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CERTIFICATION DESIGN LETTER FOR AREA 2, PHASE II – SUBAREA 3 IMPACTED MATERIAL HAUL ROAD

FERNALD CLOSURE PROJECT
FERNALD, OHIO

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U.S. DEPARTMENT OF ENERGY

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LIST OF ACRONYMS AND ABBREVIATIONS

A2PIIS3	Area 2, Phase II - Subarea 3
A2PIIS4	Area 2, Phase II - Subarea 4
ASCOC	area-specific constituent of concern
ASL	analytical support level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CRDL	contract required detection limit
CU	certification unit
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
EWF	Equipment Wash Facility
FCP	Fernald Closure Project
FRL	final remediation level
IMHR	Impacted Material Haul Road
MDL	minimum detection level
mg/kg	milligrams per kilogram
OEPA	Ohio Environmental Protection Agency
OU5	Operable Unit 5
pCi/g	picoCuries per gram
PSP	Project Specific Plan
QC	Quality Control
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
UCL	Upper Confidence Limit
V/FCN	Variance/Field Change Notice

EXECUTIVE SUMMARY

This Certification Design Letter (CDL) describes the certification approach for Area 2, Phase II - Subarea 3 (A2PIIS3) Impacted Material Haul Road (IMHR) from where it begins southeast of the Silos to where it ends on the northern end of the Equipment Wash Facility (EWF). The following information is included:

- The boundary (Figure 1-1) and a description of the area to be certified under the guidance of this CDL;
- A presentation of historical (predesign) data from the area proposed for certification;
- A discussion of the area-specific constituent of concern (ASCOC) selection process and list of ASCOCs assigned to A2PIIS3 - IMHR;
- A presentation of the certification unit (CU) boundaries;
- The analytical requirements and the statistical methodology employed; and
- The proposed schedule for the certification activities.

A2PIIS3 - IMHR is an area that consists of approximately 1.74 acres of paved road overlying areas that have been previously excavated to construct the road. It is bordered on the north by the Silos area, on the east by the Area 2, Phase II Subarea 4 (A2PIIS4) certified area and the EWF, and on the south and west by the A2PIIS4 certified area. Due to the results of predesign activities, the need for further remediation activities is not anticipated for this particular area and certification activities may begin. Physical sampling results from predesign activities along with a statistical analysis of applicable constituents of concern (COCs) for A2PIIS3 - IMHR is presented in Appendix A.

The certification design presented in this CDL follows the general approach outlined in Section 3.4 of the Sitewide Excavation Plan (SEP, DOE 1998) and SEP Addendum (DOE 2001). It differs in that this certification effort will be through the existing pavement and of the underlying soil and will rely on the existing data collected during Predesign that has been upgraded to Analytical Support Level D. The selection of A2PIIS3 - IMHR ASCOCs was accomplished using COC lists in the Operable Unit 5 Record of Decision (DOE 1996). One CU has been established to cover the A2PIIS3 - IMHR certification area. The CU design was based on the length of the road and the width between the bordering certification boundaries of A2PIIS4.

Total uranium, thorium-228, thorium-232, radium-226, and radium-228 (the sitewide primary radiological COCs) are considered ASCOCs for this CU. Additionally, arsenic is included as a secondary COC for this CU. No further soil remediation or characterization is needed because the predesign data demonstrate this area will pass the certification requirements.

The intent of this effort is to certify the soil beneath the pavement that is expected to remain in place for routine traffic until completion of the Silos Project. This approach has been used in the past when certifying the impacted road in Area 1, Phase II Access Road Area. The pavement will be excavated immediately after the Silos operation. The IMHR is needed to provide general access to the Silos area during its operation. Certification of the soil under the road without excavation of the road itself is being done to minimize the waste that would be generated should the site remove the current road and build a new one after certification has been completed.

