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CERTIFICATION REPORT FOR AREA 2, PHASE III PART TWO

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

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U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A1PII	Area 1, Phase II
A2PIII	Area 2, Phase III
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
DCN	Design Change Notice
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FRL	final remediation level
FY	Fiscal Year
HAMDC	highest allowable minimum detectable concentration
IRDP	Integrated Remedial Design Package
MDC	minimum detectable concentration
mg/kg	milligrams per kilogram
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OU	Operable Unit
pCi/g	picoCuries per gram
PSP	Project Specific Plan
QA/QC	Quality Assurance/Quality Control
RAWP	Remedial Action Work Plan
ROD	Record of Decision
SDFP	Soil and Disposal Facility Project
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SSOD	Storm Sewer Outfall Ditch
SWRB	Stormwater Retention Basin
TPU	total propagated uncertainty
V&V	verification and validation
WAC	waste acceptance criteria

EXECUTIVE SUMMARY

This certification report presents the information and data used by the U.S. Department of Energy (DOE) to determine that existing soil contamination does not exceed final remediation levels (FRLs) in Area 2, Phase III (A2PIII) Part Two at the Fernald Environmental Management Project (FEMP). On the basis of this reported information and supporting project files, DOE has determined that no further remedial action is required in A2PIII Part Two; therefore, this area can be considered "certified."

Above-FRL contamination was identified during initial precertification real-time scanning and subsequent soil sampling. As a result, remedial activities were designed and conducted until all above-FRL contamination was removed. Following remediation to design depths, precertification real-time scanning and certification sampling were conducted.

Delineation and design of the three certification units (CUs) was initially presented in the Certification Design Letter (CDL) for A2PIII Part Two (DOE 2000a). Certification sampling was conducted to verify that the certification criteria established in the Sitewide Execavation Plan (SEP, DOE 1998) were achieved. These criteria state that: 1) the mean concentrations or activities of the primary area-specific constituents of concern (ASCOCs) within a CU are less than the FRLs at the 95 percent upper confidence level, and 2) no certification result can exceed two times the FRL (i.e., the hot spot criterion). If either of these criteria is not met, then further investigation and possible excavation would be required. If both of these criteria are met for a CU, than it can be released for final land use development.

The A2PIII Part Two samples were analyzed at the FEMP on-site laboratories, following guidelines outlined in the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ, Procedure FD-1000) and the SEP. All these samples were analyzed and reported at the required analytical support level (ASL). Analytical data packages included sample results with associated quality assurance/quality control (QA/QC) data and all applicable raw data. The data were also subjected to the required validation and verification process, which did not identify any significant quality concerns.

All A2PIII Part Two CUs achieved the certification criteria. The determination of passing or failing certification was based on a review of certification sample analytical results from each CU against the

certification criteria. Statistical analysis was not necessary to determine if an ASCOC passed certification for a particular CU, since no result exceeded the associated FRL. All three CUs passed final certification relative to the average constituent of concern (COC) concentration and the "hot spot" determination on the first round of certification, and no additional remedial actions were necessary.

DOE has restricted access to certified areas (and those currently being certified) in order to maintain their integrity prior to development of the final land use. A FEMP procedure (EP-0008) has been developed to implement a process to protect certified areas from becoming recontaminated. Upon approval from the regulatory agencies, this area will become available for future land use or restoration projects.

1.0 INTRODUCTION

1.1 PURPOSE

This certification report presents the information and data used by the U.S. Department of Energy (DOE) to determine that existing soil contamination does not exceed the final remediation levels (FRLs) within Area 2, Phase III (A2PIII) Part Two. In addition, this report documents the remedial action and strategy used to support certification. The soil is being certified in order to proceed with future land use. Based on the data generated and summarized in this report, DOE considers the remedial goals achieved in A2PIII Part Two.

1.2 BACKGROUND

In the Operable Unit (OU) 5 Record of Decision (ROD, DOE 1996a), DOE committed to excavating contaminated soil that exceeds health-based FRLs. The excavated material may be dispositioned at the On-Site Disposal Facility (OSDF) or at an off-site disposal facility if the OSDF waste acceptance criteria (WAC) are not met. The OU5 Remedial Investigation Report (DOE 1995) defined the extent of soil contamination exceeding the FRLs and, in general, indicated widespread contamination occurring in approximately 430 acres of the 1,050-acre Fernald Environmental Management Project (FEMP).

In the OU5 Remedial Action Work Plan (RAWP, DOE 1996b), DOE committed to preparing a Sitewide Excavation Plan (SEP, DOE 1998) to define the overall approach to cleaning up soil and at- and below-grade debris in accordance with the OU2, OU3, and OU5 RODs. Per the SEP, the FEMP has been divided into distinct remedial areas and phases for soil remediation; this report addresses the soils in A2PIII Part Two.

In March 1999, initial precertification using real-time monitoring identified elevated levels of radium-226 within the A2PIII soil. Since the elevated levels of radium-226 were isolated within a 5-acre, peninsula-like area, A2PIII was separated into Part One and Part Two. The 5-acre, peninsula-like area was identified as Part Two. Additional predesign sampling and analysis was conducted to determine the depth of impacted, contaminated material in Part Two. Part One, which represented the remaining 70 acres of A2PIII, continued the certification process. Part One precertification data were presented in the Certification Design Letter (CDL) for A2PIII Part One (DOE 1999a), with the resulting

certification data presented in the A2PIII Part One Certification Report (DOE 1999b). Therefore, Part One precertification or certification data are not addressed under this report.

Based on real-time and subsequent soil sampling data, soil remediation was delineated for a portion of A2PIII Part Two. Consequently, an Integrated Remedial Design Package (IRDP, DOE 2000b) was developed in accordance with SEP Excavation Approach A, a shallow excavation of on-property, impacted material outside the Former Production Area and other Waste Storage/Management Areas. After excavation of the contaminated soil, the certification process began with precertification scanning activities under the Project Specific Plan (PSP) for the A2PIII Precertification Real-Time Scan (DOE 1999c) and concluded with certification sampling under the PSP for A2PIII Part Two Certification Sampling (DOE 2000c).

1.3 AREA DESCRIPTION

A2PIII Part Two is a 5-acre peninsula-like area in the south-central portion of the FEMP site within A2PIII (Figure 1-1). This area is west of the northern leg of the unnamed tributary, south of the east chamber of the Stormwater Retention Basin (SWRB), and east of the Storm Sewer Outfall Ditch (SSOD). The stream bed and side banks of the unnamed tributary and SSOD drainage area corridor will not be certified until the upgradient drainage sources have been certified. The certification for this "dirty" corridor will be completed as part of Area 10 remediation.

1.4 SCOPE

The scope of this report is the presentation of the results from the certification of A2PIII Part Two and the subsequent conclusions. A2PIII Part Two is divided into three certification units (CUs). The certification design for the CUs follows the general approach outlined in Section 3.4 of the SEP and is detailed in A2PIII Part Two CDL (DOE 2000a).

1.5 OBJECTIVES

The objectives of this Certification Report are:

- Describe the precertification and remedial activities
- Describe the analytical methods, data validation processes, data reduction and statistical processes used to support the certification process

- Present certification sampling results for the three CUs
- Present the statistical analysis showing that all three CUs have passed the certification criteria, including FRL attainment and hot spot criteria
- Describe access controls implemented to prevent recontamination.

