manager is responsible for documenting the CU boundaries in the A6PI Certification Design Letter (CDL).

2.2 PRECERTIFICATION PHASE 2

All Phase 2 measurements will be obtained using the HPGe detectors. Phase 2 readings will be obtained as specified in the RTIMP Protocols (31 cm detector height; 5-minute acquisition time) and all locations will be surveyed and marked with the measurement location identifier, per Section 2.4. One duplicate HPGe reading will be collected daily or per 20 Phase 2 measurements [i.e., Analytical Support Level (ASL) B], whichever is greater, at locations selected by the RTIMP Lead. The Phase 2 Target Analyte List (TAL) is shown in Table 2-2.

HPGe spectra will be obtained at the locations of hot spots (as defined in Section 2.0) identified by Phase 1 measurements. If NaI Phase 1 measurements indicate multiple hot spots in a single batch file, than HPGe confirmation measurements will begin at the location of the maximum result for each target analyte. If the Phase 2 measurement indicates that the potential hot spot with the highest activity is below the Phase 2 hot spot criterion of 2x FRL, no additional Phase 2 measurements are necessary for that target analyte in that batch file. When hot spots are absent from the spectra in a batch file, a minimum of one Phase 2 measurement per batch file will be obtained at the location exhibiting the highest total gamma activity.

A hot spot is confirmed when a Phase 2 measurement exceeds 2x FRL for total uranium, thorium-232 and/or radium-226. If this is the case, hot spot delineation will take place with additional Phase 2 measurements that are consistent with RTIMP protocols and guidelines. The delineation approach will be determined by the RTIMP and Characterization Managers after considering all surrounding real-time results. Details of any necessary hot spot delineation will be documented in a Variance/Field Change Notice (V/FCN).

2.3 PRECERTIFICATION PHASE 3

If Phase 2 measurements confirm and delineate a hot spot (i.e., total uranium, thorium-232 or radium-226 activity above 2x FRL), time must be allowed to prepare for and conduct a remedial excavation. Details of the remedial excavation will be documented in an excavation plan and submitted to the EPA and OEPA for approval. After the planned excavation is complete, Phase 3 measurements will be obtained in a manner consistent with RTIMP Protocols to verify the hot spot removal. This includes the establishment of a 4-meter triangular grid across the excavated surface and obtaining a measurement at each grid node (detector height = 31 cm; count time = 5 minutes). One duplicate HPGe reading will be collected daily or one per 20 Phase 2 measurements (i.e., ASL B), whichever is greater, at locations selected by the RTIMP Lead. In the event Phase 3 measurements indicate total uranium, thorium-232 and/or radium-226 activities remain at levels above 2x FRL, additional Phase 2 measurements will take place to delineate the remaining extent of the hot spot for removal. This process will continue until Phase 3 measurements verify removal of the hot spot.

2.4 REAL-TIME MEASUREMENT IDENTIFICATION

All NaI detector data files will be assigned a unique sample identifier, which will include the area/phase, the detector used (RTRK, RSS1, RSS2, GATOR or EMS), and the batch number in the file names. Supplemental HPGe readings obtained during Precertification Phase 1 (those collected in areas inaccessible to the mobile NaI detectors) will be identified as *A6P1-P1-reading #-QC,* where:

A6P1 = The remediation area/sub-area where the reading was collected. For data management purposes a numerical "1" is used in place of the Roman numeral I
P1 = Phase 1 of Precertification
reading # = Sequential reading number; if a second reading is necessary at that same location, the reading number will include the letter "A"
QC = "D" for Duplicate reading, if applicable. No dash will separate the reading # and the "D"

For example, A6P1-P1-4 is the fourth HPGe reading obtained in A6PI during Phase 1 of precertification.

Precertification Phase 2 will be identified as *A6P1-P2-reading #-QC,* where:

A6P1 = The remediation area in which the reading was collected (again, a numerical "1" is used in place of the Roman numeral I for data management purposes).
P2 = Phase 2 of Precertification
reading # = Sequential reading number within that CU, if a second reading (detector height = 31 cm) is necessary at that same location, the reading number will include the letter "A"
QC = "D" for Duplicate reading, if applicable. No dash will separate the reading # and the "D"

For example, A6P1-P2-1 is the first HPGe reading obtained in A6PI, collected during the second phase of precertification. A6P1-P2-1D would be the duplicate reading collected at the same location.

If HPGe readings are necessary for hot spot delineation, the sample identification scheme will be the same as that for Precertification Phase 2; and the purpose will be identified as "P2HS" (for hot spot delineation). For example, the fourth hot spot delineation reading in A6PI would be identified as A6P1-P2HS-4.

If necessary, Precertification Phase 3 measurements will be identified as *A6P1-P3-reading #-QC*. For example, the sixth hot spot removal confirmation reading in A6PI will be identified as A6P1-P3-6.

Any necessary radon measurements will be identified as *A6P1-RADON-reading #*, where:

A6P1	=	The remediation area in which the reading was collected (again, a numerical "3" is used in place of the Roman numeral "III" for data management purposes)
RADON	=	Radon measurement
reading #	=	Sequential reading number.

2.5 SURFACE SOIL MOISTURE GAUGE MEASUREMENTS

The Zeltex® Infrared Moisture Meter will be used to obtain soil moisture measurements. Instrument operation is explained in the equipment manuals. These measurements will be used to correct the real-time data so the readings are representative of environmental conditions. At least two surface moisture measurements per acre will be obtained where the mobile NaI detectors are used for the Precertification Phase 1 scan. When the HPGe is used during precertification (any phase), a surface moisture measurement will be obtained for each HPGe reading. All surface moisture gauge measurements will be collected within eight hours of collecting the real-time measurements if environmental conditions are not expected to change.

2.6 BACKGROUND RADON MONITORING

A background radon monitor will be used during the collection of any necessary Phase 2 and Phase 3 HPGe measurements if radium-226 hot spots were identified by Phase 1 measurements. The monitor will be placed in one location for the day where it will be set at the same height as the HPGe detector being used to collect the soil radiation measurements. The background radon data will be used to correct the radium-226 data per the User's Manual.

