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# CERTIFICATION REPORT FOR AREA 2, PHASE III PART ONE

## FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
## FERNALD, OHIO

NOVEMBER 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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# LIST OF ACRONYMS AND ABBREVIATIONS

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| | |
|---|---|
| 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 |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| FEMP | Fernald Environmental Management Project |
| FRL | final remediation level |
| GIS | Geographical Information System |
| HAMDC | highest allowable minimum detectable concentration |
| HPGe | high-purity germanium detector |
| LCS | laboratory control sample |
| 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 |
| RCRA | Resource Conservation and Recovery Act |
| 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 |
| SWU | Southern Waste Units |
| TPU | total propagated uncertainty |
| UCL | upper confidence level |
| V&V | verification and validation |
| WAC | Waste Acceptance Criteria |

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# EXECUTIVE SUMMARY _ 2601

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 One at the Fernald Environmental Management Project (FEMP). On the basis of this reported information and supporting project files, DOE has determined that no remedial actions are required in these areas of the site, and therefore, they can be considered "certified."

A2PIII Part One was divided into 22 certification units (CUs), including eight CUs specifically for the four soil stockpiles within the A2PIII Part One footprint. Delineation and design of these CUs were presented in the Certification Design Letter (CDL) for A2PIII Part One (DOE 1999a). Certification sampling was conducted in these areas of the site 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 (UCL); 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 is required. If both of these criteria are met for a CU, than it can be released for final land use development.

Based on historical data and precertification real-time scanning data, no above-FRL contamination is present within A2PIII Part One; as a result, certification began without conducting remedial activities. The A2PIII Part One 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; DOE 1999) 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 One CUs achieved the certification criteria, including all the soil stockpiles and their footprints. 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 22 CUs passed final certification relative to the average COC concentration and the "hot spot" determination on the first round of certification, and no additional corrective 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.

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# 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 One. 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 One.

## 1.2 BACKGROUND

In the 1996 Operable Unit (OU) 5 Record of Decision (ROD; DOE 1996a), DOE committed to excavating contaminated soil that exceeds health-based FRLs with final disposition of the excavated material in the On-Site Disposal Facility (OSDF) or at an off-site disposal facility if the OSDF waste acceptance criteria (WAC) are exceeded. 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 1050-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 implementing the soil and at- and below-grade debris cleanup obligations identified in the OU2, OU3, and OU5 RODs. In the SEP, the FEMP has been divided into distinct remedial areas and phases for soil remediation, based on the operable units' remediation schedule.

After all necessary soil and at-below-grade remediation is completed with each area/phase, the soil will be certified as attaining all clean up goals (i.e., FRLs). The SEP describes the general soil remediation and certification process at the FEMP. Since A2PIII Part One is considered nonimpacted and the need for excavation is unlikely, excavation Approach E was followed in A2PIII Part One and the area was forwarded directly to certification after precertification radiological scans were conducted. Precertification data collection started in late January 1999, and data indicated that no soil excavation activities were required. All precertification and certification activities for these areas were conducted in compliance with the SEP.

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## 1.3 AREA DESCRIPTION

A2PIII Part One is an 70-acre area located in the south-central portion of the Fernald site and is bounded to the east by the South Access Road, to the south by Willey Road, to the north by the Area I, Phase II and to the north and west by the Storm Sewer Outfall Ditch (SSOD) and Paddys Run. There are three soil stockpiles within A2PIII which were generated during the installation of injection/extraction well pipeline. In addition to this 70-acre tract, a half-acre soil stockpile (MTL-HRD-011) near the Southern Waste Units (SWUs) equipment wash facility is also considered part of A2PIII Part One. These areas of the FEMP site are shown in Figure 1-1.

## 1.4 SCOPE

The scope of this report includes presenting the results from the certification of A2PIII Part One and the subsequent conclusions. A2PIII Part One is divided into fourteen (14) open field certification units (CUs) and eight (8) stockpile and stockpile footprint CUs. The certification design for the CUs follows the general approach outlined in Section 3.4 of the SEP and detailed in A2PIII Part One Certification Design Letter (CDL; DOE 1999a).

## 1.5 OBJECTIVES

The objectives of this Certification Report are:

- Describe the precertification 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 22 CUs
- Present the statistical analysis showing that all 22 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: Precertification 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 | A2PIII Part One Stockpile CU Sample Locations |
| Appendix B | Certification Statistics |
| Appendix C | Certification Sample Results |