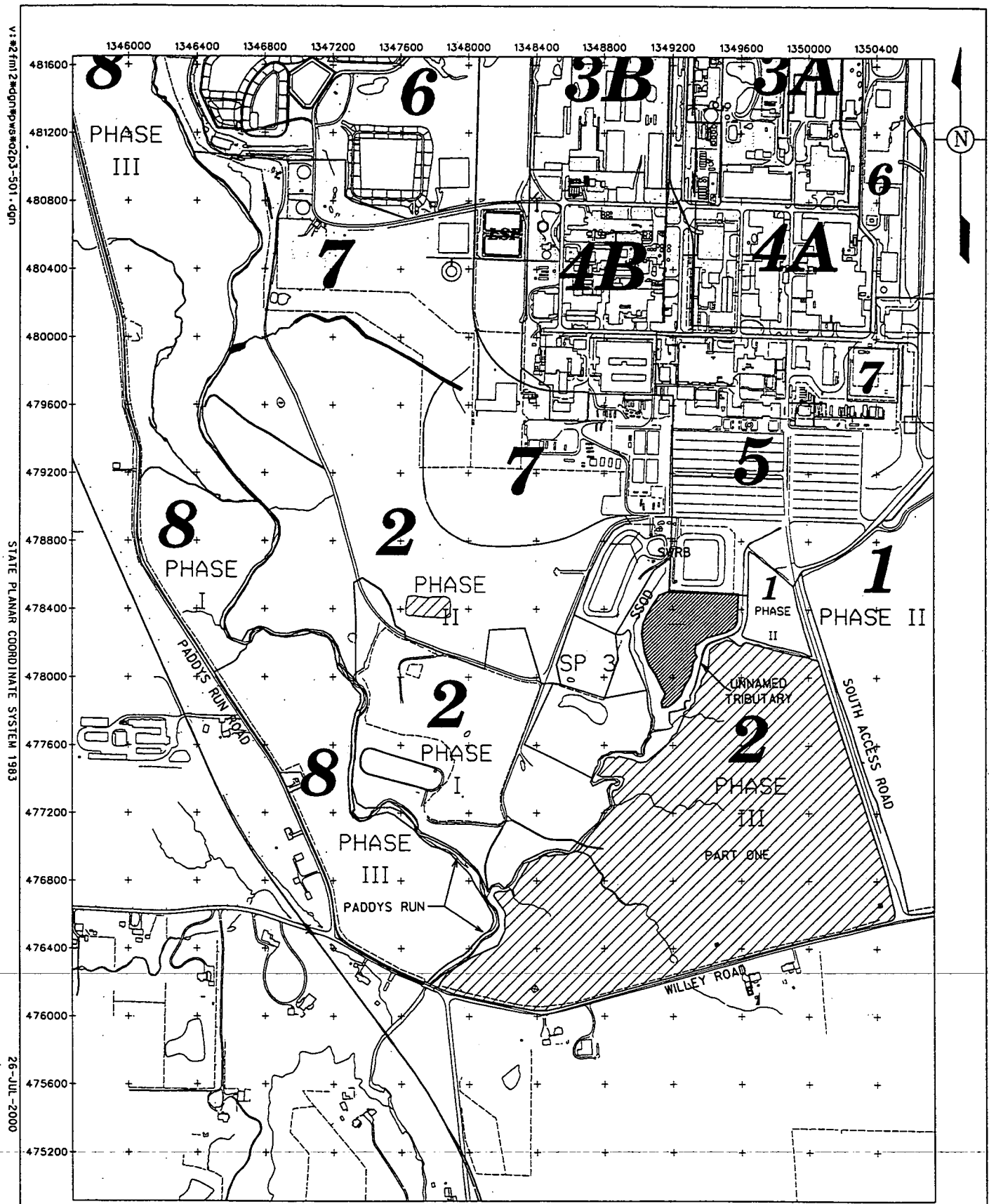
1.6 REPORT FORMAT

This certification report is presented in six sections with supporting documentation and data in the appendices. These sections are as follows:

Section 1.0	Introduction: Purpose, background, area description, scope, and objectives of the report
Section 2.0	Certification Approach: The approach for certification sampling and analysis
Section 3.0	Overview of Field Activities: Area preparation, excavation and changes to work scope
Section 4.0	Analytical Methodologies, Data Validation Processes, and Data Reduction
Section 5.0	Certification Evaluation and Conclusions
Section 6.0	Protection of Certified Areas
Appendix A	Certification Statistics and Results
Appendix B	Criteria for Completion of Remedial Action

1.7 FEMP CERTIFICATION MASTER MAP

In order to track certification and characterization for reuse areas at the FEMP, DOE updates a controlled map showing the status of the soil remediation areas and phased areas with all Certification Reports. This map has been updated to add certification of A2PIII Part Two (Figure 1-2).



LEGEND:

AREA BOUNDARY

A2PIII PART ONE AREA (Except for tributaries)

A2PIII PART TWO AREA

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SCALE

800 400 0 800 FEET

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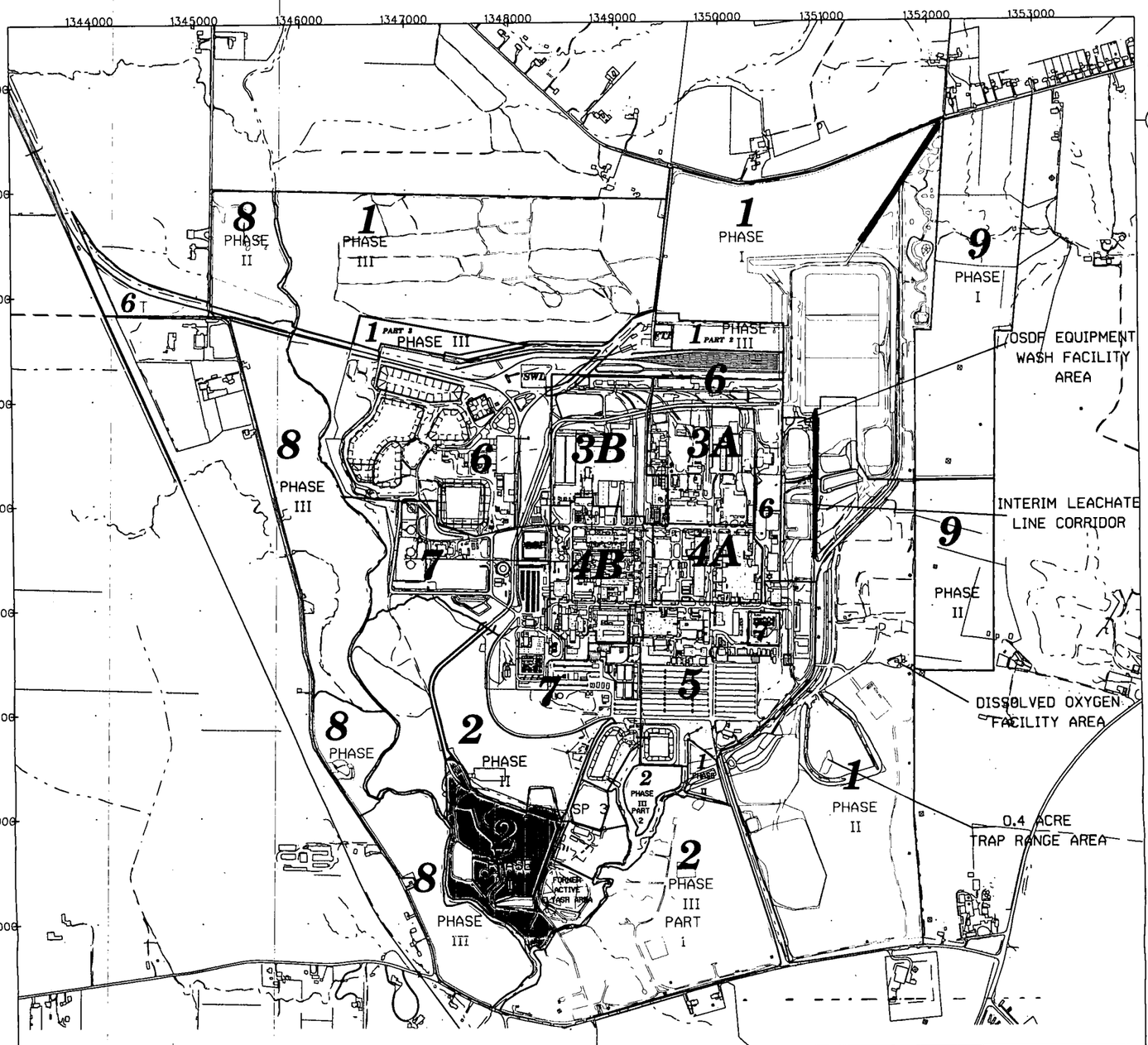
FIGURE 1-1. A2PIII PART TWO LOCATION MAP