TABLE 2-1
REAL-TIME EQUIPMENT AND DETECTOR CONFIGURATIONS USED DURING EACH PHASE OF PRECERTIFICATION

Precertification Phase	Equipment Used	ASL	Detector Configuration
Phase 1 – Scanning	Mobile NaI (RTRAK/RSS/ Gator/EMS)	A	Speed = 1 mph Detector Height = 31 cm Acquisition Time = 4 seconds
	HPGe[a]	A	Height = 1 m, Acquisition Time = 5 minutes
Phase 2 - Confirmation and Hot Spot Delineation	HPGe	B	Height = 31 cm Acquisition Time = 5 minutes
Phase 3 - Hot Spot Removal Verification	HPGe	B	Height = 31 cm Acquisition Time = 5 minutes

[a] The HPGe will only be used during Phase 1 if areas are inaccessible to the mobile NaI detectors.

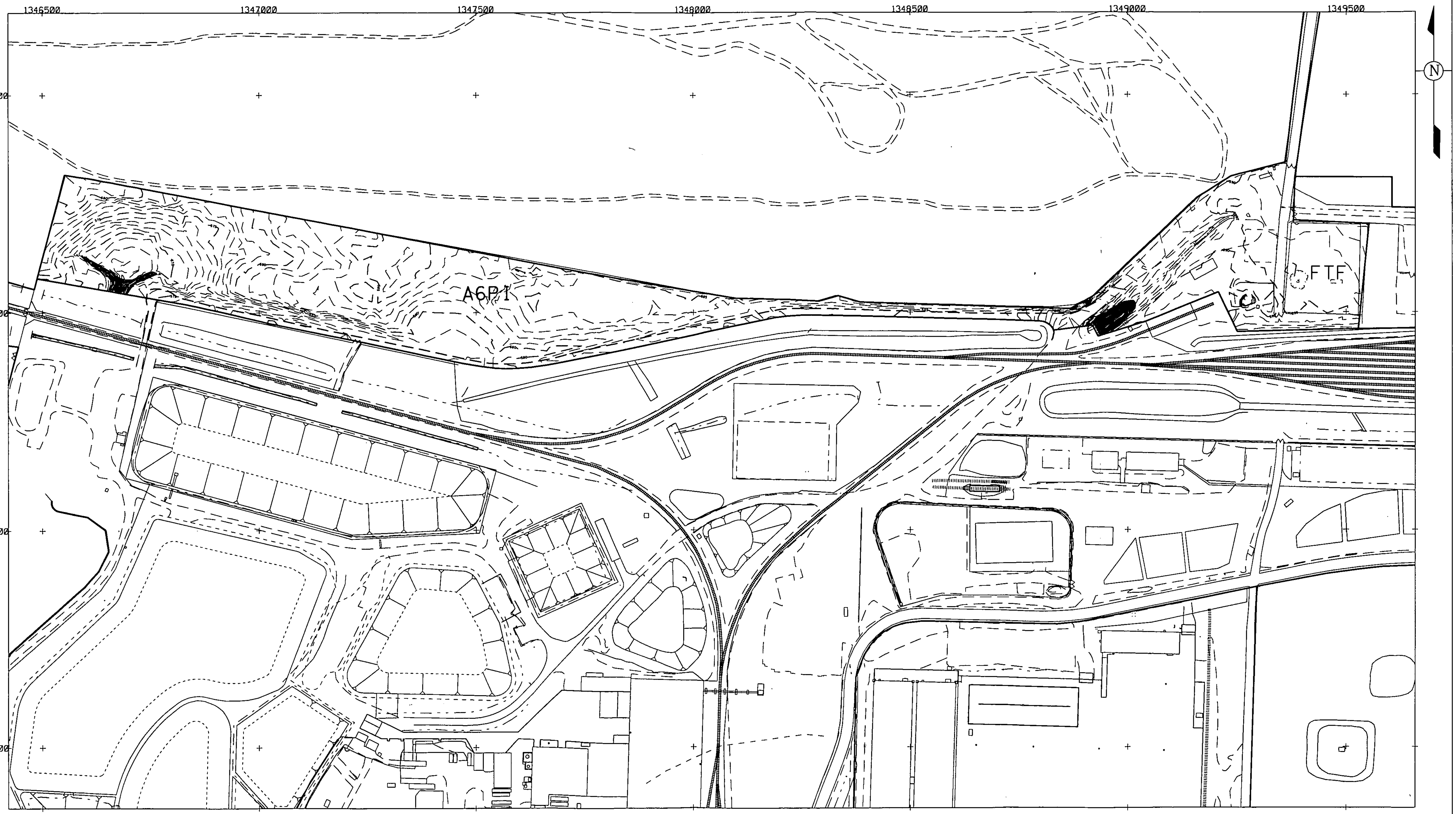
TABLE 2-2
TARGET ANALYTE LIST FOR PRECERTIFICATION HPGe SCANNING OF A6PI

TAL A6P1-PRECERT-A

HPGe Detector		
1	ASL B*	Total Uranium (FRL = 82 mg/kg)
2	ASL B*	Thorium-228 (FRL = 1.7 pCi/g)
3	ASL B*	Thorium-232 (FRL = 1.5 pCi/g)
4	ASL B*	Radium-226 (FRL = 1.7 pCi/g)
5	ASL B*	Radium-228 (FRL = 1.8 pCi/g)

mg/kg – milligrams per kilogram
pCi/g – picoCuries per gram

* The ASL applies only to Precertification Phase 2 and hot spot delineation readings. All HPGe and Mobile NaI readings obtained during Precertification Phase 1 will be classified as ASL A.