## 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 One (Figure 1-2).

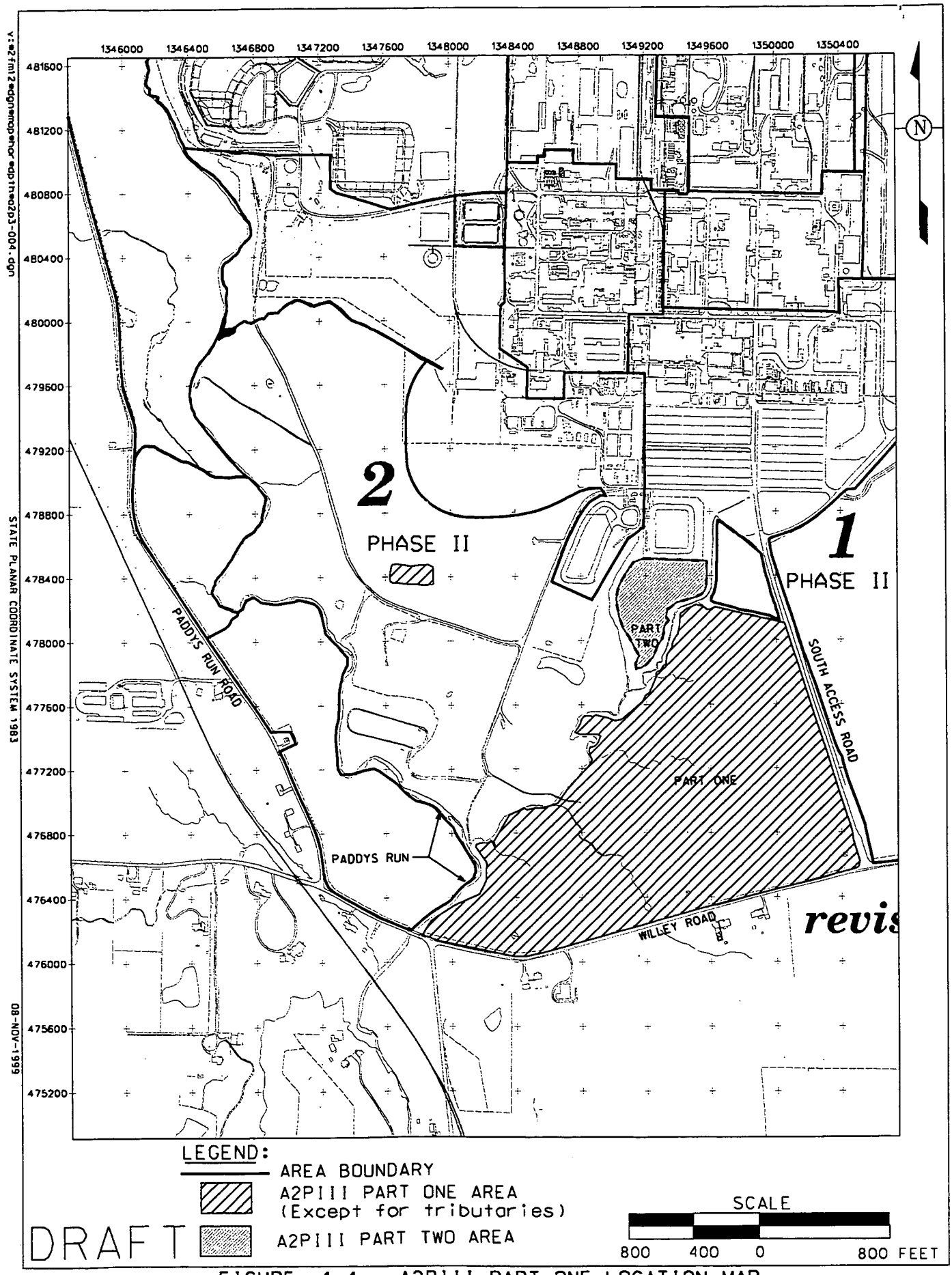
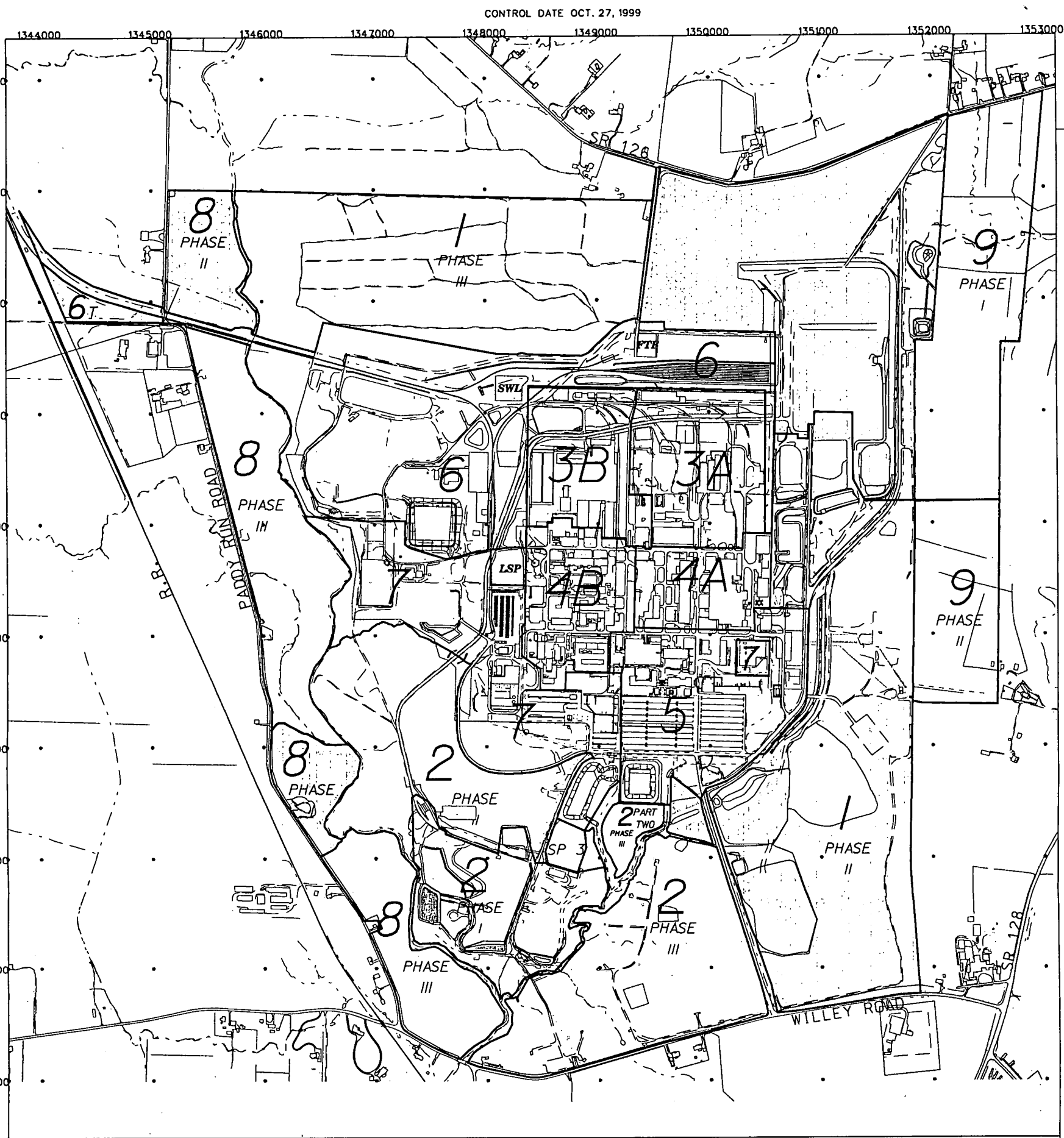



FIGURE 1-1. A2PIII PART ONE LOCATION MAP




LEGEND:

APPROVED CERTIFIED AREAS (236.7 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
- AREAS EXCLUDED FROM A1PI

PENDING CERTIFIED AREAS

- A1PII SECTOR 3 UTILITY TRENCHES
- CHARACTERIZATION FOR REUSE AREAS - 20.2 ACRES

NON CERTIFIED AREAS

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SCALE

10 5 0 10FEET

FIGURE 1-2. FEMP CONTROLLED CERTIFICATION MAP

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STATE PLANAR COORDINATE SYSTEM 1927
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# 2.0 CERTIFICATION APPROACH

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## 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 purpose of certification sampling is to verify that the mean concentrations or activities of primary ASCOCs remaining in the soil of a CU following remedial activities are less than the FRLs at a 95 percent upper confidence level (UCL), and at a 90 percent UCL for secondary ASCOCs. The certification process also includes the hot spot criterion, which states that if any of the certification results exceeds two times the FRL, further action is required as discussed in Section 2.2.5. If the mean residual ASCOC concentrations or activities are below the FRLs within the respective confidence bounds, and the hot spot criterion is met, then the remedial objectives have been achieved for the CU. It can then be released for regrading, reseeding and development of a final land use. The general certification strategy is described in Section 3.4 of the SEP, and the A2PIII Part One-specific strategy is described in the CDL for A2PIII Part One.