LEGEND:

APPROVED CERTIFICATION AREAS (320 ACRES TOTAL)

- A1PI APPROVED CERTIFIED AREAS - 120.5 ACRES
- A1PI SEDIMENT TRAPS 2 AND 3 APPROVED CERTIFIED AREAS 1.4 ACRES
- A1PII APPROVED CERTIFIED AREAS - 80.1 ACRES
- A1PII-S2B APPROVED CERTIFIED AREAS 1.5 ACRES
- A8PII/A6TA APPROVED CERTIFIED AREA - 22.1 ACRES
- A8PI APPROVED CERTIFIED AREAS - 12.5 ACRES
- A2PIII APPROVED CERTIFIED AREA - 70 ACRES
- A1PII APPROVED CERTIFIED AREAS WEST OF OLD NORTH ACCESS ROAD - 11.9 ACRES

CERTIFICATION AREA, SEPARATE REPORT PRESENTLY UNDER AGENCY REVIEW - 55.5 ACRES

A1PI ROADS EXCLUDED FROM CERTIFICATION

CERTIFICATION IN PROGRESS

REMEDIATION IN PROGRESS

CHARACTERIZATION FOR REUSE AREAS - 2.5 ACRES

NON CERTIFIED AREAS

NOTE: SUBSURFACE SOIL IN UTILITY CORRIDORS WITHIN THE FORMER ACTIVE FLYASH AREA CERTIFICATION AREA WILL BE CERTIFIED AT A LATER DATE.

SCALE

1200 600 0 1200 FEET

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FIGURE 1-2. FEMP CONTROLLED CERTIFICATION MAP

STATE PLANAR COORDINATE SYSTEM 1983

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2.0 CERTIFICATION APPROACH

2.1 CERTIFICATION STRATEGY

This section summarizes the area-specific constituent of concern (ASCOC) selection process and the certification approach, including CU establishment, sampling design, and statistical analysis. The general certification strategy is described in Section 3.4 of the SEP, and the A2PIII Part Two specific strategy is described in the CDL for A2PIII Part Two.

2.1.1 Selection of ASCOCs

As committed in the SEP, the primary radiological constituents of concern (COCs) (total uranium, radium-226, radium-228, thorium-228, and thorium-232) were retained sitewide as ASCOCs in each remediation area. The selection process for retaining secondary ASCOCs for a remediation area is driven by applying a set of decision criteria, as follows:

- The ASCOC must be listed as a soil COC in the OU5 ROD
- The ASCOC must be traced to site use, either through process knowledge or known release of the constituent to the environment
- Analytical results must indicate the COC is present at concentrations above its FRL sufficient to possibly fail certification criteria, and the above-FRL results are not attributable to false positives or elevated contract-required detection limits (CRDLs).

2.1.2 ASCOC Selection Process for A2PIII Part Two

Review of historical data shows little above-FRL contamination in A2PIII Part Two. Based on these factors and the inability to identify any mechanism for secondary COC contamination, only total uranium, radium-226, radium-228, thorium-228, and thorium-232 (the five sitewide primary radiological ASCOCs) were retained as ASCOCs. The ASCOCs identified for A2PIII Part Two are summarized in Table 2-1.

2.2 CERTIFICATION DESIGN

The certification design and sampling strategy follows Section 3.4 of the SEP. The A2PIII Part Two certification area consists of the following:

- Two Group 1 CUs, one for the excavated radium-226 footprint (A2P3-PT2-C-2) and one for the north east area (A2P3-PT2-C-1) disturbed during the hauling of impacted material during excavation.

- One Group 2 CU for the southern perimeter, non-impacted (A2P3-PT2-C-3) area.

The A2P3-PT2 CUs are shown in Figure 2-1. The Group 1 CUs cover the perimeter around the excavation footprint and the area partially impacted during excavation (truck turnaround, loading area, and equipment laydown area). The Group 2 CU for the southern perimeter, non-impacted area is bounded by the SSOD and the unnamed tributaries and extends only partially down the side banks to allow for potential backup during extreme rain events and flooding. The streambeds and lower side banks are excluded from this certification event and will be certified at a later date with the "dirty" corridors.

2.2.1 Sample Selection Process

The selection of certification sampling locations was conducted according to Section 3.4.2 of the SEP. Each CU was first divided into 16 approximately equal sub-CUs. Sample locations were then generated by randomly selecting easting and northing coordinates within each sub-CU boundary, and testing the locations against the minimum distance criterion for the CU. The minimum distance criterion is the smallest distance allowed between two sample locations within a CU, and is a function of CU size. The formula for calculating the minimum distance is presented in the SEP. If the minimum distance criterion were violated, an alternative random location was selected for that sub-CU and all the locations were re-tested. This process continued until all 16 random locations met the minimum distance criterion. The selected A2PIII Part Two certification sampling locations are shown in Figure 2-2.

2.2.2 Certification Sampling and Analysis

Each CU sample was collected from the 0 to 6-inch (surface) soil interval at the designated and surveyed location. Four of the 16 locations (one per each quadrant of the CU) were randomly selected for archiving, and the other 12 locations were submitted for analysis except for CU A2P3-PT2-C-2, in which all 16 samples were submitted for analysis. All samples were analyzed at the FEMP on-site laboratory for the five primary ASCOCs using the gamma spectrometry method.

2.2.3 Statistical Analysis

The statistical analysis of certification samples is discussed in Appendix G of the SEP. Statistical analysis of certification results was not necessary since all of the results for the ASCOCs in each CU were below the FRL.

TABLE 2-1
ASCOC LIST FOR A2PIII PART TWO

ASCOC	FRL	Reason Retained
Total uranium	82 mg/kg	Retained as a sitewide primary ASCOC
Radium-226	1.7 pCi/g	Retained as a sitewide primary ASCOC
Radium-228	1.8 pCi/g	Retained as a sitewide primary ASCOC
Thorium-228	1.7 pCi/g	Retained as a sitewide primary ASCOC
Thorium-232	1.5 pCi/g	Retained as a sitewide primary ASCOC

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

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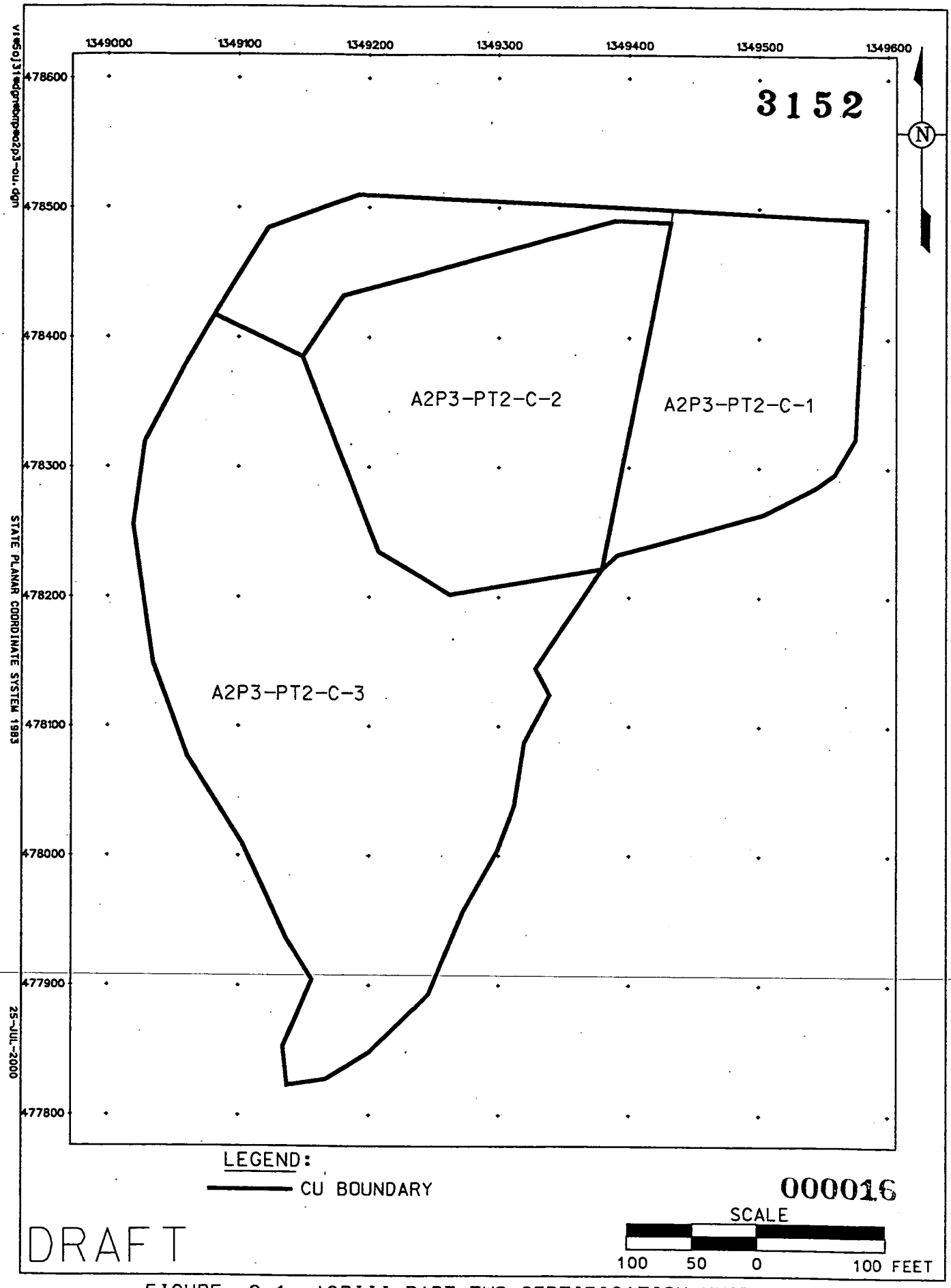