NOTE: PORTIONS OF A6PI NOT SHOWN ARE EXPECTED TO BE ACCESSIBLE TO REAL-TIME EQUIPMENT (OLD NORTH ACCESS ROAD AND LAND WEST OF WPRAP)

LEGEND:

CU BOUNDARY

INACCESSIBLE TO MOBILE NaI and HPGe

SCALE

220 110 0 220 FEET

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FIGURE 2-1. AREAS OF A6PI INACCESSIBLE TO REAL TIME EQUIPMENT

3.0 PHYSICAL SAMPLE COLLECTION

3.1 SAMPLING STRATEGY

The sampling strategy identified in this PSP has been established to determine if fill material is present in the portion of A6PI west of WPRAP, and to verify that subsurface conditions show that this area is ready for certification sampling to begin. While samples were collected at three Remedial Investigation/ Feasibility Study locations (CIS_CYSGEN_881, CIS_CYSGEN_897, and 11368) in A6PI west of WPRAP, only 11368 includes samples from the subsurface.

Four boring locations have been selected to span the western portion of A6PI, as shown in Figure 3-1. There are no specific locations ideal for biasing borings, as the area is homogeneous in past land uses (refer to Section 1.1). Also, no questionable areas were evident from a field walkdown. This sampling density will provide the data sufficient to demonstrate the certification readiness of this area. The boring locations are shown on Figures 2-1 and 2-2. All borings will be performed to an initial depth of 5 feet, with samples collected from the surface (0 to 0.5-foot), 2 to 2.5-foot and 4.5 to 5-foot depths. The borings planned under this PSP are listed in Appendix B. If evidence of fill material is still present at 5 feet below surface, the boring will be extended to native soil and samples will be collected every 3 feet (so the next sample collected will be at 7.5 to 8 feet), plus a sample from the top 6 inches of native soil.

The target analytes for these samples include total uranium, thorium-228, thorium-232, radium-226, and radium-228; the five primary radiological COCs identified in the SEP. Thorium-230 will also be analyzed due its known presence at the nearby Waste Pits. These six radiological COCs make up TAL A. Additionally, arsenic, beryllium, aroclor-1254 and aroclor-1260 (TAL B) will also be analyzed in these samples, as these contaminants were present above the FRL in other parts of A6PI, as well as other perimeter areas of the site.

3.2 SAMPLE COLLECTION METHODS

Soil sampling will be conducted in accordance with procedure SMPL-01, Solids Sampling. Soil borings will be completed using the Geoprobe® Model 5400 or 6600, or an alternate method identified in SMPL-01, Solids Sampling. Ultimately, the method of sample collection will be left to the discretion of the field sampling lead. If refusal or resistance is encountered during sample collection, the location may be moved within a 3-foot radius of the identified sample location, unless precluded by the penetration permit. If any point is moved more than 3 feet from the originally planned sample point, the change must be documented on a V/FCN form.

Following collection (to a depth of 5 feet) the soil cores will be laid on clean, disposable plastic. Sampling personnel will provide a physical description of the material, consisting of general color, material type, frisker readings, and foreign material, at each 6-inch interval of each boring. If anomalous material, including evidence of fill, is found in the boring, then a geologist will be notified to further define the material's characteristics. Full lithological characterization by a geologist will not be performed.

Then entire length of each core will be surveyed with a beta/gamma (Geiger-Mueller) survey meter. These results will be recorded as part of the field documentation. In the event that the field screening results from the deepest sample interval identified for collection in Appendix B exceed 450 corrected counts per minute (ccpm), it is considered potential above-waste acceptance criteria (WAC) material, and another sample will be collected 3 feet below that interval. That sample will also be submitted for total uranium analysis (TAL C). This process will be repeated until the deepest interval collected scans less than 450 ccpm.

The entire core will also be scanned with the photoionization detector (PID), per procedure EQT-04, and results will be recorded as part of the field documentation. Any samples with scanning results that exceed 5 parts per million (ppm) above background will be collected and analyzed for all volatile organic compounds (VOCs, TAL D). If this is the case, a trip blank must also be collected. Sampling and analytical requirements for VOCs (solid and liquid) are also provided in Table 3-1.

Following soil core collection, beta/gamma screening and PID scan, the appropriate sample intervals will be separated from each core (see Section 3.1 or Appendix B). The sample material for all contract laboratory analyses can be placed into one container. Sampling and analytical requirements are summarized in Table 3-1. All samples will be taken to the Sample Processing Laboratory (SPL) where they will be prepared for shipment to an off-site laboratory for analysis. Sample volumes, preservation requirements and analysis information are summarized in Table 3-1. If a 6-inch interval contains insufficient soil mass for the necessary analyses, additional material can be obtained by performing an additional push.

Field QC samples will not be collected during this sampling effort. One alpha-beta screen sample will be collected per analytical release in a separate container, with the goal of collecting that alpha-beta screen sample from the soil sample exhibiting the highest beta-gamma activity. While it is anticipated that most or all samples will show beta-gamma frisker readings at or very close to background, this will be accomplished as follows:

- If all samples in the release do show beta-gamma activity at or near background, the alpha-beta screen will be collected from the last sample batched into each release
- If a sample demonstrates a clear, above-background beta-gamma reading, it will be collected to serve as the alpha-beta sample for that release
- If a second sample in that release demonstrates a clear, above-background beta-gamma and it is higher than the previously-collected alpha-beta sample, an alpha-beta sample will be collected from that location and submitted instead.

3.3 SAMPLE IDENTIFICATION

All physical samples collected for laboratory analysis or archiving will be assigned a unique sample identifier, as listed in Appendix B. This identifier will consist of the following:

1. Area Designator: Identifies the remediation area where the sample is collected (A6P1; note a numerical "1" is used in place of a Roman numeral "I" for consistency with previous sample identification schemes.
2. Location Designator: This will simply be a sequential number (1 through 4) to correspond to the boring locations.
3. Depth Interval Designator: A number equal to two times the bottom depth (ft) of the interval below surface (refer to Appendix B).
4. Measurement Designator: RMP = Radionuclide, metal and PCB analysis
   AB = Alpha-beta screen

For example, A6P1-3-5-RMP is the 2 to 2.5-foot sample interval collected at the third boring location in A6PI, and it will be will be analyzed for primary radiological COCs, metals and PCBs.