### 2.1.1 Selection of Area-Specific Contaminants of Concern

The OU5 ROD lists 80 soil constituents of concern (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 the COC. 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 remedial investigation data presented on spatial distribution maps, it was possible to reduce the sitewide list of soil COCs from the 80 listed in the OU5 ROD to 30. This reduction was possible because the majority of the COCs with FRLs listed in the OU5 ROD have no detections on-site 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.

As committed in the SEP, the primary radiological COCs (total uranium, radium-226, radium-228, thorium-228, and thorium-232) will be 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 either the OU2 or 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 CRDLs.

### 2.1.2 ASCOC Selection Process for A2PIII Part One

Review of historical data shows little above-FRL contamination in A2PIII Part One. As discussed in the CDL, n-nitroso-di-n-propylamine was not retained as an ASCOC since the non-detect CRDL is greater than the FRL. Based on these factors and the inability to identify any mechanism for secondary COC contamination, only total uranium, radium-226, and radium-228, thorium-228, and thorium-232 (the five sitewide primary radiological ASCOCs) were retained as ASCOCs. The ASCOCs identified for A2PIII Part One are summarized in Table 2-1.

## 2.2 CERTIFICATION APPROACH

Excavation Approach E, as described in Section 4.5 of the SEP, is used as the basis for certification in this area. The certification design for A2PIII Part One follows the general approach outlined in Section 3.4 of the SEP. Although the soil generated in creation of the stockpiles is considered "nonimpacted," the general approach outlined in Section 3.4 of the SEP is slightly modified for the soil stockpiles and footprints. The A2PIII Part One certification design is divided into two separate approaches: Open Field CUs and Stockpile CUs.

### 2.2.1 Certification Design

Fourteen Open Field Group 2 CUs were designed based primarily on topography and drainage. Group 2 CUs can be designed as large as 250,000 square feet. The eastern CU boundaries extend to the west edge of the South Access Road and the southern CU boundaries extend to Willey Road. The CUs bounded by

the tributaries extend partially down the side banks of the tributaries to allow for potential backup during extreme rain events and flooding.

As mentioned in Section 1.3, four soil stockpiles were considered for certification. Three stockpiles (MTL-SPO-019, MTL-SPO-004, and MTL-SPO-005) are located within the 70-acre footprint in A2PIII Part One. The fourth soil stockpile (MTL-HRD-011) is located near the equipment wash facility north of the Southern Waste Units. Each stockpile was designated as two CUs; one CU for the footprint underneath the stockpile (footprint CU) and one CU for the pile (pile CU).

### 2.2.2 Sample Selection Process

The selection of Open Field 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.

The stockpiles were gridded into quadrants per Section 3.4.2 of the SEP except for MTL-HRD-011, which was divided into eighteen subareas. Sixteen random sample locations were generated for stockpiles MTL-SPO-004 and MTL-SPO-005. Eighteen random sample locations were generated for MTL-HRD-011 because of its larger size and 12 random sample locations were generated for stockpile MTL-SPO-019 due to its smaller size.

The locations of all certification samples were tested 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. As necessary, the locations were re-tested and alternate random locations were selected for that sub-CU. This process continued until all random locations met the minimum distance criterion. (The sample locations for all the CUs within the work scope of this report are shown in Figure 2-2 and Appendix A).

### 2.2.3 Certification Sampling and Analysis

Each Open Field 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. All samples were

analyzed at the FEMP on-site laboratory for the five primary ASCOCs using the gamma spectrometry method.

The randomly identified sample locations for the soil stockpile and footprint CUs were bored to a depth of six inches below each stockpile's base footprint. Base footprint CU samples were collected following the same protocol as established in Section 3.4.2 of the SEP. Stockpile CU samples were collected with the following protocol as described in the Section 4.1.2 of the A2PIII Part One CDL:

1. Each core location had a randomly identified 6-inch interval for submittal for analysis.

2. Each core was beta/gamma-frisked in the field. If a core had an interval with a greater than background beta/gamma measurement, that interval superceded the randomly generated interval and was submitted for analysis.

3. The randomly generated 6-inch interval was submitted for analysis when no interval exhibited greater than background beta-gamma measurements.

Fourteen samples for each CU in MTL-HRD-011 were submitted for analysis and ten samples for each CU in MTL-004 and MTL-005 were submitted for analysis. Eight samples for each CU in MTL-009 were submitted for analysis. The number of samples submitted for the soil stockpile and footprint CUs were the same.

### 2.2.4 Statistical Analysis

The statistical analysis of certification samples is discussed in Appendix G of the SEP. Statistical analysis of certification results is not necessary to determine if an ASCOC passed certification in a CU if all of the results for that ASCOC in that CU were below the FRL. If any sample result(s) exceeds the associated FRL, then statistical analyses will be performed and two criteria must be met for the CU to pass certification. If the data distribution is normal or lognormal, the first criterion is to compare the 95 percent UCL on the mean of each primary ASCOC to its FRL, resulting in the pass/fail decision on each individual CU. If the data distribution was not normal or lognormal, the appropriate nonparametric approach, discussed in Appendix G of the SEP, was used to evaluate the 95 percent UCL on the mean. The second criterion is related to the hot spot criterion, which states that if a certification sample for a primary radiological ASCOC exceeds two-times the FRL, then further action is necessary as shown on Figure 3-11 of the SEP. When the given UCL on the mean for each COC is less than its FRL, and the hot spot criterion is met, the CU has met both criteria and will be considered certified.