1.0 INTRODUCTION

This Certification Design Letter (CDL) describes the certification approach for demonstrating that soil under the road in Area 2, Phase II Subarea 3 (A2PIIS3) - Impacted Material Haul Road (IMHR) meets the final remediation levels (FRLs) for all area-specific constituents of concern (ASCOCs). The format of this CDL follows guidelines presented in the Sitewide Excavation Plan (SEP, DOE 1998). Accordingly, this CDL consists of six sections:

- Introduction - Presentation of the purpose, objectives, and scope of this CDL
- Historical Data - Presentation and discussion of historical (predesign) soil data from A2PIIS3 - IMHR
- Area-Specific Constituents of Concern - Discussion of selection criteria and ASCOCs for A2PIIS3 - IMHR
- Certification Approach - Presentation of design, sampling and analytical methodologies
- Schedule

Just as with other parts of Area 2, certification of A2PIIS3 is being performed in several phases based on the required action for each of the different sections to be found in this area. This CDL deals only with the IMHR. The Equipment Wash Facility (EWF), Subcontractor Laydown Area, Trailer Complex Area, Aquifer Project Area, and the South Field Extraction System Valve House Area will be submitted for certification under different documentation.

1.1 OBJECTIVES

The primary objectives of this document are to:

- Define the boundaries of the area to be certified under the guidance of this CDL;
- Present historical (predesign) data collected from within the area proposed for certification;
- Define the ASCOC selection process and list the selected A2PIIS3 - IMHR ASCOCs;
- Present the certification unit (CU) boundaries;
- Present the existing predesign data and demonstrate certification will be achieved,
- Summarize the analytical requirements and the statistical methodology employed; and
- Present the proposed schedule for the certification activities.

1.2 SCOPE AND AREA DESCRIPTION

A2PIIS3 - IMHR is an area of approximately 1.74 acres of paved road overlying previously excavated areas. It is bordered on the north by the Silos area, on the east by the Area 2, Phase II - Subarea 4 (A2PIIS4) certified area and the EWF, and on the south and west by the A2PIIS4 certified area. The boundary for A2PIIS3 - IMHR is shown on Figure 1-1.

Due to the results of predesign activities, further remediation activities are not expected. The ASCOCs for the only CU in this area are total uranium, thorium-228, thorium-232, radium-226, and radium-228 [the sitewide primary radiological constituents of concern (COCs)] as well as the secondary COC of arsenic.

This CDL differs from that of a typical CDL in that the predesign data will be used to demonstrate that the soil underlying the IMHR is ready for certification. Furthermore, this data will be presented in a Certification Report to comply with all certification protocols. Variance/Field Change Notice (V/FCN) 20450-PSP-0005-11 was written in order to utilize Data Quality Objectives SL-052, Sitewide Certification Sampling and Analysis. This variance documented the adjustments made to the Project Specific Plan (PSP) for the Predesign of Area 2, Phase II – Subarea 3 (Supplement to 20300-PSP-0011, DOE 2004) to allow the predesign samples to be analyzed for certification purposes and the applicable analytes affected. This was done to ensure the results received were consistent with the requirements of both the certification DQO as well as FD-1000, Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Plan (SCQ). All data will be validated to the same level as required for any certification effort. Both the surface and subsurface of the soil beneath the road will be demonstrated to be ready for certification as outlined in Section 3.4, Appendix G of the SEP and Section 3.4.8 of the SEP Addendum (DOE 2001).