FIGURE 2-1. A2PIII PART TWO CERTIFICATION UNITS

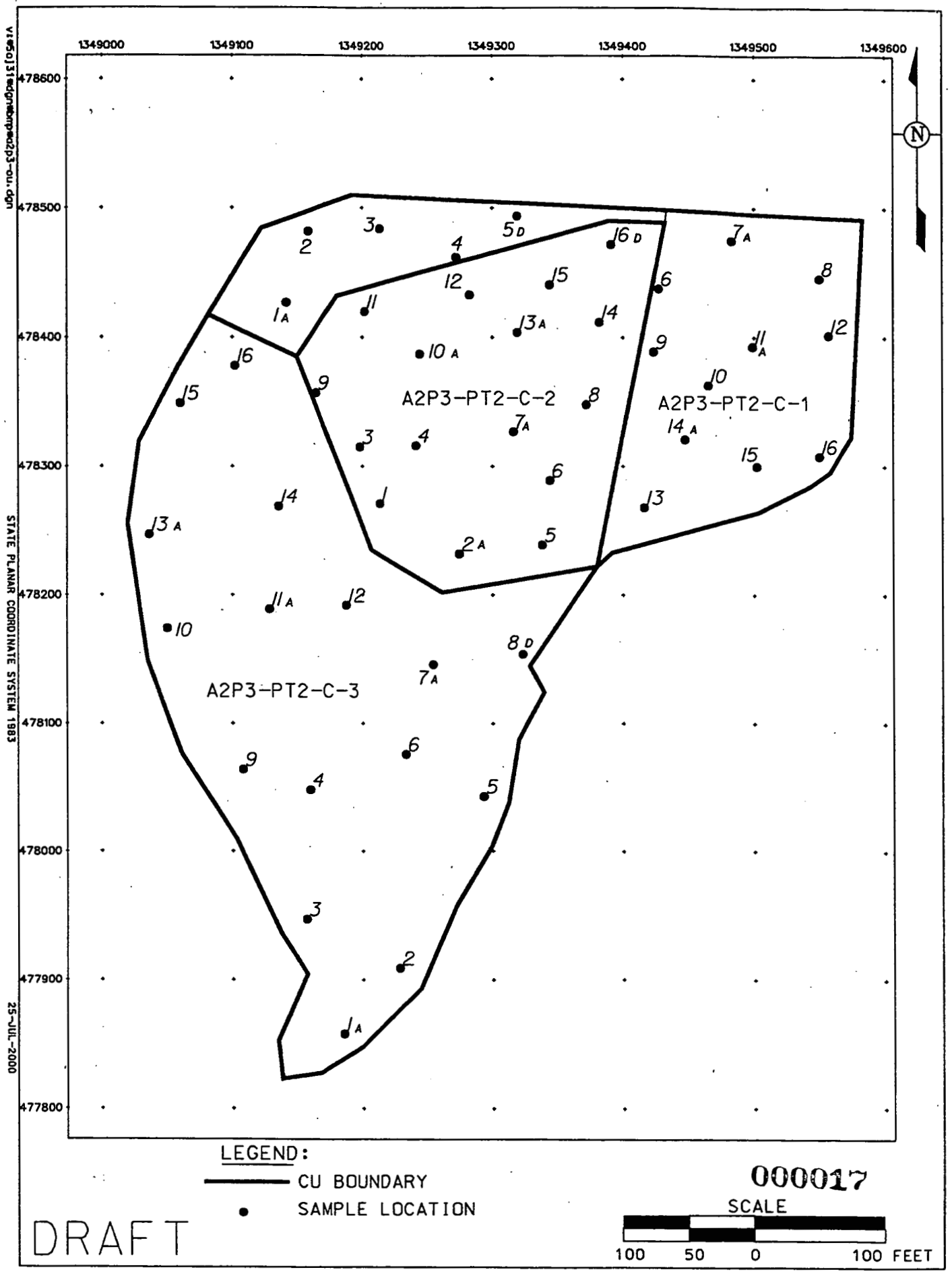

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FIGURE 2-2. A2PIII PART TWO CU SAMPLE LOCATIONS

3.0 OVERVIEW OF FIELD ACTIVITIES

3.1 AREA PREPARATION

The field activities in A2PIII Part Two began in early Spring 1999 and concluded in Summer 2000. Initial precertification scanning of the entire A2PIII area was conducted in March 1999. Based on elevated radium-226 real-time data in Part Two, soil sampling to delineate the depth of the contamination commenced in May 1999 and concluded in late Summer 1999. The results of the data collection and the remedial design for A2PIII Part Two were summarized an IRDP (DOE 2000b) consisting of an approved Implementation Plan and a Design Change Notice (DCN) 20400-102 to the existing Southern Waste Units plans and specifications.

Under the direction of Fluor Fernald construction personnel, field implementation of the remedial design began in May 2000 with site preparation (silt fence, outfall soil work and coconut matting) of the radium hot spot by Wise Construction. Petro Environmental commenced excavation and hauling per the DCN (3 feet in depth except for a 6-inch scraping area) immediately after site preparation. The criteria necessary to demonstrate completion of the remedial action are summarized in Appendix B. The estimated amount of impacted material was approximately 5,080 bank cubic yards. Approximately 4,876 cubic yards of Category 1 material and 30 yards of Category 4 material were actually excavated and hauled to the OSDF for final disposition. All the impacted material was tracked under the Waste Acceptance Organization (WAO) Material Tracking Log number MTL-RHS-001 and involved 500 haul truck manifests. No above-WAC or prohibited items were identified during excavation monitoring. Upon completion of the excavation in mid-May, a precertification scan was conducted over the remediated footprint. In addition, scanning was conducted over the truck turnaround/loadout area to check for cross-contamination during loading and hauling. Certification sampling was completed within a week of the precertification scanning. A summary of complete project costs can be found in Table 3-1.

3.2 CHANGES TO SCOPE OF WORK

The scope of work for A2PIII Part Two certification sampling was documented in the CDL and A2PIII Part Two Certification PSP, and there were no major changes during field implementation. Final certification sampling locations and CU boundaries remained as identified, and all analyses were carried out as planned. The only change to the scope of work was the submittal of the archive samples for CU

A2P3-PT2-02. The archived samples were submitted due to their close proximity to locations with slightly elevated, post-excavation precertification radium-226 measurements.