If a boring location requires multiple borings due to subsurface refusal, or if a boring is moved after attempting the original location, the boring identifier will be designated with an alphabetical suffix (e.g., A6PI-1A, A6PI-1-6B, etc.). Unless refusal is experienced in the first push of the Geoprobe®, samples collected from a boring prior to experiencing refusal will be kept, and sample collection will resume beyond the refusal depth at a subsequent successful boring.

3.4 EQUIPMENT DECONTAMINATION

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

3.5 WASTE DISPOSITION

Excess soil from the borings will be dispersed on the ground or gravel surface in the same general area of the boring, based on direction from WAO. Any water (used decontamination water, etc.) generated during sampling must be containerized and documented on a completed Wastewater Discharge Request Form (FS-F-4045) before disposal. Any non-soil solid waste generated from the sampling effort will be documented and disposed in accordance with applicable requirements for each boring location, as determined by WAO.

3.6 BOREHOLE ABANDONMENT

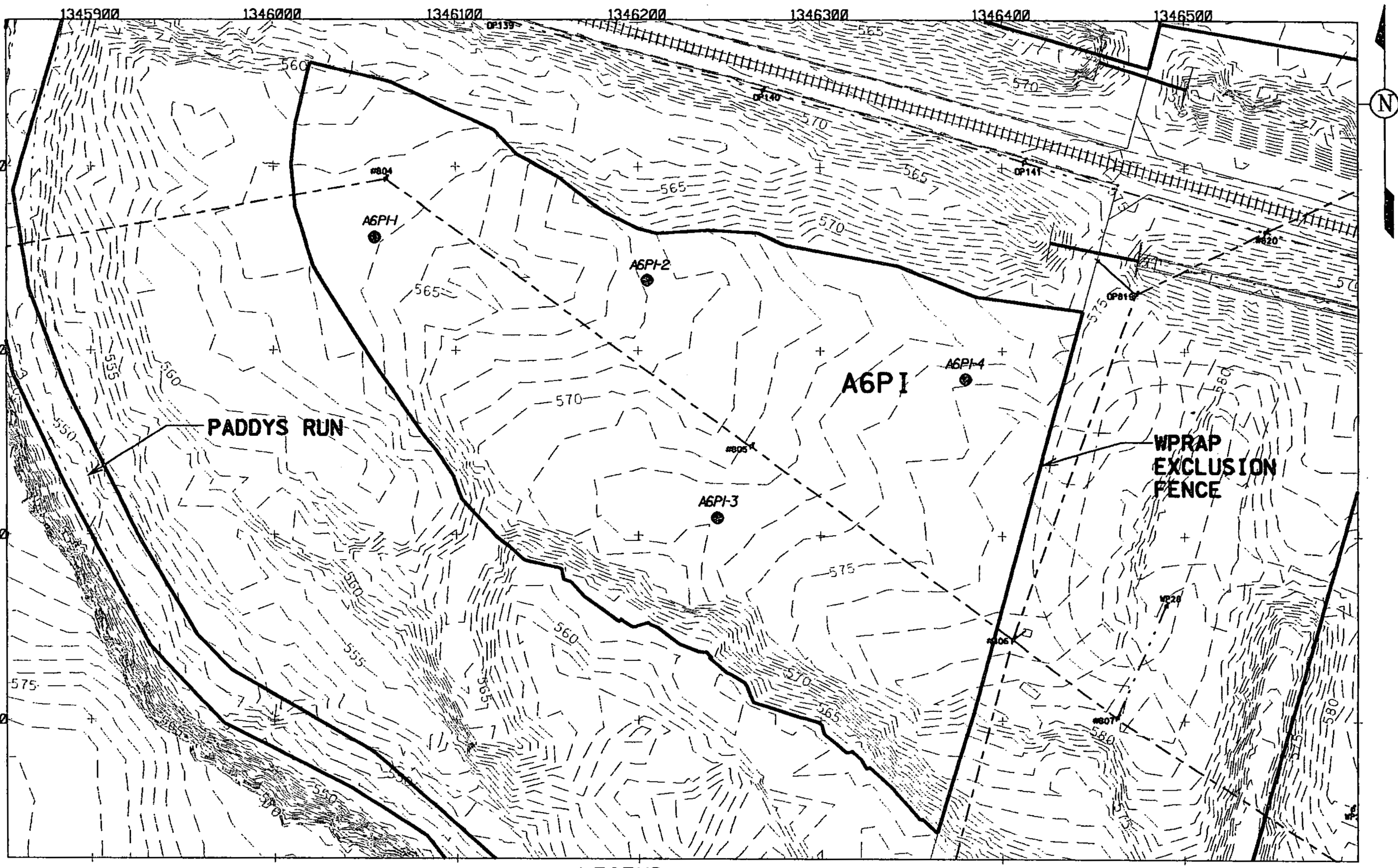
Each borehole will be plugged using bentonite pellets or a bentonite grout slurry immediately after sampling is completed, in accordance with DRL-01, Plugging and Abandonment. Any concrete or asphalt that is removed will be replaced with an equal thickness of cement. A Borehole Abandonment Log will be completed for each borehole greater than 6 inches in depth.

TABLE 3-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analytes	Sample Matrix	Lab	TAT	ASL	Preservation	Holding Time	Container	Minimum Sample Mass
Total Uranium Throrium-228 Thorium-230 Thorium-232 Radium-226 Radium-228 (TAL A) [a] Arsenic Beryllium Aroclor-1254 Aroclor-1260 (TAL B) [a]	Solid	Off-site	30 days	B	Cool to 4°C (due to metals)	6 months (rads) 6 months (metals) 14 days (PCBs)	Glass w/ Teflon-lined lid (due to PCBs)	450 g
Total Uranium (TAL C) [b]	Solid	On-site	3 days	B	None	12 months	Glass or Plastic	20 g
Total VOC (TAL G)	Solid	Off-site	30 days	B	Cool 2°-6° C	14 days	60-mL glass w/ Teflon cap	10 mg (soil w/o rocks)
Alpha/Beta Screen	Solid	On-site	3 days	NA	None	NA	Any	10 g
Total VOC (TAL G) [c]	Water (trip blanks)	Off-site	30 days	B	Cool 2°-6° C, H_2SO_4, pH<2	14 days	3 x 40-mL glass w/ Teflon septa cap; fill to no headspace	120 mL (3 x 40 ml)

[a] Only one container needs to be collected per location for the TAL A and TAL B analyses; and the appropriate volume of soil for each of the prescribed analyses can be separated from that container at the contract laboratory. The radiological and chemical constituents are on separate TALs for analytical and data management purposes. Note that a separate container will be collected for the necessary alpha-beta screens.
[b] If necessary based on results of beta-gamma frisker scan.
[c] If necessary based on results of PID scan.