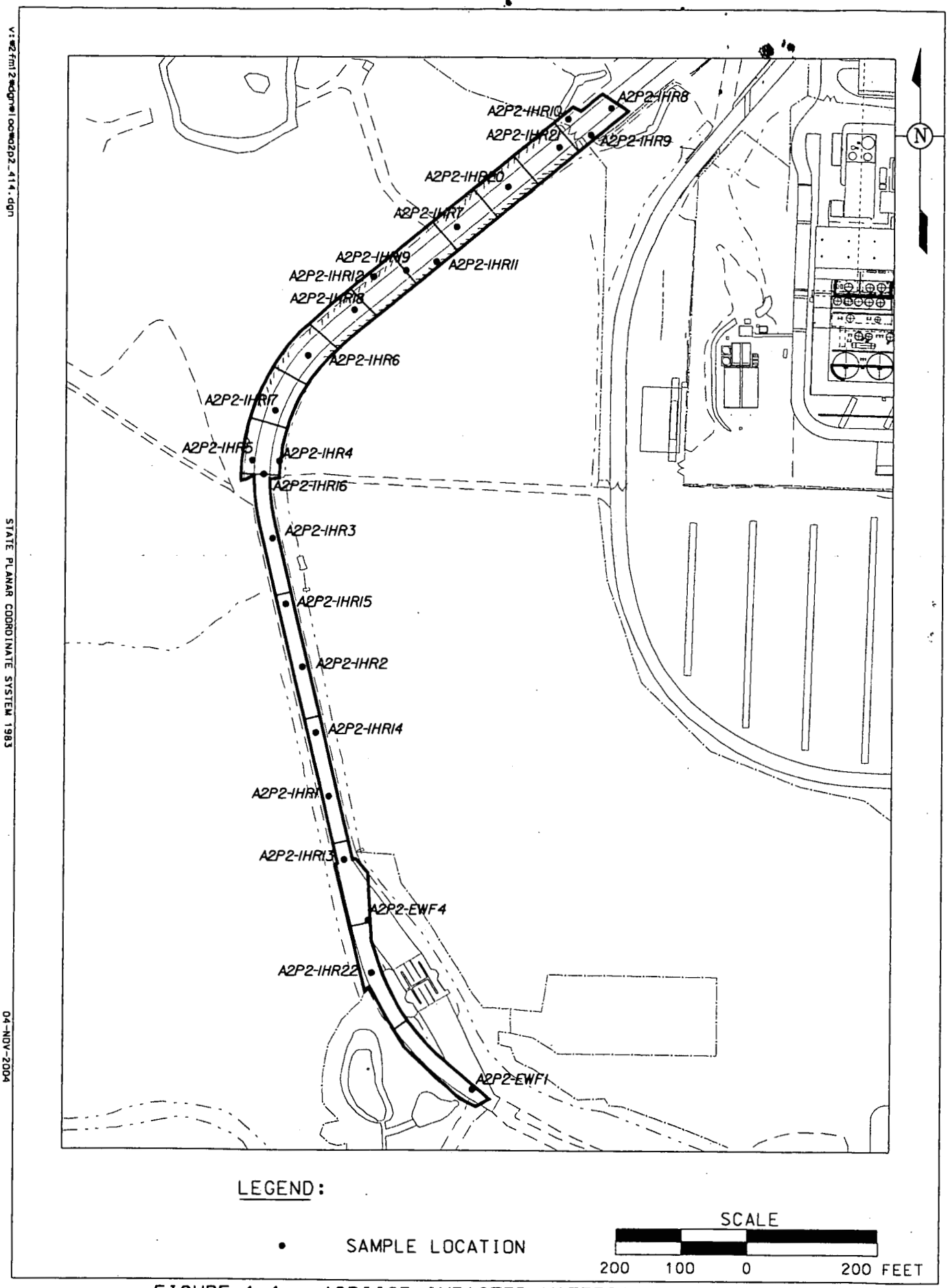

FIGURE 1-1. A2PIIS3 IMPACTED MATERIAL HAUL ROAD - CU/SUB CU/SAMPLE LOCATION MAP

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STATE PLANAR COORDINATE SYSTEM 1983

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2.0 HISTORICAL DATA

The purpose of gathering historical data (in this case predesign data) from A2PIIS3 - IMHR is to determine if the area is ready for certification. Characterization data have been collected from A2PIIS3 - IMHR as part of the sampling activities proscribed by the A2PIIS3 Predesign PSP.

2.1 EXCAVATION HISTORY

The IMHR was originally built to support the South Field Excavation. The area was initially scraped to remove the topsoil which was stockpiled adjacent to the EWF and later certified clean as a soil pile to be used for restoration activities. After excavation of the proposed roadbed, the pavement was laid utilizing importing "clean" construction materials (i.e., materials not removed from the former production area or having the potential for containing radiological materials).

2.2 PREDESIGN DATA

Before initiating the certification process, all pertinent historical soil data relative to A2PIIS3 - IMHR (in this case predesign data) were pulled from the Sitewide Environmental Database (SED). The historical sample data are presented in Appendix A of this CDL. No Remedial Investigation/Feasibility Study (RI/FS) data exists for the area within the IMHR.

Results of predesign sampling indicate that the data that are in the 0 to 0.5-foot soil interval immediately below the road surface meet the requirements for certification. A preliminary statistical analysis shows that the average concentration for all applicable ASCOCs in this area have been demonstrated to be below the FRLs within the confidence level. However, subsurface intervals at depths greater than 2.5 feet show elevated levels of radium-226 and arsenic. Therefore, as described in the addendum to the SEP, the subsurface data was compared to background levels on a population-to-population basis. The statistics also demonstrate that the levels of radium-226 and arsenic in the subsurface are consistent with the area background conditions. The results of predesign sampling and preliminary statistical analysis are provided in Appendix A.