**TABLE 2-1**
**ASCOC LIST FOR A2PIII PART ONE**

| 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 |

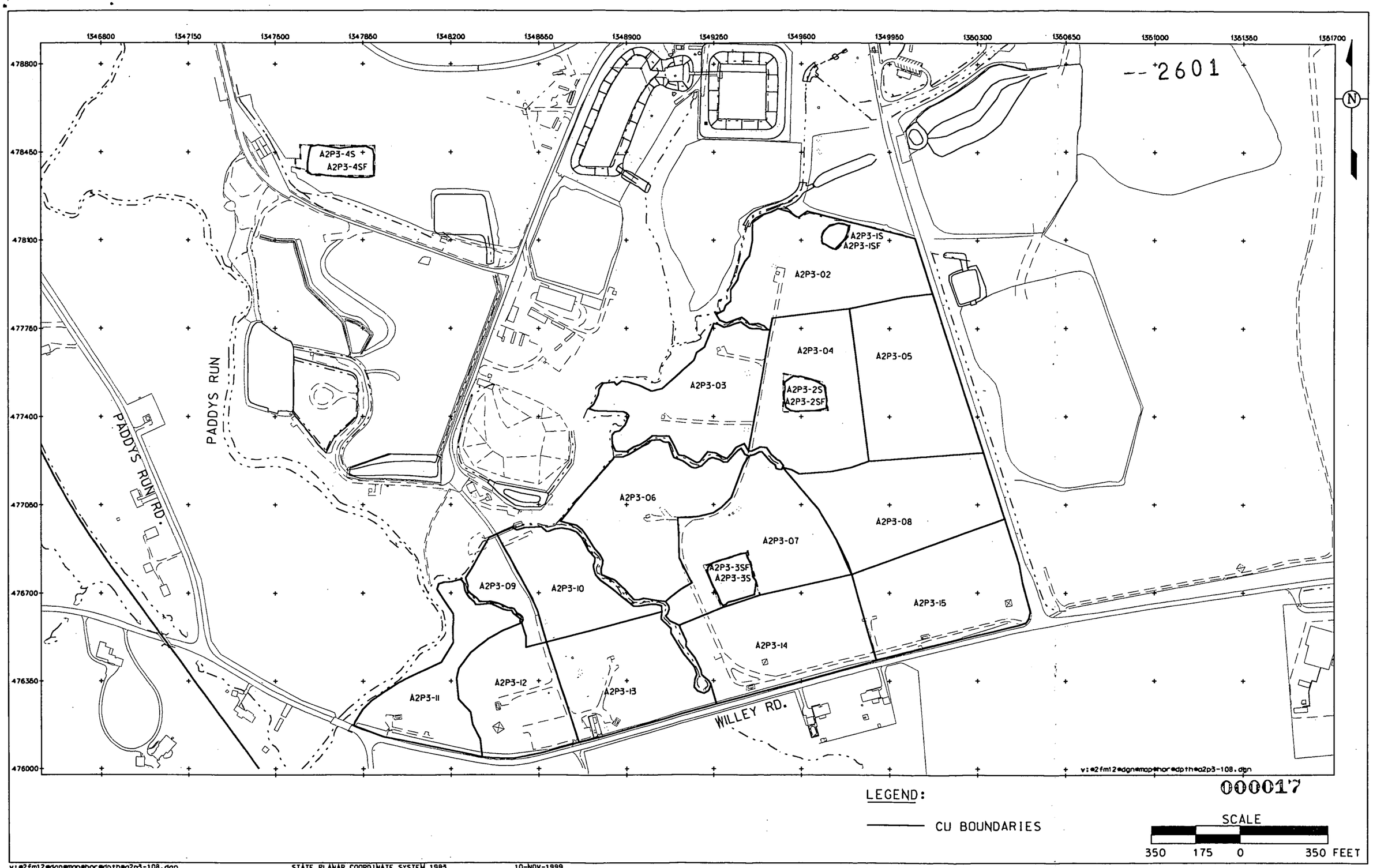


FIGURE 2-1. A2PIII PART ONE CERTIFICATION UNITS

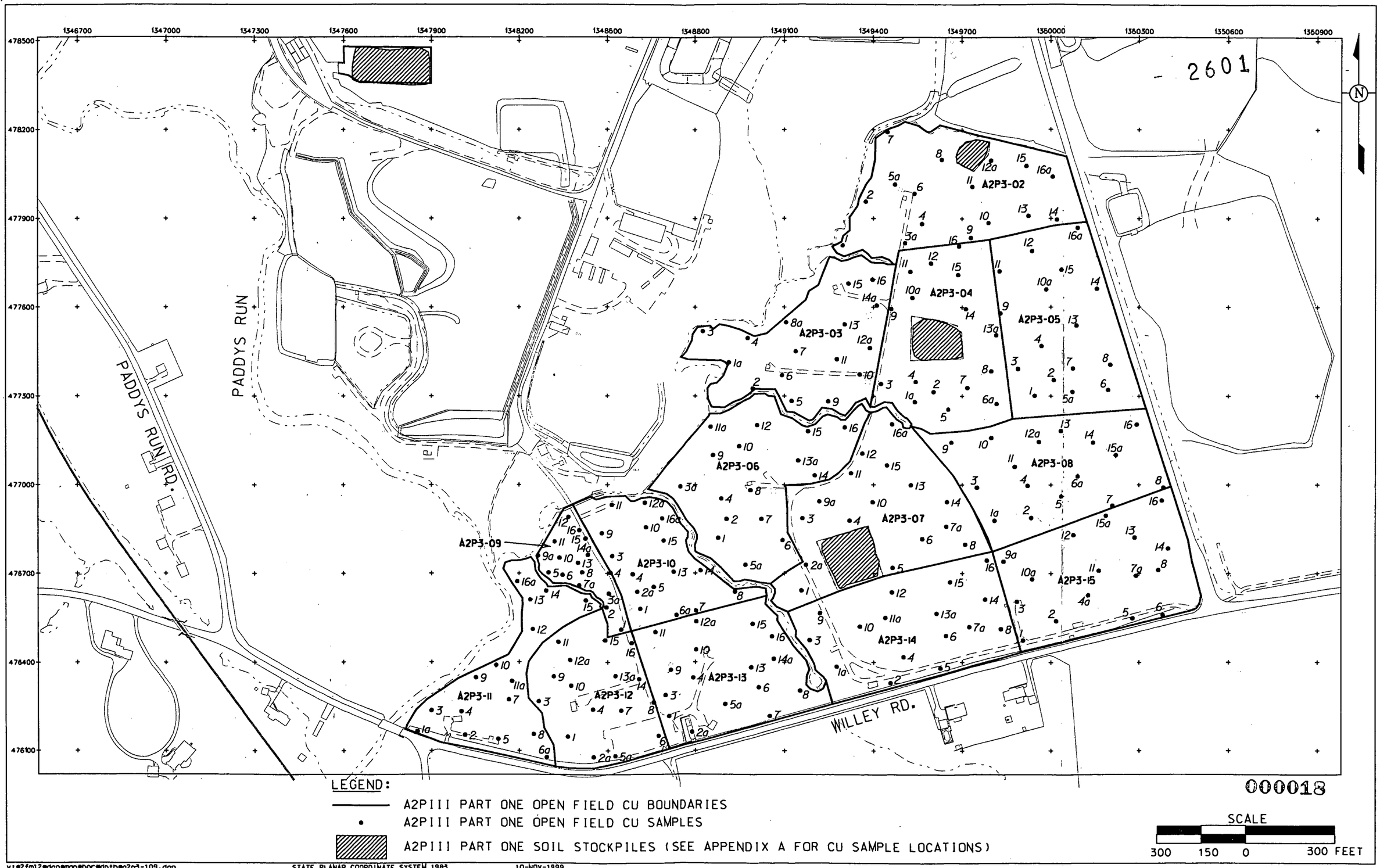


FIGURE 2-2. A2PIII PART ONE OPEN FIELD CU SAMPLE LOCATIONS

# 3.0 OVERVIEW OF FIELD ACTIVITIES

## 3.1 DATA EVALUATION AND PRECERTIFICATION

Based on historical data and precertification surveys from A2PIII Part One, no soil remediation activities were required prior to certification sampling. A2PIII Part One historical and precertification real-time data are discussed in detail in the CDL.

## 3.2 CHANGES TO SCOPE OF WORK

The scope of work for A2PIII Part One certification sampling was documented in the CDL and A2PIII Part One Certification Project Specific Plan (PSP; DOE 1999b), 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.

Only minor changes to the scope of work were encountered in the A2PIII Part One certification:

- Modified Table 3-1 of PSP and Section 4.0 to reflect a change in the analytical support level (ASL) for water and soil samples. The on-site laboratory could meet the ASL D critieria for the highest allowable minimum detectable concentration (HAMDC) on QC water samples for all the primary radiological COCs with gamma spectroscopy. Thus, the analysis did not have to be qualified as ASL E for water sample. For soil samples, the project-required minimum detectable concentration (MDC) for thorium-228 and thorium-232 by gamma spectroscopy is less stringent than the ASL D Sitewide CERCLA Quality Assurance Project Plan (SCQ) HAMDC. Therefore, the thorium-228 and thorium-232 gamma spectroscopy data for soil samples, along with the previously stated total uranium data, were considered ASL E although the data deliverable is identical in all other specifications for ASL D.

- Corrected a typographical error in the sample identification for the A2P3-4S stockpile CU in Appendix D of the PSP.

- Moved three sample locations less than three feet to avoid subsurface obstacles. The locations were A2P3-9-15 (moved to east), A2P3-4S-2 (moved to north), and A2P3-4S-3 (moved to the north). These moves did not violate the minimum distance criteria.

# 4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

## 4.1 ANALYTICAL METHODOLOGIES

The samples for A2PIII Part One 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 ASL D with the following exception. For soil samples, the project-specified MDC for total uranium, thorium-228 and thorium-232 by gamma spectroscopy is less stringent than the ASL D SCQ 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.

### 4.1.2 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:

Total uranium (mg/kg) = (2.998544) x uranium-238 gamma spectrometry result (pCi/g)

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

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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 ingrowth period before counting. The on-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIII Part One 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 One certification results.

Isotopic Thorium

Isotopic thorium was also quantified by gamma spectrometry. The on-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIII Part One 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's (EPA's) 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 quality assurance 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.