TAT - Turnaround Time



LEGEND:

- - - - - OVERHEAD ELECTRIC

SCALE

80 40 0 80 FEET

000025

DRAFT

4692

v:#fm12#dgn#area6_005.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 3-1. PRECERTIFICATION SOIL BORINGS IN A6P1 WEST OF WPRAP

22-JAN-2003

4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

4.1 QUALITY CONTROL MEASUREMENTS AND SAMPLES

For real-time measurements, per DQO SL-054, Revision 1 (Appendix A), all Precertification Phase 1 real-time measurements will be classified as ASL A. Precertification Phase 2 and Phase 3 HPGe measurements will be classified as ASL B, per the User's Manual. Duplicate readings will be taken at a frequency of one for every 20 ASL B measurements, or daily, whichever is more frequent. For soil sampling, per DQO SL-048, Revision 5, no field QC samples are required for this ASL B effort.

4.2 PROJECT REQUIREMENTS FOR 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 QA/QC 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 assessment may be performed by conducting surveillances.

4.3 FIELD CHANGES TO THE PSP

If field conditions require changes or variances, written approval must be obtained from the Project Lead and QA/QC before the changes may be implemented (electronic mail is acceptable). Changes to the PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA/QC must receive the completed V/FCN, with the signatures of the Project Manager, Characterization Lead and the QA/QC Representative, within seven working days of granting approval. Any field changes that may impact the safety of the field team will also be approved by Health and Safety.

4.4 APPLICABLE DOCUMENTS, MANUALS AND PROCEDURES

Applicable documents for all work conducted under this PSP include the following:

- RM-0020, Radiological Control Requirements Manual
- RM-0021, Safety Performance Requirements Manual
- SH-1006, Event Investigation and Reporting
- Sitewide CERCLA Quality Assurance Project Plan (SCQ)
- Sitewide Excavation Plan (SEP)
- Solid Waste Landfill and Fire Training Facility IRDP
- WAC Attainment Plan for the OSDF

Additional documents specific for real-time scanning work include the following:

- RTIMP-M-001, RTIMP Administrative Manual
- RTIMP-M-002, RTIMP Field Manual
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of *In Situ* Gamma Spectrometry at the Fernald Site (User's Manual)

Additional documents specific to physical sampling include the following:

- SMPL-01, Solids Sampling
- SMPL-21, Collection of Field Quality Control Samples
- DRL-01, Plugging and Abandonment
- EQT-04, Photoionization Detector
- EQT-06, Geoprobe® Model 5400 (or 6600) Operation and Maintenance Manual
- EW-0002, Chain of Custody/Request for Analysis Record for Sample Control
- 9501, Shipping Samples to Off-Site Laboratories
- 9505, Using the FACTS Database to Process Samples
- 7532, Analytical Laboratory Services Internal Chain of Custody

5.0 HEALTH AND SAFETY

Technicians will schedule a project walkdown with Health and Safety (Radiological Control, Industrial Hygiene, and Safety) and any other groups that may be working in the same or an adjacent area before the start of the project. Weekly walkdowns will be conducted throughout the course of the project in accordance with Procedure SPR 1-10, Safety Walk-Throughs. All work on this project will be performed according to applicable Environmental Monitoring procedures, the documents identified in Section 3.4, Fluor Fernald work permit, Radiological Work Permit, and other applicable permits as determined by project management. Each technician must concur with all applicable safety permits in the performance of their assigned duties. A job/safety briefing will be conducted before field activities begin each day; the project lead or designee will document the briefing on form FS-F-2955. Personnel will also be briefed on any health and safety documents (such as Travelers) that may apply to the project work scope.

Technicians will provide 2-way radios and cellular phones for all remote locations. The Technician or designee will have direct radio communication with Fluor Fernald Communication. This will ensure timely notification of site emergencies and severe weather.

- To report emergencies by site phone, dial 6511
- To report by cellular phone, dial 648-6511 and ask for "CONTROL"
- To report by Radio call "CONTROL".

If physical samples are required, Safety and Health Industrial Hygiene must be consulted prior to approving the V/FCN.

6.0 DATA MANAGEMENT

A data management process for all data collected under this PSP will be implemented so information collected during the investigation will be properly managed after completion of field activities. Data management activities for real-time scanning and physical samples are discussed below.

6.1 RTIMP DATA MANAGEMENT

As specified in Section 5.1 of the SCQ, daily activities will be recorded on the RTIMP field worksheet with sufficient detail to enable a situation to be reconstructed without reliance on memory. Field worksheets will be kept on file for review by the Characterization Manager. Per the User's Manual and the RTIMP Field Manual, all electronically recorded data will have the Checklist for Verification of QC and the Data Review Elements for Real-Time Measurements, which are to be completed after each data collection event. The most recent versions of these checklists can be found on forms FS-F-5508 (for the mobile NaI detectors) and FS-F-5509 (for the HPGe).

Electronically recorded data from the GPS, HPGe, and mobile NaI systems will be downloaded on a daily basis to disks, or to the Local Area Network (LAN). The RTIMP group will review electronic data for completeness and accuracy before downloading it onto the LAN. Once complete, the data will be sent to the loader where it will be loaded onto the SED and an error log will be generated. The data will then be made available to users through both the Geographic Information System (GIS) and Microsoft Access Software. The RTIMP group will archive all downloaded data for future reference.