3.0 AREA-SPECIFIC CONSTITUENTS OF CONCERN

In the Operable Unit 5 (OU5) Record of Decision (ROD, DOE 1996), there are 80 soil COCs with established FRLs. These COCs were retained for further investigation based on a screening process that considered the presence of the constituent in site soil and the potential risk to a receptor exposed to soil containing this contaminant. In spite of the conservative nature of this COC retention process, many of the COCs with established FRLs have a limited distribution in site soil or the presence of the COC is based on high contract required detection limits (CRDLs). When FRLs were established for these COCs in the OU5 ROD, the FRLs were initially screened against site data presented on spatial maps to establish a picture of potential remediation areas.

By reviewing existing RI/FS data presented on spatial distribution maps, the sitewide list of soil COCs in the OU5 ROD was reduced from 80 to 30. This reduction was possible because the majority of the COCs with FRLs listed in the OU5 ROD have no detections above their corresponding FRL, thus eliminating them from further consideration. The 30 remaining sitewide COCs account for over 99 percent of the combined risk to a site receptor model, and they comprise the list from which all of the remediation ASCOCs are drawn. When planning certification for a remediation area, additional selection criteria are used to derive a subset of these 30 COCs. This subset of COCs is passed along to the certification process.

3.1 SELECTION CRITERIA

All of the sitewide primary COCs (total uranium, radium-226, radium-228, thorium-232, and thorium-228) will be retained as ASCOCs for certification. The selection process for retaining secondary ASCOCs for a remediation area is driven by applying a set of decision criteria. A soil contaminant will be retained as an ASCOC if:

- It was retained as an ASCOC in adjacent Fernald Closure Project (FCP) soil remediation areas;
- It is listed as a soil COC in the OU5 ROD, and it is listed as an ASCOC in Table 2-7 of the SEP for the Remediation Area of interest;
- Analytical results show that a contaminant is present above its FRL, and the above-FRL concentrations are not attributable to false positives or elevated CRDLs;
- It can be traced to site use, either through process knowledge or known release of the constituent to the environment; and

- Physical characteristics of the contaminant, such as degradation rate and volatility, indicate it is likely to persist in the soil between time of release and remediation.

3.2 ASCOC SELECTION PROCESS FOR A2PIIS3 - IMHR

The A2PIIS3 Predesign PSP identified two primary COCs and six secondary COCs for this area. When the possibility of this data being used for certification purposes was identified, the three additional primary COCs were added. The complete list of ASCOCs used for the IMHR is shown in Table 3-1.

Total uranium, radium-226, radium-228, thorium-228 and thorium-232 are sitewide primary COCs, and will be retained as ASCOCs for the A2PIIS3 CU. The remaining ASCOC (arsenic) to be evaluated during certification of the A2PIIS3 - IMHR CU is based on the suite of ASCOCs from above-FRL results on predesign samples. The selected A2PIIS3 - IMHR ASCOC for the CU(s) is listed on Table 3-2, along with it's applicable FRL. No other constituent in the predesign samples was present above the FRL.

Table 3-2 lists the ASCOCs that will be retained for sampling based on the above-listed criteria. The reason for constituent retention is included in the table.

TABLE 3-1
ASCOC LIST ASSOCIATED WITH A2PIIS3 - IMHR PREDESIGN DATA

Primary ASCOCs	Secondary ASCOCs	
Total Uranium Radium-226 Radium-228 Thorium-228 Thorium-232	Arsenic Benzo(a)pyrene Beryllium	Dibenzo(a,h)anthracene Lead Technetium-99

TABLE 3-2
ASCOC LIST FOR A2PIIS3 - IMHR CERTIFICATION UNITS

ASCOC	FRL	Reason Retained
Total Uranium	82 mg/kg	Retained as a primary ASCOC sitewide
Radium-226	1.7 pCi/g	Retained as a primary ASCOC sitewide
Radium-228	1.8 pCi/g	Retained as a primary ASCOC sitewide
Thorium-228	1.7 pCi/g	Retained as a primary ASCOC sitewide
Thorium-232	1.5 pCi/g	Retained as a primary ASCOC sitewide
Arsenic	12 mg/kg	ASCOC for A2PIIS3 – above-FRL results