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 level of confidence of the results. General areas examined that apply to all the chemical data include:

- Holding Times
- Instrument calibrations
- Calculation of results
- Matrix spike/matrix spike duplicate recoveries
- Laboratory/field duplicate precision
- Field/Laboratory Blank contamination
- Dry weight correction for solid samples
- Correct detection limits reported
- Laboratory control sample (LCS) recoveries and compliance with established limits

Parameters unique to the evaluation of radiochemical analyses include:

- Calibration data for specific energies
- Background checks
- Relative Error ratios
- Tracer yields
- 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 ASL B, but included a systematic review of the raw data and recalculations. Three of the 23 analytical releases (CUs A2P3-3, -7 and -10) were 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. The majority of the results received no qualifier (-) while some results are qualified as estimated (J) and nondetects (U). No results were qualified as rejected (R).

## 4.3 DATA REDUCTION

Each sample used to support the A2PIII Part One 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.

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 minimum detectable concentration (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 AND EVALUATION

All CUs for A2PIII Part One passed the certification criteria. The determination of successful certification or certification failure was based on a review of certification sample data from each CU against criteria discussed in Section 2.2.5. All CUs in A2PIII Part One passed final certification relative to the average concentration of COCs and the two times the FRL "hot spot" criterion. All CUs passed on the first round of certification, and no additional corrective actions were necessary. Final certification data are presented in Appendices B and C. A review of the A2PIII Part One certification results shows no FRL exceedences for any of the ASCOCs.

## 5.2 A2PIII PART ONE CERTIFICATION CONCLUSIONS

All of the CUs have passed certification statistical analyses relative to the determination of average residual soil concentrations within applicable confidence bounds of all the ASCOCs, and relative to the two times FRL "hot spot" criterion. Based on these results, DOE has determined that the remedial objectives in the OU5 ROD have been achieved in A2PIII Part One, and no remedial actions are required. The subject areas will be released for final land use.

# 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 initiation of certification sampling activities for a remediation area, temporary fencing will be installed to delineate the perimeter of the "certified" area if existing fencing is not already present
- Signs will be posted upon the temporary perimeter fencing to require access approval for entry into the "certified" area from the Soil and Disposal Facility Project (SDFP) Natural Resources Group.
- To gain access to conduct work in a "certified" area, the person or project desiring admittance will submit a written request to the responsible project manager
- Any equipment to be used within the "certified" area must have been cleaned in accordance with FEMP certified area access procedure subsequent to any use in an uncertified area or for any work before entering a "certified" area
- FEMP management team representatives must instruct general employees/operators on the entry and exit requirements for a "certified" area.