TABLE 3-1
PROJECT COSTS FOR A2PIII PART TWO

ACTIVITY	COST
Engineering	$14,500
Construction/Excavation Hauling	$91,700 *
Characterization – Predesign/Precertification/Certification	$47,000 **

* Construction/excavation costs consist of $5,500 for site preparation and $86,200 for excavation/hauling/placement in OSDF. Excavation/hauling/placement actual costs are within 10 percent of the original estimated value.

** Characterization precertification and predesign costs accumulated in FY99 and FY00. FY99 are estimated due to schedule overlap between Part one certification and Part Two predesign. All FY00 costs are actuals.

4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

4.1 ANALYTICAL METHODOLOGIES

The samples for A2PIII Part Two were analyzed at the FEMP on-site laboratory, which meets SCQ requirements. The SCQ is the source for analytical methodologies (Appendix G), data validation and verification, and analytical and field quality assurance/quality control (QA/QC) requirements.

For all the certification data, laboratory analysis met all requirements for Analytical Support Level (ASL) D with the following exception. For soil samples, the project-specified minimum detectable concentration (MDC) for total uranium, thorium-228 and thorium-232 by gamma spectroscopy is less stringent than the ASL D SCQ highest allowable minimum detectable concentration (HAMDC). Therefore, the total uranium, thorium-228 and thorium-232 gamma spectroscopy data were considered ASL E although the data deliverable is identical in all other specifications for ASL D per Appendix G of the SCQ. Also, the on-site laboratory prepared an ASL D data package, which included sample results with associated QA/QC data and all applicable raw data. Certification analytical results are provided in Appendix C, and a summary of the analytical methods follows.

4.1.1 Radiochemical Methods

The radiochemical analytical methods depended on the specific nuclides of interest. Performance-based specification criteria included HAMDC, percent overall tracer/chemical recovery, percent matrix spike recovery, method blank concentration, percent recovery of laboratory control sample, and percent recovery for duplicate samples for each analyte. The on-site laboratory was required to meet these specifications using the methodologies described below.

Total Uranium

Samples were analyzed for uranium-238 using gamma spectrometry, and the results were used to calculate the total uranium value. The calculation used was as follows:

$$\text{Total uranium (mg/kg)} = (2.998544) \times \text{uranium-238 gamma spectrometry result (pCi/g)}$$

The validation qualifier assigned to the total uranium value was the same as the uranium-238 qualifier.

Radium-226

Samples were analyzed by gamma spectrometry, and radium-226 was quantified by measuring gamma rays emitted by members of its decay chain. This method does not require chemical separation, but the samples must be allowed a 20-day progeny in-growth period before counting. The on-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIII Part Two certification results.

Radium-228

Following gamma spectrometry analysis, radium-228 was also quantified by measuring gamma rays emitted by members of its decay chain. The on-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIII Part Two certification results.

Isotopic Thorium

Isotopic thorium (thorium-228 and thorium-232) was also quantified by measuring gamma rays emitted by members of its decay chain by gamma spectrometry. The on-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIII Part Two certification results.

4.2 DATA VERIFICATION AND VALIDATION

This section discusses the data verification and validation (V&V) process used to examine the quality of field and laboratory results. Data were qualified to indicate the level of data usability, or level of confidence in the reported analytical results. The U.S. Environmental Protection Agency (EPA) National Functional Guidelines for Data Review (Inorganic Data) (EPA 1994), as adapted and approved by EPA Region V, was used for this process.

Specific parameters associated with the data were evaluated during V&V to determine whether or not the data quality objectives were met. Five principal QA parameters (i.e., precision, accuracy, completeness, comparability, and representativeness) were addressed during V&V. Field sampling and handling, laboratory analysis and reporting, and nonconformances and discrepancies in the data were examined to ensure compliance with appropriate and applicable procedures.

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The V&V process evaluated the following parameters:

- Specific field forms for sample collection and handling
- Chain of Custody forms
- Completeness of laboratory data deliverable.

The data validation process examined the analytical data to determine the confidence level of the results. Parameters unique to the evaluation of radiochemical analyses include:

- Calibration data for specific energies
- Background checks
- Relative Error ratios
- Detector efficiencies
- Background count correction.

For this project, all the radiological data were reviewed and validated for all criteria noted above. Per project requirements, a minimum of 10 percent of the certification data were validated to validation Level D. This validation included the same review process as for Level B, but included a systematic review of the raw data and recalculations. One of the three analytical releases was validated to Level D, while all remaining data were validated to Level B.

Following V&V, qualifier codes were applied to specific data points, reflecting the level of confidence assigned to the particular datum. These codes included:

-	No qualification; the positive result or detection limit is confident as reported
J	Positive result is estimated or imprecise; data point is usable for decision-making purposes. Positive results less than the contract required reporting limit are also qualified in this manner
R	Positive result or detection limit is considered unreliable; data point should not be used for decision-making purposes
U	Undetected result at the stated limit of detection
UJ	Undetected result; detection limit is considered estimated or imprecise; the data point is usable for decision-making purposes

N Positive result is tentatively identified - that is, there is some question regarding the actual identification and quantification of the result. Compound reported is best professional judgement of the interpretation of the supporting data, such as mass spectra. Caution must be exercised with the use of this data

NV Not Validated. The results for this sample were not validated

Z This result, or detection limit in this analysis is not the best one to use; another analysis (e.g., the dilution or re-analysis) contains a more confident and usable result.

The V&V of this data set did not identify any problems with the data set. All the results received passed the validation qualifier with eleven results qualified as estimated (J) and ten nondetects (U). No results were qualified as rejected (R).

4.3 DATA REDUCTION

Each sample used to support the A2PIII Part Two certification decision was entered in the FEMP Sitewide Environmental Database (SED) with the following information:

Field Information

- Sample Identification Number - A unique number assigned to each discrete sample point
- Coordinate Information - Northing and Easting locations
- Certification Unit - Each sample is assigned to a CU based on location.

Laboratory Information

For each sample result the following information is entered:

- Laboratory Result - The reported analytical value from the laboratory
- Laboratory Qualifier - The qualifier reported from the lab. For radiological parameters non-detect values are assigned a U qualifier
- Total Propagated Uncertainty (TPU) - This value represents the uncertainty associated with the reported result. TPU includes the counting error, as well as uncertainty from other laboratory measurements and data reduction. (Applicable to radiological parameters only.)
- Units - The units in which the Laboratory Result is reported.

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Validation Information

- Validation Result - The result based on the validation process. During the validation process, sample results may be adjusted. If the laboratory result is less than the associated MDC , the validation result becomes the MDC value

- Validation TPU - The TPU based on the validation process

- Validation Qualifier - The qualifier assigned as a result of the data validation process

- Validation Units - The units in which the Validation Result is reported.

Using the information as summarized above, the following actions were taken for data reduction of each CU data set.

1. All the data for each CU were queried from SED. All the data were used even if the CU had more than the minimum required data points

2. The data from the validation fields were used for statistical calculations

3. Data with a qualifier of R or Z was not used in the statistical calculations

4. The highest of the two duplicate results was used in the statistical calculations

5. One half of the non-detect (U or UJ) values was used in the statistical calculations.

5.0 CERTIFICATION EVALUATION AND CONCLUSIONS

5.1 CERTIFICATION RESULTS, EVALUATION, AND CONCLUSION

A review of the A2PIII Part Two certification results indicates all ASCOC concentrations were at or below their respective FRLs. All CUs for A2PIII Part Two passed the certification criteria. Final certification data are presented in Appendix A. Based on these results, DOE has determined that the remedial objectives in the OU5 ROD have been achieved in A2PIII Part Two, and no further remedial actions are required. The subject areas will be released for final land use.