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

4.0 CERTIFICATION APPROACH

4.1 CERTIFICATION DESIGN

The intent of this effort is to certify the soil beneath the pavement that is expected to remain in place for routine traffic after the underlying soil has been certified. This approach has been used in the past when certifying the impacted road in Area 1, Phase II Access Road Area. The pavement will be excavated immediately after the Silos operation. Currently, the road is needed to support the Silos Project. The current access road to the Silos area will be restricted due to radiation from the Silos staging area. The IMHR is needed to provide general access to the Silos area. Certification of the soil under the road without excavation of the road itself is being done to minimize the waste that would be generated should the site remove the current road and build a new one after certification has been completed. The certification design for A2PIIS3 - IMHR follows the general approach outlined in Section 3.4 of the SEP and the SEP Addendum. The CU design and sample locations are depicted in Figure 1-1. Approach A from the SEP will be used as a basis for certification design, as described in Section 4.5 of the SEP. A single CU was designed to encompass the entirety of the surface soil of the IMHR excluding the EWF.

Although the area of this CU exceeds the prescribed 62,500 ft^2 for a Group 1 CU by having 75,770 ft^2, the intent of increasing the sample density in an impacted area has been met with this CU having 23 surface samples. Given that the usual sample density for a Group 1 CU is 16 samples and that the area of the IMHR is 121.23 percent of the proscribed area for a Group 1 CU, the maximum number of samples for the actual area of this CU should be 20. Twenty-three (23) surface samples are more than sufficient (see Figure 1-1). One Sub-CU is designated as an archive location and had no samples collected associated with it (see Figure 1-1).

Additionally, the subsurface of this CU will be compared to the background levels of the ASCOCs as described in the SEP addendum since the predesign data have indicated elevated levels at the 2.5 to 4.5-foot depths for radium-226 and arsenic.

4.1.1 Sampling of the IMHR

As discussed previously in this document, the IMHR is an area of approximately 1.74 acres of paved road overlying areas previously excavated. Since samples were collected every 100 feet along the road

as well as on both sides of the road at certain intervals, 23 sample locations were sampled. At each location, four intervals were collected (0 to 0.5 feet, 1.0 to 1.5 feet, 2.0 to 2.5 feet, and 3.0 to 3.5 feet). Because preliminary data evaluation indicates that no further remedial activity is necessary, the 92 samples collected during predesign will be used for certification and the CU was designed to accommodate this information.

4.2 ANALYTICAL METHODOLOGY

Laboratory analysis of certification samples was conducted using approved analytical methods, as discussed in Appendix H of the SEP. The minimum detection level (MDL) was set at 10 percent of the FRL. Because samples were originally requested at Analytical Support Level (ASL) "B" (as is appropriate for predesign samples), the field Quality Control (QC) required for ASL "D" were not collected. For chemical analyses, where sufficient lab QC is routinely done to verify precision and accuracy of the data, this is of limited consequence. For the radiological samples, which do not routinely analyze the additional lab QC (duplicates), it was requested that the lab analyze two duplicates per analytical release to provide additional precision and accuracy information. This will be done to create the approximation of ASL "D" analyses. However, the analyses meet all other SCQ ASL"D" criteria. An ASL "D" data package will be provided for all of the analytical data for the required ASCOCs (see Table 3-1). All data will be validated to the same level as required for any certification effort.

4.3 STATISTICAL ANALYSIS

Once data are entered into the SED, a statistical analysis will be performed to evaluate the pass/fail criteria for the CU. The statistical approach is discussed in Section 3.4.3, Appendix G of the SEP, and Section 3.4.8 of the SEP Addendum.

Surface Samples (0 to 6-inch)

Two criteria must be met for the CU to pass certification. If the data distribution is normal or lognormal, the first criterion compares the 95 percent Upper Confidence Limit (UCL) on the mean of each primary COC to its FRL, or the 90 percent UCL on the mean of each secondary ASCOC. On an individual CU basis, any ASCOC with the 95 percent UCL for primary ASCOCs (or 90 percent UCL above the FRL for secondary COCs) results in that CU failing certification. If the data distribution is not normal or lognormal, the appropriate nonparametric approach discussed in Appendix G of the SEP will be used to evaluate the second criterion. The second criterion is the hot spot criterion, which states that primary or

secondary ASCOC results must not exceed two times the FRL. When the given UCL on the mean for each COC is less than its FRL and the hot spot criterion is met, the CU will be considered certified.