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.

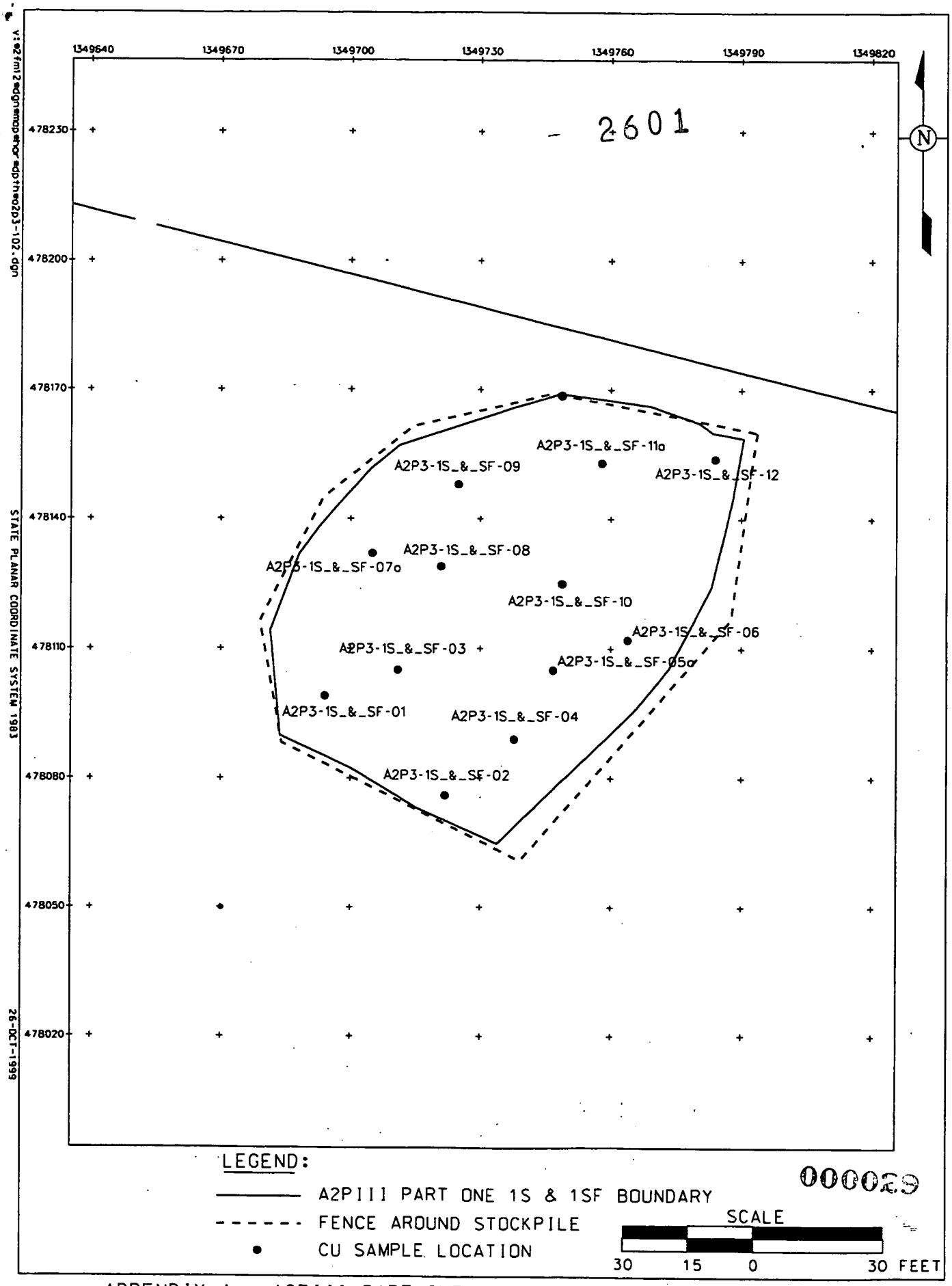
U.S. Department of Energy, 1999a, "Certification Design Letter for Area 2, Phase III Part One," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1999b, "Project Specific Plan for Area 2, Phase III Part One 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.