5.2 LESSONS LEARNED

A lessons learned program has been implemented to apply knowledge accumulated during successive remedial and certification efforts conducted under the SEP. Lessons learned from past certification activities in Area 1, Phase I (A1PI), Area 1, Phase II (A1PII), and A2PIII Part One have been incorporated into the A2PIII Part Two effort. Some lessons learned from the Part Two efforts include:

- Use of real-time, *in situ* gamma spectroscopy can be effective in the identification of radium-226 contaminated soil. The real-time equipment successfully delineated the extent of horizontal surface contamination during precertification.

- Review of historical photographs should be emphasized during predesign investigations. Further examination of the Part Two historical photographs provided evidence of a "tear-drop" shaped scar in close proximity to the elevated radium-226 measurements.

Because the general complexity of remedial activities varies from area to area, soil remediation approaches at the FEMP will continue to evolve with each successive remedial effort.

6.0 PROTECTION OF CERTIFIED AREAS

DOE has restricted access to certified areas in order to maintain their integrity prior to transferral for final land use. FEMP Procedure EP-0008 has been developed to implement a process to protect certified areas from becoming recontaminated.

The procedure is summarized as follows:

- At the beginning of certification sampling activities for a remediation area, the perimeter of the "certified" area will be clearly delineated.
- Signs will be posted upon the temporary perimeter limiting access to authorized individuals or projects.
- To gain access to conduct work in a "certified" area, the person or project desiring access will submit a written request to the compliance section of SDFP.
- Any equipment to be used within the "certified" area must have been cleaned in accordance with FEMP certified area access.
- Employees/operators should be briefed on the entry and exit requirements for a "certified" area.
- Additional restrictions apply to certified areas that have been restored. The SDFP Compliance section will forward access requests for restored areas to SDFP Natural Resources for written approval prior to entry.

After DOE, EPA and Ohio Environmental Protection Agency (OEPA) agree that an area is certified, the area will be released for final land use. At that time, best management practices and administrative controls will be used to protect the area from contamination, and other controls will be implemented as needed.

REFERENCES

U.S. Department of Energy, 1995, "Remedial Investigation Report for Operable Unit 5," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

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

U.S. Department of Energy, 1996b, "Remedial Design Work Plan for Remedial Actions at Operable Unit 5,"Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

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

U.S. Department of Energy, 1999a, "Certification Design Letter for Area 2, Phase III Part One," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1999b, "Certification Report for Area 2, Phase III Part One," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1999c, "Project Specific Plan for Area 2, Phase III Precertification Real-Time Scan," Revision 0, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 2000a, "Certification Design Letter for Area 2, Phase III Part Two," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 2000b, "Integrated Remedial Design Package for Area 2, Phase III Part Two," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 2000c, "Project Specific Plan for Area 2, Phase III Part Two Certification Sampling," Revision 0, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Environmental Protection Agency, 1994, "National Functional Guidelines for Data Review," U.S. EPA Office of Solid Waste and Emergency Response, Washington, DC.

APPENDIX A

CERTIFICATION STATISTICS AND RESULTS

APPENDIX A-1
CERTIFICATION STATISTICS FOR A2P3-PT2-C-1

	Primary COCs				
Sample ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Total Uranium
A2P3-PT2-C-1-02-R	1.15 -	0.93 -	0.93 -	0.93 -	29.77 -
A2P3-PT2-C-1-03-R	1.07 -	0.95 -	0.92 -	0.95 -	8.80 -
A2P3-PT2-C-1-04-R	1.27 -	1.00 -	0.96 -	1.00 -	11.21 -
A2P3-PT2-C-1-05-R	1.35 -	0.93 -	0.89 -	0.93 -	3.83 J
A2P3-PT2-C-1-05-R-D	1.26 -	0.90 -	0.91 -	0.90 -	6.93 -
A2P3-PT2-C-1-06-R	1.14 -	0.95 -	0.94 -	0.95 -	4.04 -
A2P3-PT2-C-1-08-R	1.03 -	0.80 -	0.77 -	0.80 -	3.68 J
A2P3-PT2-C-1-09-R	1.16 -	1.01 -	0.98 -	1.01 -	8.87 -
A2P3-PT2-C-1-10-R	1.25 -	1.02 -	1.00 -	1.02 -	5.39 -
A2P3-PT2-C-1-12-R	1.18 -	0.92 -	0.91 -	0.92 -	3.39 U
A2P3-PT2-C-1-13-R	1.23 -	1.00 -	0.96 -	1.00 -	6.13 J
A2P3-PT2-C-1-15-R	1.05 -	0.95 -	0.92 -	0.95 -	6.10 -
A2P3-PT2-C-1-16-R	1.08 -	0.99 -	0.97 -	0.99 -	5.09 J
FRL	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Confidence Level	0.95	0.95	0.95	0.95	0.95
Max Result	1.35 @	1.02 @	1.00 @	1.02 @	29.77 @
Standardized Skewness	--	--	--	--	--
W-Statistic Probability*	--	--	--	--	--
Test Procedure	--	--	--	--	--
Sample Size	12	12	12	12	12
Estimated Mean	--	--	--	--	--
UCL on the Mean**	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--
2x Rule Pass / Fail	Pass	Pass	Pass	Pass	Pass
a posteriori Sample	--	--	--	--	--
Size calculation	--	--	--	--	--

Definition of Qualifiers
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
" - " = no data qualifier
"NV" = not validated
"UNV" = not detected, not validated

NOTES:
(1) Maximum result did not exceed the FRL, therefore no statistics were generated and no other tests performed. (Indicated by --)
(2) The maximum value of the two duplicates was used in all statistical equations.
(3) * W-Statistic Probability is the highest calculated probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumpti
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognormality.
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).

APPENDIX A-2
CERTIFICATION STATISTICS FOR A2P3-PT2-C-2

	Primary COCs				
Sample ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Total Uranium
A2P3-PT2-C-2-01-R	1.32 J	0.97 -	0.96 -	0.97 -	3.41 J
A2P3-PT2-C-2-02-R	1.02 -	0.85 -	0.84 -	0.85 -	2.80 U
A2P3-PT2-C-2-03-R	1.17 -	0.97 -	0.94 -	0.97 -	2.99 J
A2P3-PT2-C-2-04-R	1.37 -	1.05 -	1.02 -	1.05 -	3.07 U
A2P3-PT2-C-2-05-R	0.88 -	0.67 -	0.67 -	0.67 -	3.39 J
A2P3-PT2-C-2-06-R	1.21 -	0.99 -	0.94 -	0.99 -	3.56 U
A2P3-PT2-C-2-07-R	1.38 J	0.98 -	0.98 -	0.98 -	3.92 U
A2P3-PT2-C-2-08-R	0.98 -	0.69 -	0.68 -	0.69 -	3.95 J
A2P3-PT2-C-2-09-R	1.42 -	1.09 -	1.06 -	1.09 -	3.55 J
A2P3-PT2-C-2-10-R	1.38 -	1.02 -	0.97 -	1.02 -	2.80 U
A2P3-PT2-C-2-11-R	1.09 -	0.91 -	0.93 -	0.91 -	5.91 -
A2P3-PT2-C-2-12-R	1.69 -	1.19 -	1.19 -	1.19 -	3.45 J
A2P3-PT2-C-2-13-R	1.04 -	0.87 -	0.87 -	0.87 -	3.74 U
A2P3-PT2-C-2-14-R	1.05 J	0.83 -	0.80 -	0.83 -	2.87 U
A2P3-PT2-C-2-15-R	0.77 -	0.45 -	0.44 -	0.45 -	2.57 U
A2P3-PT2-C-2-16-R	1.36 -	0.97 -	0.95 -	0.97 -	3.67 J
A2P3-PT2-C-2-16-R-D	1.37 -	0.99 -	0.96 -	0.99 -	2.93 U
FRL	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Confidence Level	0.95	0.95	0.95	0.95	0.95
Max Result	1.69 @	1.19 @	1.19 @	1.19 @	5.91 @
Standardized Skewness	- -	- -	- -	- -	- -
W-Statistic Probability*	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -
Sample Size	16	16	16	16	16
Estimated Mean	- -	- -	- -	- -	- -
UCL on the Mean**	- -	- -	- -	- -	- -
Non-Parametric Prob.	- -	- -	- -	- -	- -
Est. Mean - Pass / Fail	- -	- -	- -	- -	- -
2x Rule Pass / Fail	Pass	Pass	Pass	Pass	Pass
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Definition of Qualifiers
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
" - " = no data qualifier
"NV" = not validated
"UNV" = not detected, not validated

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APPENDIX A-2
CERTIFICATION STATISTICS FOR A2P3-PT2-C-2

NOTES:

(1) Maximum result did not exceed the FRL; therefore no statistics were generated and no other tests performed. (Indicated by --)

(2) The maximum value of the two duplicates was used in all statistical equations.