In the event that the CU fails certification, the following scenarios will be evaluated: 1) a high variability in the data set, 2) localized contamination, and 3) widespread contamination. Details on the evaluation and responses to these possible outcomes are provided in Section 3.4.5 of the SEP. When the CU within the scope of this CDL has passed certification, a certification report will be issued. The Certification Report will be submitted to the U.S. Environmental Protection Agency (EPA) and the Ohio Environmental Protection Agency (OEPA) to receive acknowledgement that the pertinent operable unit remedial action was completed and the individual CU is certified to be released for interim or final land use. Section 7.4 of the SEP provides additional details and describes the required content of the certification reports.

Subsurface Baseline Confirmation Samples (18-inches and greater)

As described in Section 3.4.8 of the SEP Addendum, statistical analyses for the baseline confirmation samples (subsurface) compare the subsurface soil data to background concentrations. If all of the baseline confirmation data in the entire area (i.e., 70 or more samples) to be certified are less than the 95th percentile background concentration for each COC, then the impacted area is not extended and the background area below/outside the impacted zone is considered certified. If any COC has a baseline confirmation result equal to or exceeding the 95th percentile background concentration, statistics of the baseline confirmation data set for each COC are evaluated. If those COC-specific baseline confirmation results are less than the corresponding background population, based on a population-to-population comparison (i.e., t-test or Wilcoxon tests) or cannot be differentiated at 99 percent UCL, then the original impacted zone is not extended and the zone below/outside the impacted area is considered certified.

If any COC-specific data population is higher than the background population, more statistical evaluations of the data are required. For example, all baseline confirmation data from any CU with concentration(s) higher than the 95th percentile background concentration will be grouped into a subset for evaluation. If the UCL of the mean of this subset of data for each COC is less than the 95th percentile background concentration, then the original impacted area is not extended, and the zone below/outside the impacted surface CU is considered certified.

If the UCL of the mean of this subset of data for any COC is greater than the 95th percentile background concentration, then a portion of the originally designated background zone will be designated as impacted.

This newly designated impacted zone will require FRL certification. The reduced background certification area will require re-analyses using the remaining baseline confirmation data to confirm that background conditions exist. Guidelines of the baseline confirmation process are defined in the SEP Addendum, Section 3.4.5, Procedures for Non-Attainment Scenarios.

When the CU within the scope of this CDL has passed certification, a Certification Report will be issued. The Certification Report will be submitted to the regulatory agencies to receive acknowledgment that the pertinent operable unit remedial actions were completed, and the CU is certified and may be released for interim or final land use. Section 7.4 of the SEP provides additional details and describes the required content of the Certification Report.

5.0 SCHEDULE

The following draft schedule shows key activities for the completion of the work within the scope of this CDL. Implementation of this schedule is pending funding availability and property access. If necessary, an extension will be requested.

Activity	Target Date
Submittal of Certification Design Letter	November 9, 2004
Complete Data Validation and Statistical Analysis	November 15, 2004
Submit Certification Report	November 22, 2004*

*Only the date for submittal of the Certification Report is a commitment to the EPA and OEPA. Others dates are internal target completion dates.

REFERENCES

U.S. Department of Energy, 1996, "Record of Decision for Remedial Action at Operable Unit 5," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

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

U.S. Department of Energy, 2001, "Addendum to the Sitewide Excavation Plan," Draft, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2004, "Project Specific Plan for the Predesign of Area 2, Phase II – Subarea 3 (Supplement to 20300-PSP-0011)" Revision 1, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