Field documentation, such as the field worksheets and moisture worksheet will undergo an internal QA/QC review by the RTIMP group. Field worksheets may be completed in the field and maintained in loose-leaf form. The RTIMP group will provide the Characterization Manager with maps displaying the precertification results for total activity, total uranium, radium-226, and thorium-232 HPGe readings. Maps will be produced for all Phase 1, 2 and 3 measurements. The data files for these results will be forwarded electronically to the Characterization Manager for inclusion in the CDL. All Mobile NaI data and the Phase 1 HPGe data will be considered ASL A. All Phase 2 and 3 HPGe data will be considered ASL B.

6.2 PHYSICAL SAMPLE DATA MANAGEMENT

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

All field measurements, observations, and sample collection information associated with physical sample collection will be recorded, as applicable, on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form, as required. The method of sample collection will be specified in the Field Activity Log. Borehole Abandonment Logs are required. The PSP number will be on all documentation associated with these sampling activities. Samples will be assigned a unique sample number as explained in Section 2.3 and listed in Appendix B. This unique sample identifier will appear on the Sample Collection Log and Chain of Custody/Request for Analysis and will be used to identify the samples during analysis, data entry, and data management.

Technicians will review all field data for completeness and accuracy and then forward the data package to the Field Data Validation Contact for final review. The field data package will be filed in the records of the Environmental Management Project. Analytical data that is designated for data validation will be forwarded to the Data Validation Group. The PSP requirements for analytical data validation are outlined in Section 3.1. Analytical data from the on- and off-site laboratories may be reviewed by the Data Management Lead prior to transfer of the data to the SED from the FACTS database.

Following field and analytical data validation, the Sample Data Management organization will perform data entry into the SED. After entry into the SED, a data group form will be completed for each material tracking location (as identified by WAO) and transmitted to WAO for WAC documentation.

To ensure that correct coordinates and survey information are tied to the final sample locations in the database, the following process will take place. Upon surveying all locations identified in the PSP, the Surveying Manager will provide the Data Management Lead (i.e., SDFP Characterization) with an electronic file of all surveyed coordinates and surface elevations. The Sampling Manager will provide the Data Management Lead with a list of any locations that must be moved during penetration permitting or collection, and the Data Management Lead will update the electronic file with this information. After sample collection is complete, the Data Management Lead will provide this electronic file to the Database Contact for uploading to SED.

APPENDIX A

DATA QUALITY OBJECTIVES
SL-054, REV. 1 AND SL-048, REV. 5

Control Number ___________

Fernald Environmental Management Project

Data Quality Objectives

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

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

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

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

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

DATA QUALITY OBJECTIVES

Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

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

Conceptual Model of the Site

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

1.0 Statement of Problem

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

2.0 Identify the Decision

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

3.0 Inputs That Affect the Decision

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

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

4.0 The Boundaries of the Situation

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

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

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

5.0 Decision Rule

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

6.0 Limits on Decision Errors

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

Types of Decision Errors and Consequences

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

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

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

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

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

7.2 COC Delineation

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

7.3 QC Considerations

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

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

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

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

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

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

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

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

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

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

7.4 Independent Assessment

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

7.5 Data Management

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

COC's.

7.6 Applicable Procedures

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

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

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

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

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

RI ☐ FS ☐ RD ☒ RA ☐ R_vA ☐ OTHER ☐

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

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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) ____

---

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
A ☒ B ☒ C ☐ D ☒ E ☒

Other
A ☐ B ☐ C ☐ D ☐ E ☐

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

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

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5. Site Information (Description):

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

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

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

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

6.B. Equipment Selection and SCQ Reference:

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

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

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

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

DQO Number: SL-048, Rev. 5

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

Background samples: OU5 RI

7.C. Sample Collection Reference:

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

---

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

8.A. Field Quality Control Samples:

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

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

8.B. Laboratory Quality Control Samples:

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

Other (specify) Per SCQ

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

Control Number ________

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Instrumentation Measurement Program: Precertification Monitoring

Number: SL-054

Revision: 1

Effective Date: 11/14/02

Contact Name: Richard J. Abitz

Approval: ____________________ Date: 11/14/02
James Chambers
DQO Coordinator

Approval: ____________________ Date: 11/14/02
Richard J. Abitz
RTIMP Manager

Rev. #	0	1					
Effective Date:	6/03/99	11/14/02					

Data Quality Objectives
Real Time Instrumentation Measurement Program
Precertification Monitoring

1.0 Statement of Problem

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

Conceptual Model of the Process

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

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

RTIMP measurements are collected according to procedures in the RTIMP Field Manual (RTIMP-M-0002) and protocols discussed in the *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In Situ Gamma Spectrometry at the Fernald Site* (Users Manual) and the *Sitewide Excavation Plan* (SEP). The RTIMP protocols in the Users Manual provide detail on the three phases of precertication monitoring, which can be summarized as follows:

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

- Phase 2 measurements are performed only with HPGe detectors. Measurements are collected at Phase 1 locations that correspond to the NaI action levels of highest gross gamma activity, U-238 or Th-232 activity greater than 3xFRL, and/or Ra-226 activity that exceeds 7xFRL. For HPGe Phase 1 locations, Phase 2 measurements are performed if U-238, Th-232 or Ra-226 activity exceeds 2xFRL (i.e., a hotspot). The objective of Phase 2 measurements is to screen the locations that exceed Phase 1 action levels and to confirm and delineate any hotspots that may be present at these locations. If hotspots are absent, certification activities can begin in the area. When hotspots are found, they are excavated and removed prior to performing Phase 3 measurements.

- Phase 3 measurements are performed only with HPGe detectors, and only if hotspots were identified and removed during Phase 2 activities. The area impacted by the hotspot removal is covered with a triangular grid and each node (4-meter nodes) is measured to confirm that U-238, Th-232 or Ra-226 activity is below 2xFRL (i.e., the hotspot is removed). If Phase 3 measurements confirm that the hotspot has been removed, certification activities can begin. When Phase 3 measurements indicate a hotspot remains in the area, additional Phase 2 measurements are performed to delineate the extent of the contamination.