(3) * W-Statistic Probability is the highest calculated probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumptio
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognormality.

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

APPENDIX A-3
CERTIFICATION STATISTICS FOR A2P3-PT2-C-3

	Primary COCs				
Sample ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Total Uranium
A2P3-PT2-C-3-02-R	1.05 -	0.92 -	0.91 -	0.92 -	8.19 -
A2P3-PT2-C-3-03-R	1.06 -	0.81 -	0.82 -	0.81 -	16.25 -
A2P3-PT2-C-3-04-R	1.10 -	0.94 -	0.93 -	0.94 -	16.81 -
A2P3-PT2-C-3-05-R	1.15 -	0.97 -	0.96 -	0.97 -	15.88 -
A2P3-PT2-C-3-06-R	1.16 -	0.91 -	0.94 -	0.91 -	12.44 -
A2P3-PT2-C-3-08-R	1.26 -	0.94 -	0.93 -	0.94 -	9.83 -
A2P3-PT2-C-3-08-R-D	1.19 -	0.93 -	0.93 -	0.93 -	9.68 -
A2P3-PT2-C-3-09-R	1.07 -	0.84 -	0.85 -	0.84 -	10.13 -
A2P3-PT2-C-3-10-R	0.91 -	0.75 -	0.73 -	0.75 -	5.49 -
A2P3-PT2-C-3-12-R	1.27 -	0.93 -	0.92 -	0.93 -	11.38 -
A2P3-PT2-C-3-14-R	1.19 -	1.00 -	1.01 -	1.00 -	14.50 -
A2P3-PT2-C-3-15-R	1.03 -	0.76 -	0.75 -	0.76 -	7.13 -
A2P3-PT2-C-3-16-R	1.15 -	0.99 -	0.99 -	0.99 -	20.02 -
FRL	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Confidence Level	0.95	0.95	0.95	0.95	0.95
Max Result	1.27 @	1.00 @	1.01 @	1.00 @	20.02 @
Standardized Skewness	--	--	--	--	--
W-Statistic Probability*	--	--	--	--	--
Test Procedure	--	--	--	--	--
Sample Size	12	12	12	12	12
Estimated Mean	--	--	--	--	--
UCL on the Mean**	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--
Est. Mean - Pass / Fail	--	--	--	--	--
2x Rule Pass / Fail	Pass	Pass	Pass	Pass	Pass
a posteriori Sample	--	--	--	--	--
Size calculation	--	--	--	--	--

Definition of Qualifiers
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
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NOTES:
(1) Maximum result did not exceed the FRL, therefore no statistics were generated and no other tests performed. (Indicated by --)
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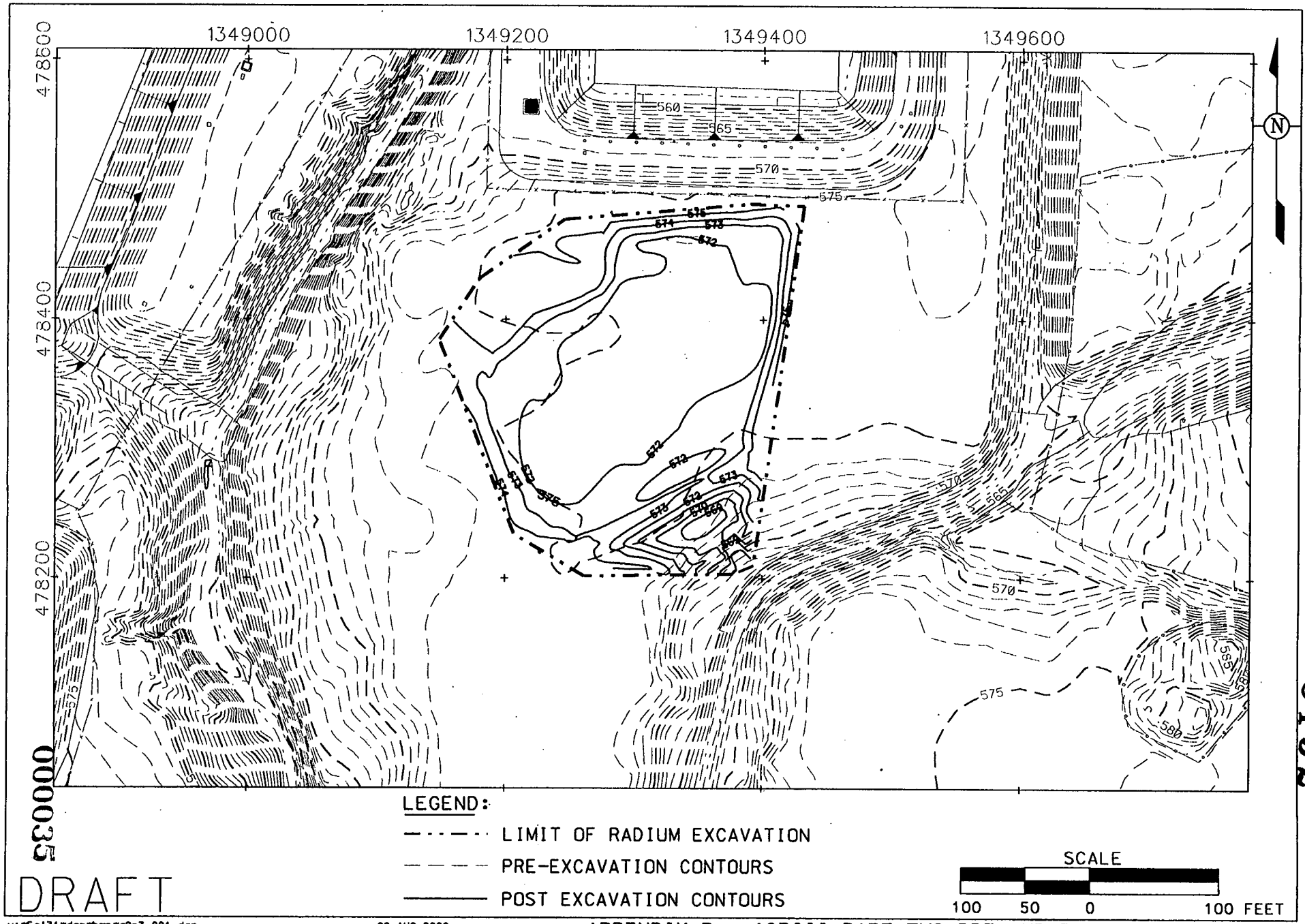
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognormality.
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).

APPENDIX B

CRITERIA FOR COMPLETION OF REMEDIAL ACTION



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STATE PLANAR COORDINATE SYSTEM 1983

02-AUG-2000

APPENDIX B. A2PIII PART TWO PRE AND POST REMEDIATION TOPOGRAPHY AND SURFACE FEATURES

SURVEILLANCE REPORT

TITLE/ACTIVITY: Verification of the Excavation and Removal of the Radium Hot Spot			SURVEILLANCE I.D. NO: 2003740
Division: Soil and Water Project	DEPARTMENT: S&DF	SUPPLIER: NA	START DATE: May 01, 2000
Project (if applicable): Southern Waste Units (SWU)		PROJECT NO.: 20402	COMPLETION DATE: May 15, 2000

MINIMUM DISTRIBUTION:

Lee McDaniel/MS 60	Joe Neyer/DOE/MS 45
Frank Flack/MS 60	Rob Janke/DOE/MS 45
Warren Hooper/MS52-0	Don Pfister/DOE/MS 45
J. D. Chiou/MS 52-0	Mike Godber/MS 64
Frank Thompson/MS 52-4	Mary Eleton, MS 60
Diana Sparks/Original/MS 31	ECDC (8.6) MS 52-7 (SCEP 20402)
Gene Norman/Petro	Pete Bolig/Petro/MS 52-7

SUMMARY:

On the dates listed above, Quality Assurance performed a Surveillance to verify the requirements as outlined in the Design Change Notice, 20402-102, "Revised Radium Excavation", and the requested "Sequence of Construction" Memorandum.