APPENDIX A

ANALYTICAL RESULTS AND STATISTICAL ANALYSIS OF SAMPLE DATA WITHIN A2PIIS3 - IMHR

APPENDIX A-1
SURFACE PREDESIGN DATA

Sample ID	Primary COCs					Secondary COC[1]	
	Total U	Radium-226	Radium-228	Thorium-228	Thorium-232	Arsenic	
A2P2-EWF1^1-MRS	6.34	0.962	0.81	0.862	0.81	3.68	
A2P2-EWF4^1-MRS	9.7	1.25	0.864	0.842	0.864	1.42	U
A2P2-IHR1^1-MRS	5.43	1.47	1.08	1.07	1.08	12.1	
A2P2-IHR10^1-MRS	5.89	1.15	0.963	0.978	0.963	8.87	
A2P2-IHR11^1-MRS	10.6	1.27	1.06	1.08	1.06	4.75	
A2P2-IHR12^1-MRS	0.288 U	1.35	1.05	1.07	1.05	11.6	
A2P2-IHR13^1-MRS	2.46 U	1.14	0.841	0.868	0.841	12.8	
A2P2-IHR14^1-MRS	2.81 U	1.02	0.791	0.815	0.791	8.88	
A2P2-IHR15^1-MRS	3.82	1.06	0.679	0.66	0.679	5.96	
A2P2-IHR16^1-MRS	3.31	1.03	0.709	0.708	0.709	8.25	
A2P2-IHR17^1-MRS	3.95	1.12	0.702	0.669	0.702	7.8	
A2P2-IHR18^1-MRS	4.77	1.04	0.814	0.809	0.814	0.971	U
A2P2-IHR19^1-MRS	5.64	0.967	0.768	0.769	0.768	1.04	U
A2P2-IHR2^1-MRS	2.81 U	1.25	0.963	0.986	0.963	2.88	U
A2P2-IHR20^1-MRS	2.96 U	1.01	0.769	0.767	0.769	4.17	
A2P2-IHR21^1-MRS	2.75 U	1.05	0.795	0.806	0.795	3.21	
A2P2-IHR3^1-MRS	2.47	1.09	0.727	0.729	0.727	2.32	U
A2P2-IHR4^1-MRS	10.9	1.14	0.912	0.929	0.912	3.22	U
A2P2-IHR5^1-MRS	10.7	1.2	0.876	1.01	0.876	10.9	
A2P2-IHR6^1-MRS	4.24	1.43	1.14	1.11	1.14	8.37	U
A2P2-IHR7^1-MRS	2.86 U	0.945	0.764	0.783	0.764	2.9	U
A2P2-IHR8^1-MRS	4.69	1.16	0.779	0.776	0.779	5.65	
A2P2-IHR9^1-MRS	3.95 U	1.36	0.971	0.977	0.971	11.2	
FRL	82	1.7	1.8	1.7	1.5	12	
Units	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g	mg/kg	
Conf. Level	95%	95%	95%	95%	95%	90%	
Max. Result	10.9	1.47	1.14	1.11	1.14	12.8	
Max. >= Limit	No	No	No	No	No	Yes	
W-Statistic Prob. *	--	--	--	--	--	4.7% (N)	
Test Procedure	--	--	--	--	--	Wilcoxon	
Sample Size	23	23	23	23	23	23	
Nondetects	8	0	0	0	0	8	
% Nondetects	34.8	0	0	0	0	34.80%	
Est. Mean **	--	--	--	--	--	4.75	
UCL	--	--	--	--	--	8.25	
Prob. > Limit	--	--	--	--	--	0.00%	
Pass / Fail	pass	pass	pass	pass	pass	pass	
A posteriori Sample Size Calculation	--	--	--	--	--	4 pass	

[1] No other secondary COCs were reported since only Arsenic had results exceeding the FRL.

* W - Statistic Probablility is the highest reported probability of the Shapiro-Wilk W - Statistic for tests for the validity of the normality assumption. The test is performed o nthe raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

** Est. Mean = Estimated measure of central tendency (normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

APPENDIX A-2
SUBSURFACE STATISTICS FOR THE IMHR

Arsenic (mg/kg) Subsurface

	A2P2	Back
Samples	75	140
Average	8.98	7.54
Median	6.57	7.40
Std. Dev.	8.51	2.96
Minimum	0.51	0.69
Maximum	45.7	15.8
Lower Quartile	2.75	5.31
Upper Quartile	11.6	9.75
UCL-Mean (90%)	10.26	7.86
t-Test Prob.	**0.0712**	
F-test (SD) Prob.	**0.000**	
W-test (median) P	**0.5452**	
K-S (distr.) Prob.	**0.0041**	

INTERPRETATION
Not Significantly Different
Std. Dev. Different
Not Significantly Different
Distributions are different

CONCLUSION: Insufficient evidence to conclude that A2P2 is greater than Background.

Radium-226 (pCi/g) Subsurface

	A2P2	Back
Samples	75	140
Average	1.212	1.174
Median	1.170	1.267
Std. Dev.	0.367	0.302
Minimum	0.616	0.515
Maximum	2.900	1.687
Lower Quartile	0.980	0.880
Upper Quartile	1.380	1.435
UCL-Mean (95%)	1.283	1.216
t-Test Prob.	**0.409**	
F-test (SD) Prob.	**0.0497**	
W-test (median) P	**0.977**	
K-S (distr.) Prob.	**0.295**	

INTERPRETATION
Not Significantly Different
Std. Dev. Different
Not Significantly Different
Not Significantly Different

CONCLUSION: Insufficient evidence to conclude that A2P2 is greater than Background.