Available Resources

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

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

Personnel: The RTIMP requires a minimum of 7 FTEs to maintain efficient operations under the current accelerated schedule. Personnel are distributed as follows: Manager, Field Supervisor, Systems Supervisor, and four field technicians.

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

2.0 Identify the Decision

Decision

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

Decision 1: Phase 2 measurements indicate the area is free of U-238, Th-232 and Ra-226 contamination in excess of 2xFRL (i.e., hotspots are absent).

Decision 2: Phase 2 measurements indicate hotspots are present and additional excavation is required to remove the contamination.

Results of Decision 1

When Phase 2 measurements indicate the area contains no hotspots, the area is released to begin the certification process. Precertification results are provided as maps to document that U-238, Th-232 and Ra-226 levels are below 2xFRL, and these maps are placed in the Certification Design Letter.

Results of Decision 2

Phase 2 measurements that identify hotspots are used to delineate the extent of the excavation, and the contamination is removed as additional scope under the Integrated Remedial Design Plan that is applicable to the area. Upon completion of the excavation and removal of the contaminated soil, Phase 3 measurements must be performed to verify that U-238, Th-232 and Ra-226 levels are below 2xFRL.

If Phase 3 measurements indicate the area contains no hotspots, the area is released to begin the certification process. Precertification results are provided as maps to document that U-238, Th-232 and Ra-226 levels are below 2xFRL, and these maps are placed in the Certification Design Letter.

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

3.0 Identify Inputs That Affect the Decision

Required Information

Information needed to make the decisions identified in Section 2 include gamma spectra collected with the NaI and HPGe detectors, soil moisture readings to correct the measurement results to dry-weight basis, log files generated from the software reduction of the spectra to reportable nuclide activity, geographic coordinates to allow the plotting of results on maps, and maps indicating the activity of the U-238, Th-232 and Ra-226 nuclides.

Sources of Information

GammaVision software is used to collect and save the gamma spectra and geographic coordinates obtained from the GPS. The spectra are then analyzed with LabView (NaI) or EGAS (HPGe) software to quantify the activity of U-238, Th-232 and Ra-226. Log files written by LabView and EGAS report sample identification, collection date, geographic coordinates, nuclide results and errors, and a flag column that indicates potential problems during the data reduction process. The log files are imported into Excel to check the results and flag column and then assign final quality-check codes. Maps are produced using Surfer software and the information contained in the Excel spreadsheet.

Action Levels

Action levels for the NaI measurements are the highest value for gross gamma counts in each batch file (a batch file is a continuous scan that contains hundreds to thousands of 4-second spectra), U-238 and Th-232 levels that exceed 3xFRL, and Ra-226 results that exceed 7xFRL. For HPGe measurements, action levels are set at 2xFRL for U-238, Th-232 and Ra-226.

Methods of Data Collection

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

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

4.0 The Boundaries of the Situation

Spatial Boundaries

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

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

Temporal Boundaries

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

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

5.0 Develop a Logic Statement

Parameters of Interest

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

Action Levels

Precertification action levels for each batch file collected with a NaI system are values corresponding to the highest gross counts (i.e., total gamma activity), 3xFRL for U-238 and Th-232, and 7xFRL for Ra-226. For HPGe detectors, the action levels are 2xFRL for U-238, Th-232 and Ra-226.

Decision Rules

If Phase 2 results indicate hotspots are absent (i.e., contamination is below 2xFRL for U-238, Th-232 or Ra-226), certification sampling can begin. However, when a Phase 2 measurement indicates a hotpot is present, the extent of the hotspot will be delineated and mapped to provide a record for removal of the hotspot.

After the hotspot is excavated and removed from the area, Phase 3 measurements will be taken to verify the removal of the hotspot. If Phase 3 measurements indicate the hotspot is gone, certification activities may begin. When a Phase 3 measurement records U-238, Th-232 or Ra-226 activity above 2xFRL, additional Phase 2 measurements are performed to delineate and map the additional contamination.

6.0 Establish Constraints on the Uncertainty of the Decision

Types of Decision Errors and Consequences

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

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

True Nature of the Decision Errors

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

7.0 Optimize a Design for Obtaining Quality Data

In situ measurements are collected with the mobile NaI detectors [Analytical Support Level (ASL A)] and the stationary HPGe detectors (ASL A or B). Surface moisture readings are obtained in conjunction with the NaI and HPGe measurements using the Zeltex moisture meter. The soil moisture is used to correct the measured U-238, Th-232 and Ra-226 activities to a dry-weight basis. Measured Ra-226 activity is also subject to a radon correction to account for differences in laboratory and *in situ* results and for background radon levels when evaluating Ra-226 hotspots. Section 5.3 of the Users Manual contains a detailed discussion on Ra-226 corrections.

Sodium Iodide Detectors

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

Prior to and after the NaI systems are mobilized to the field, the detector is checked with a Th-232 source to verify the location of the thallium-208 (Tl-208) peak and the net counts in the area under this peak. Detector efficiency is calculated annually for the protactinium-234, bismuth-214 and Tl-208 peaks, which are used to evaluate U-238, Ra-226 and Th-232 activity, respectively. Descriptions and pass/fail criteria for these calibration checks are given in the RTIMP Administrative and Field Manuals and Appendix H of the Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ).

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

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

High Purity Germanium Detectors

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

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

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

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

Data Quality Objectives
In Situ Precertification Measurements

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

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

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-054, Rev. 1 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 (OU5) Record of Decision (ROD), Appendix H of the SCQ, the RTIMP Administrative and Field Manuals, Sitewide Excavation Plan and the PSP.

4.B. Objective: To determine if the area of interest is free of hotspots (i.e., U-238, Th-232 or Ra-226 in excess of 2xFRL) and likely to pass certification.