The scope of this surveillance was to verify erosion controls, excavation activities, and surveying requirements were being implemented. Observed construction signs, fencing and silt fencing was in place. Observed the area outfall ditch and berms were constructed as specified and per management's directions. Also, observed all safety and radiological requirements were being implemented during the course of this excavation activity.

The items detailed in the attached Surveillance Checklist were observed and found to be Satisfactory.

This Surveillance is being issued as "Closed".

NONCONFORMANCE TYPES AND NUMBERS ISSUED: NA	DATE: NA

SURVEILLANCE ASSESSMENT PERSONNEL

SURVEILLANCE ASSESSMENT PERSONNEL SIGNATURE(S): Mary Eleton DEPARTMENT PERFORMING THE ASSESSMENT: Quality Assurance Mary Eleton	DATE: May 31, 2000 5/31/00

MANAGEMENT REVIEW

MANAGEMENT REVIEW SIGNATURE: Frank Thompson Michael W. Joller	DATE: May 31, 2000 5/31/00

RECORD 000036

TITLE / ACTIVITY			SURVEILLANCE I.D. NO.
Verification of the Excavation and Removal of the Radium Hot Spot			2003740
DIVISION:	DEPARTMENT:	SUPPLIER:	PROJECT/PROJECT NO. (If applicable).
Southern Waste Units	Soil and Disposal Facility		20402
SURVEILLANCE ASSESSMENT PERSONNEL:			DATE:
Mary Eleton			May 16, 2000

ITEM	ITEMS CHECKED	RESULTS INITIAL AND DATE EACH ITEM RESULT	Sat (✓)	Unsat (✓)
	Verification of the requirements outlined in the Design Change Notice 20402-102, "Revised Radium Excavation" and the requested Sequence of Construction Memorandum.			
	DCN 20402-102, Revised Radium Excavation			
1.	Excavate 3' depth from excavation limits.	Observed excavation was performed per the survey stake markings.	5/4/00 ✓	
2.	Install silt fence as shown on drawing.	Verified silt fencing was in place.	5/1/00 ✓	
3.	Field locate buffer area to allow for clean loading.	Verified a buffer area was set up for clean loading of the haul trucks.	5/12/00 ✓	
4.	Field locate construction fence around area and approximately 3 foot outside of silt fence. Construction fence shall be T-Post and rope construction with rope gate.	Verified fencing was located approximately three feet from the silt fencing. Observed T-Posts and rope construction with a rope gate was in place.	5/12/00 ✓	
5.	FDF shall provide contamination area signs for the contractor to install. The contractor shall furnish and install construction area signs.	Verified contamination area signs, as well as, the construction area signs were placed prior to initiating excavation activities.	5/1/00 ✓	
6.	Submit proposed sequence of construction, in writing, to the Construction Manager for approval.	The proposed sequence of construction memo was issued and approved on April 24, 2000.	5/1/00 ✓	
7.	Contractor shall excavate material such that it can be classified as Category 1 materials for OSDF placement.	Observed materials hauled were classified as Category 1 except for some plastic that was discovered and it was classified as Category 4 –(one truckload of Category 4 material).	5/10/00 ✓	
8.	Fluor Fernald shall perform final stabilization to include seeding and coir matting.	In the process stage of final stabilization.	5/15/00 ✓	

RECORD 000037

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HIRSCH & ASSOCIATES SURVEYING, INC.
3610 STATE LINE ROAD
OKEANA, OH 45053
(513) 367-0534
Fax: (513) 367-2935

May 22, 2000

Petro Environmental technologies
ATTN: Rick Schairbaum
7851 Palace Drive
Cincinnati, Ohio 45249

SUBJECT: RADIUM AREA EXCAVATION QUANTITY

Dear Rick:

We have determined from a survey performed on March 30, 2000 of the radium area to determine existing conditions and a survey on May 19, 2000 to determine the excavation done in this area to be 4,906 cubic yards.

The quantities were computed using the average end area method from cross sections.

If you have any questions or require additional information, please call me at my office. (513)367 0534.

Sincerely,

HIRSCH & ASSOCIATES SURVEYING INC.

Lynn Edward Hirsch

Lynn Edward Hirsch

file: radium

STATE OF OHIO
LYNN E. HIRSCH
S-5738
REGISTERED SURVEYOR

COPY

COPY

Petro Environmental

Memorandum

To: Lee McDaniel

From: Ira Rogers

CC: Pete Bolig

Date: April 24, 2000

Re: Construction Sequence, Radium Hot Spot

In accordance with our discussions and as required by DCN 20402-102, the following list identifies Petro Environmental's proposed construction sequence at the Radium Hot Spot:

1. Survey the existing ground elevations and establish work areas.
2. Construct erosion control features, and install perimeter control fencing. These features will be located based on an evaluation of the survey data.
3. Complete hand excavation around existing trees as shown on the construction drawings.
4. Grade and construct an access roadway from the paved road south of the Main Parking Lot to the Radium Hot Spot.
5. Grade and construct area outfall for Fluor Fernald to mat and seed.
6. Excavate the Radium Hot Spot to the specified depth, and push the material into a temporary stockpile.
7. Load the impacted material in haul trucks, tarp the loaded beds, and haul the material to the OSDF for placement.
8. Excavate and construct the berms as specified in DCN 20402-102.
9. Apply finish grade to excavation surface to the satisfaction of the CM such that it is ready for Fluor Fernald to seed and mulch the work area.

Should you have any comment or questions regarding our proposed construction sequence, contact me at 3404.

Sequence acceptable
Lee E. McDaniel
CM: 4/24/00

QUALITY EVALUATION PLAN

QE). 2003712 Rev

1. Source ?	Receiving ?	Const./Remediation X	Maint./Operations ?	Waste Sampling ?	Recycling ?

2. Item/Title/Description:
Area 2 Phase III, Radium Area

3. Project/Task:		4. Specification/Drawing/PO/Req.:	
Radium Excavation		DCN 20402-102	
5. Prepared By: R. Friske *R Friske*	**Date:** 4-27-00	**6. Reviewed By:** F. Thompson *Frank Thompson*	**Date:** 4-27-00
7. NDE Level III: (When Required) NA	**Date:**	**8. Approved By:** (When Required) N/A	**Date:**

9. Char. No.	10. Evaluation Characteristic (Code/Specification, Inspection/Test/Examination Techniques, Acceptance Criteria)	11. Status SAT	11. Status UNSAT	12. General Remarks
1	Excavate to 2.5' depth from excavation limits.	N/A		Just beginning excavation.
2	Strip soil to 6" depth within 10' of tree trunk.	N/A		Stripping not completed.
3	Install silt fence per drawing.	RF 4-6-00		Verified that silt fence was installed properly as described by the DCN drawing.
4	Field locate construction fence around area and approximately 3' outside of silt fence.	RF 4-6-00		Construction signs and fencing, including rad fence/postings were in place.
5	FDF shall supply the contamination area signs. Contractor shall provide construction area signs.			
6	Submit proposed sequence of construction in writing to the CM for approval prior to initializing work.	RF 4-26-00		Attached is Petro letter describing the Radium Hot Spot construction sequence. Accepted by the CM.

13. QA Team Member (Printed Name) R. Friske	(Signature) *R Friske*	**Date:** 4-27-00
14. QA Team Coach (Completed QEP): F. Thompson	*Frank Thompson*	**Date:** 4-27-00

15. Distribution: L. McDaniel, M. Eleton, M. Godber, F. Thompson, J. Blankenmeyer, R. Friske

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