APPENDIX A-3
SUBSURFACE DATA

SampleID	Primary COC	Secondary COC	
	Radium-226 (pCi/g)	Arsenic (mg/kg)	
A2P2-EWF1^3	1.56	4.31	
A2P2-EWF1^5	1.53	1.01	U
A2P2-EWF1^7	1.12	7.69	
A2P2-EWF4^3	1.53	5.03	
A2P2-EWF4^5	2.9	28.4	
A2P2-EWF4^7	1.45	13.9	
A2P2-IHR1^3	1.33	9.76	
A2P2-IHR1^5	1.51	14.8	
A2P2-IHR1^7	2.19	38.5	
A2P2-IHR1^9	1.2	15.9	
A2P2-IHR1^11	1.38	11.2	
A2P2-IHR1^13	1.4	11.6	
A2P2-IHR10^3	1.28	14	
A2P2-IHR10^5	0.683	7.48	
A2P2-IHR10^7	0.616	4.68	
A2P2-IHR11^3	0.946	5.14	
A2P2-IHR11^5	0.824	10.1	
A2P2-IHR11^7	0.902	5.12	
A2P2-IHR12^3	0.978	4.47	
A2P2-IHR12^5	0.734	4.11	
A2P2-IHR12^7	0.771	3.48	
A2P2-IHR13^3	1.43	15.2	
A2P2-IHR13^5	1.84	31.9	
A2P2-IHR13^7	0.98	45.7	
A2P2-IHR14^3	1.06	4.95	
A2P2-IHR14^5	1.04	3.47	
A2P2-IHR14^7	1.05	6.85	
A2P2-IHR15^3	1.13	10.5	
A2P2-IHR15^5	0.959	6.35	
A2P2-IHR15^7	1.32	6.48	
A2P2-IHR16^3	0.909	10.9	
A2P2-IHR16^5	1.2	8.98	
A2P2-IHR16^7	1.69	15.3	
A2P2-IHR17^3	1.15	14.2	
A2P2-IHR17^5	1.45	11.6	
A2P2-IHR17^7	1.56	8.14	
A2P2-IHR18^3	1	9.32	

SampleID	Primary COC	Secondary COC	
	Radium-226 (pCi/g)	Arsenic (mg/kg)	
A2P2-IHR18^5	0.944	4.27	
A2P2-IHR18^7	0.825	2.64	
A2P2-IHR19^3	0.991	4.65	
A2P2-IHR19^5	1.03	1.07	U
A2P2-IHR19^7	1.15	7.5	
A2P2-IHR2^3	1.6	18.5	
A2P2-IHR2^5	1.48	17.1	
A2P2-IHR2^7	1.71	16.5	
A2P2-IHR2^9	0.924	6.57	
A2P2-IHR2^11	0.711	7.64	
A2P2-IHR2^13	0.715	4.24	
A2P2-IHR20^3	1.27	1.98	
A2P2-IHR20^5	1.36	2.78	
A2P2-IHR20^7	1.06	2.69	
A2P2-IHR21^3	1	3.84	
A2P2-IHR21^5	1.35	1.05	U
A2P2-IHR21^7	1.49	2.28	
A2P2-IHR3^3	1.07	1.92	U
A2P2-IHR3^5	0.983	1.01	U
A2P2-IHR3^7	1.28	2.64	U
A2P2-IHR4^3	1.28	3.61	U
A2P2-IHR4^5	1.22	4.84	U
A2P2-IHR4^7	1.29	8.15	U
A2P2-IHR5^3	1.1	11.3	
A2P2-IHR5^5	1.17	5.83	
A2P2-IHR5^7	1.33	13.5	
A2P2-IHR6^3	1.93	17	
A2P2-IHR6^5	1.35	5.5	U
A2P2-IHR6^7	1.03	25.3	
A2P2-IHR7^3	0.803	3.76	U
A2P2-IHR7^5	0.833	7.6	U
A2P2-IHR7^7	0.629	6.24	U
A2P2-IHR8^3	1.17	4.99	
A2P2-IHR8^5	1.33	5.33	
A2P2-IHR8^7	1.36	9.86	
A2P2-IHR9^3	1.19	11.1	
A2P2-IHR9^5	1.07	10.6	
A2P2-IHR9^7	1.29	13.3	