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5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FEMP that require remediation activities. The U-238, Th-232 and Ra-226 levels in soil in these areas must be below the established FRLs.

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

1. pH	☐	2. Uranium	☒ *	3. BTX	☐
Temperature	☐	Full Rad.	☒ *	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	☐		☐		

* Full rad is U-238, Th-232 and Ra-226.

6.B. Equipment Selection and SCQ Reference:

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

* ASL B is selected when there is a 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 PSPs.

Background samples: OU5 Remedial Investigation/Feasibility Study

7.C. Sample Collection Reference:
-RTIMP-M-0001; RTIMP Administrative Manual
-RTIMP-M-0002; RTIMP Field Manual

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

8.A. Field Quality Control Samples:

Trip Blanks [ ]
Field Blanks [ ]
Equipment Rinsate Samples [ ]
Preservative Blanks [ ]
Container Blanks [ ]
Duplicate Samples [X] *
Split Samples [ ]
PE Samples [ ]

Other (specify) Radon Monitoring, moisture *

* *If specified in the PSP.*

8.B. Laboratory Quality Control Samples:

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

Other (specify)____________________

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

APPENDIX B

SAMPLES TO BE COLLECTED AS PART OF A6PI PRECERTIFICATION

APPENDIX B
SAMPLES PLANNED FOR COLLECTION - A6PI PRECERTIFICAITON SAMPLING

Location ID	Northing 83	Easting 83	Depth	Depth ID	Analysis	Sample ID
A6P1-1	482461.52	1346055.63	0-0.5 ft	1	TAL A & B	A6P1-1-1-RMP
			2-2.5 ft	5	TAL A & B	A6P1-1-5-RMP
			4.5-5 ft	10	TAL A & B	A6P1-1-10-RMP
A6P1-2	482438.38	1346205.06	0-0.5 ft	1	TAL A & B	A6P1-2-1-RMP
			2-2.5 ft	5	TAL A & B	A6P1-2-5-RMP
			4.5-5 ft	10	TAL A & B	A6P1-2-10-RMP
A6P1-3	482309.7	1346243.2	0-0.5 ft	1	TAL A & B	A6P1-3-1-RMP
			2-2.5 ft	5	TAL A & B	A6P1-3-5-RMP
			4.5-5 ft	10	TAL A & B	A6P1-3-10-RMP
A6P1-4	482384.8	1346379.94	0-0.5 ft	1	TAL A & B	A6P1-4-1-RMP
			2-2.5 ft	5	TAL A & B	A6P1-4-5-RMP
			4.5-5 ft	10	TAL A & B	A6P1-4-10-RMP

APPENDIX C

TARGET ANALYTE LISTS

APPENDIX C
TARGET ANALYTE LISTS

TAL 20600-PSP-0003-A
Soil Analysis, Off-Site (ASL B), 12 Analyses Specified in PSP

Analyte	FRL	Requested Minimum Detection Limit[a]
Total Uranium	82 mg/kg	8.2 mg/kg
Thorium-228	1.7 pCi/g	0.17 pCi/g
Thorium-230	280 pCi/g	28 pCi/g
Thorium-232	1.5 pCi/g	0.15 pCi/g
Radium-226	1.7 pCi/g	0.17 pCi/g
Radium-228	1.8 pCi/g	0.18 pCi/g

TAL 20600-PSP-0003-B
Soil Analysis, Off-Site (ASL B), 12 Analyses Specified in PSP

Analyte	FRL	Requested Minimum Detection Limit[a]
Arsenic	12 mg/kg	1.2 mg/kg
Beryllium	1.5 mg/kg	0.15 mg/kg
Aroclor-1254	130 μg/kg	13 μg/kg
Aroclor-1260	130 μg/kg	13 μg/kg

TAL 220600-PSP-0003-C
Soil Analysis, On-Site (ASL B), 0 Analyses Specified in PSP

Analyte	FRL	Requested Minimum Detection Limit[a]
Total Uranium	82 mg/kg	8.2 mg/kg

μg/kg – micrograms per kilogram

[a] The minimum detection limit is set at 10 percent of the FRL or 10 percent of the WAC limit, whichever is less.

TAL 220600-PSP-0003-D
Soil Analysis, On-Site (ASL B), 0 Analyses Specified in PSP

Analyte	FRL - Soil	Requested Minimum Detection Limit Waters - µg/L, Soils - µg/kg
Chloromethane	N/A	10
Bromomethane	8,200 mg/kg	10
Vinyl Chloride	0.13 mg/kg	10
Chloroethane	N/A	10
Methylene Chloride	37 mg/kg	10
Acetone	43,000 mg/kg	50
Carbon Disulfide	5,000 mg/kg	10
1,1-Dichloroethene	0.41 mg/kg	10
1,1-Dichloroethane	N/A	10
Total 1,2-Dichloroethene	0.16 mg/kg	10
Chloroform	45 mg/kg	10
1,2-Dichloroethane	N/A	10
2-Butanone	N/A	50
1,1,1-Trichloroethane	N/A	10
Carbon Tetrachloride	2.1 mg/kg	10
Bromodichloroemethane	4.0 mg/kg	10
1,2-Dichloropropane	N/A	10
Cis-1,3-Dichloropropene	N/A	10
Trichloroethene	25 mg/kg	10
Dibromochloromethane	N/A	10
1,1,2-Trichloroethane	4.3 mg/kg	10
Benzene	850 mg/kg	10
Trans-1,3-Dichloropropene	N/A	10
Bromoform	31 mg/kg	10
4-Methyl-2-pentanone	2,500 mg/kg	50
2-Hexanone	3.6 mg/kg	50
Tetrachloroethene	N/A	10
1,1,2,2-Tetrachloroethene	100,000 mg/kg	10
Toluene	340 mg/kg	10
Chlorobenzene	340 mg/kg	10
Ethylbenzene	5,100 mg/kg	10
Styrene	N/A	10
Xylenes (total)	920,000 mg/kg	10

µg/kg – micrograms per kilogram
µg/L – micrograms per liter