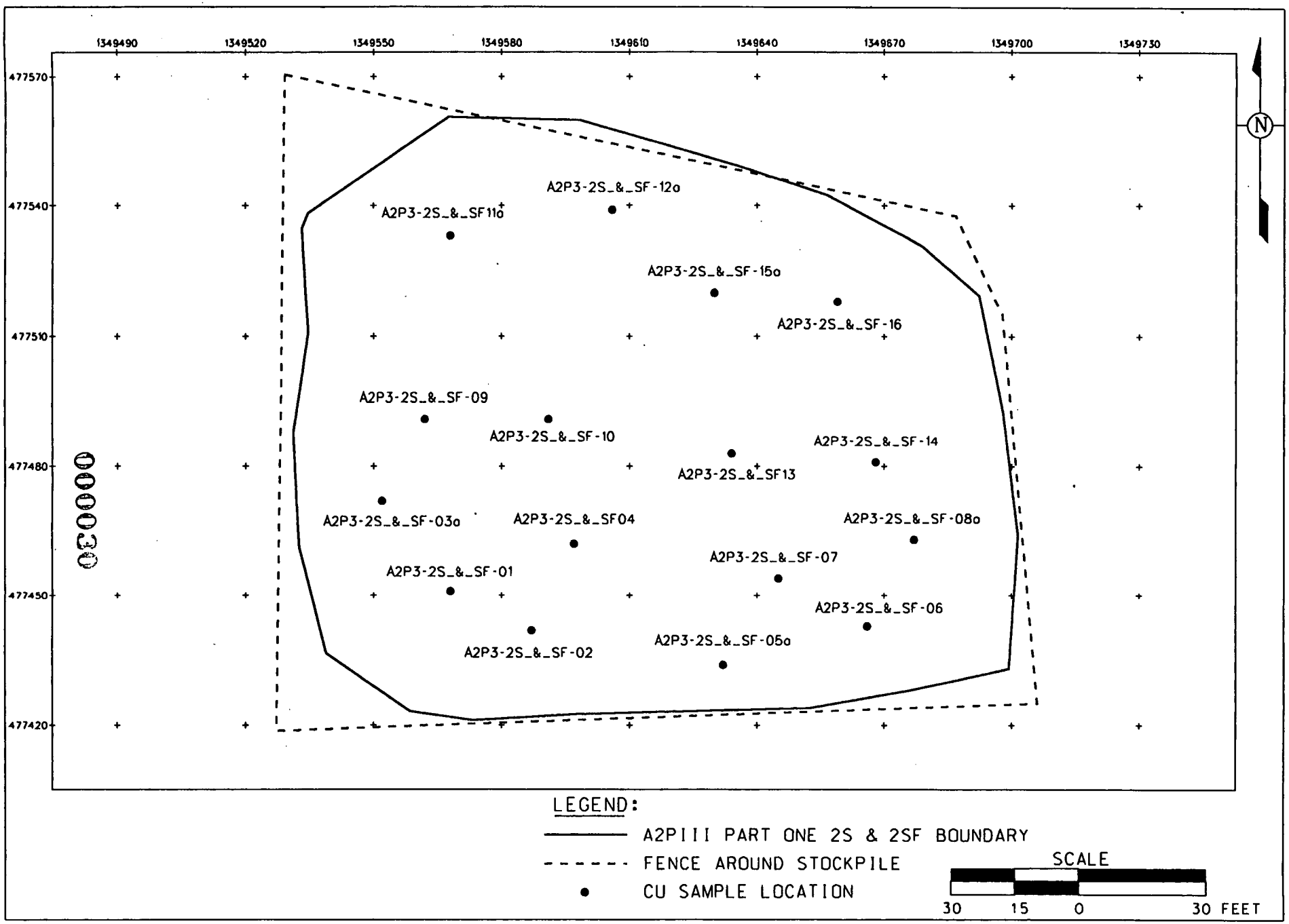
# APPENDIX A

## A2PIII PART ONE SOIL STOCKPILE CU SAMPLE LOCATIONS




000029

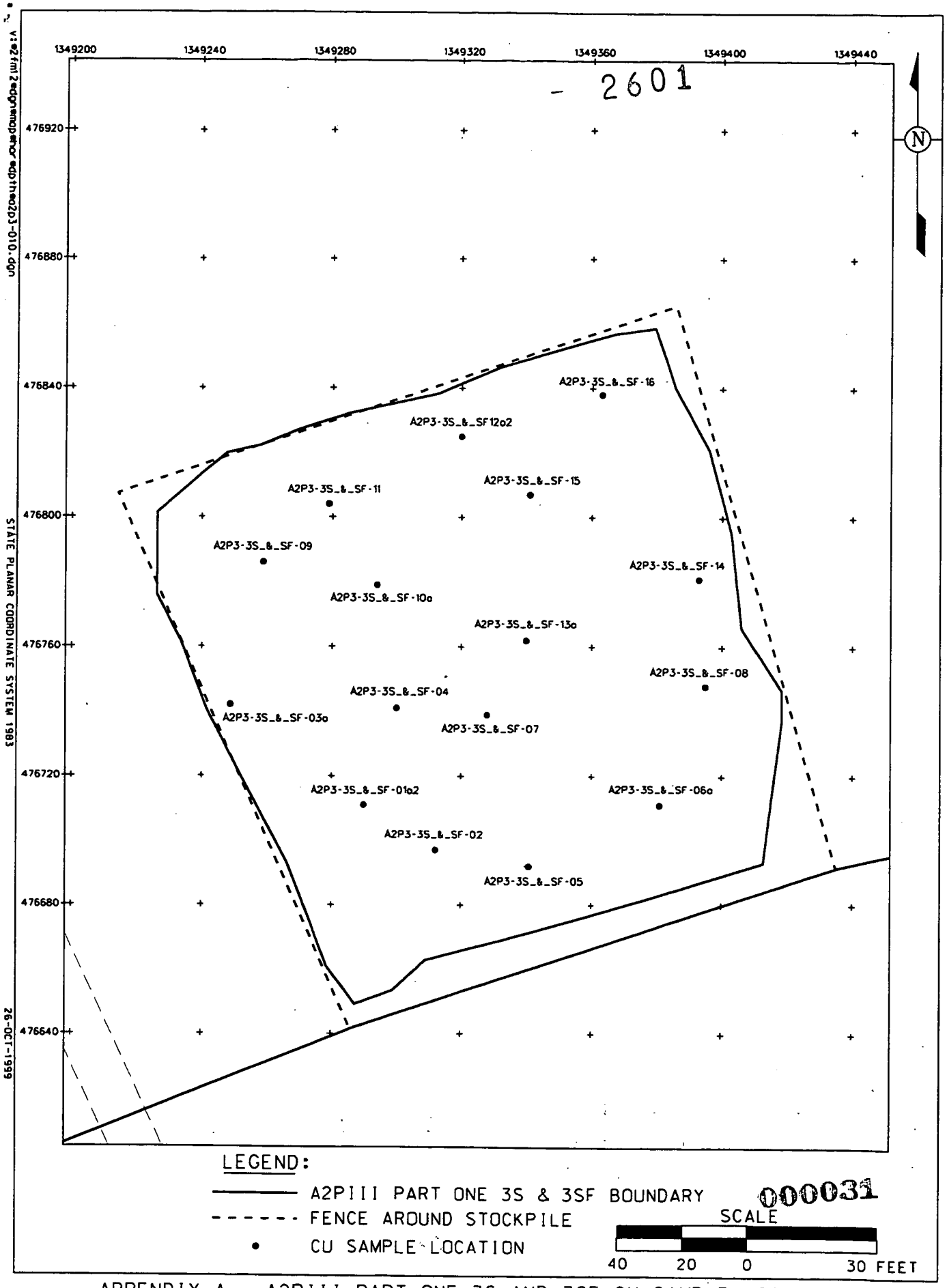
APPENDIX A. A2PIII PART ONE 1S AND 1SF CU SAMPLE LOCATIONS




000030

v:\2fm12\dgn\map\hor\dpth\a2p3-103.dgn
STATE PLANAR COORDINATE SYSTEM 1983

APPENDIX A. A2PIII PART ONE 2S AND 2SF CU SAMPLE LOCATIONS




- 2601

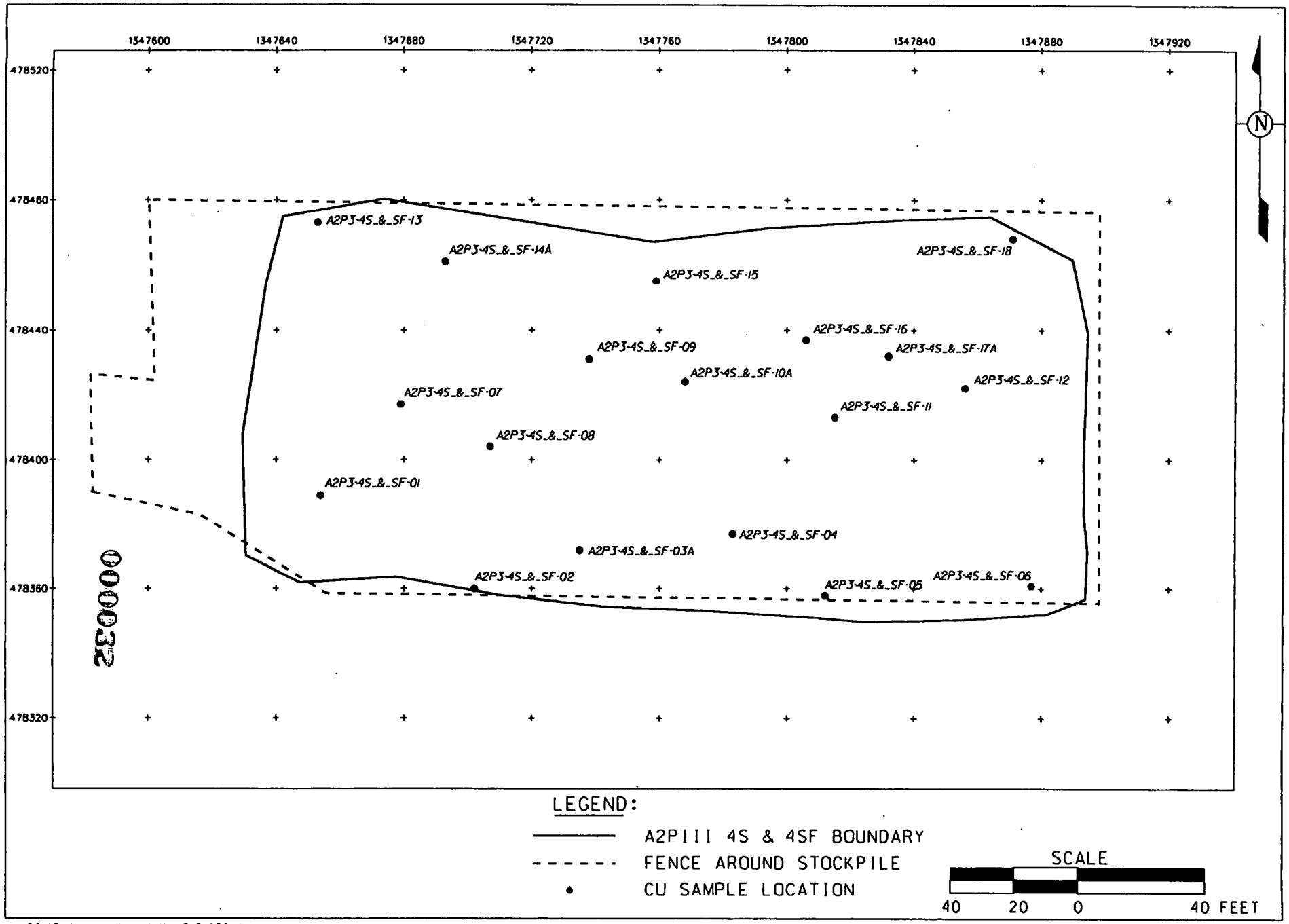
000031

APPENDIX A. A2PIII PART ONE 3S AND 3SF CU SAMPLE LOCATIONS

STATE PLANAR COORDINATE SYSTEM 1983

26-OCT-1999

v:\2fm12\dgn\mdp\hor\dp\hsd2p3-010.dgn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1347640
1347680
1347720
1347760
1347800
1347840
1347880
1347920
478520
478480
478440
478400
478360
478320
N
A2P3-4S_&_SF-13
A2P3-4S_&_SF-14A
A2P3-4S_&_SF-15
A2P3-4S_&_SF-18
A2P3-4S_&_SF-16
A2P3-4S_&_SF-09
A2P3-4S_&_SF-17A
A2P3-4S_&_SF-10A
A2P3-4S_&_SF-12
A2P3-4S_&_SF-07
A2P3-4S_&_SF-11
A2P3-4S_&_SF-08
A2P3-4S_&_SF-01
A2P3-4S_&_SF-04
A2P3-4S_&_SF-03A
A2P3-4S_&_SF-02
A2P3-4S_&_SF-05
A2P3-4S_&_SF-06
LEGEND:
A2PIII 4S & 4SF BOUNDARY
FENCE AROUND STOCKPILE
CU SAMPLE LOCATION
SCALE
40
20
0
40 FEET

000032

# APPENDIX B

# CERTIFICATION STATISTICS

## Appendix B: Certification Statistics for A2P3-C-02

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-02-01-R | 1.21 - | 1.13 - | 1.13 J | 1.13 - | 2.89 J |
| A2P3-C-02-02-R | 1.00 - | 0.81 - | 0.80 - | 0.81 - | 4.42 J |
| A2P3-C-02-02-R-D | 1.12 - | 0.87 - | 0.87 - | 0.87 - | 4.11 J |
| A2P3-C-02-04-R | 1.13 - | 1.06 - | 1.03 - | 1.06 - | 6.69 - |
| A2P3-C-02-06-R | 1.11 - | 0.95 - | 0.94 - | 0.95 - | 8.23 - |
| A2P3-C-02-07-R | 0.89 - | 0.87 - | 0.82 - | 0.87 - | 7.07 - |
| A2P3-C-02-08-R | 0.86 - | 0.80 - | 0.80 - | 0.80 - | 4.86 - |
| A2P3-C-02-09-R | 1.05 - | 1.09 - | 1.07 - | 1.09 - | 10.67 - |
| A2P3-C-02-10-R | 1.07 - | 0.85 - | 0.84 - | 0.85 - | 6.74 - |
| A2P3-C-02-11-R | 0.89 - | 0.77 - | 0.76 - | 0.77 - | 4.67 J |
| A2P3-C-02-13-R | 1.05 - | 0.99 - | 1.01 - | 0.99 - | 15.07 - |
| A2P3-C-02-14-R | 1.00 - | 0.99 - | 1.01 - | 0.99 - | 15.73 - |
| A2P3-C-02-15-R | 0.89 - | 0.92 - | 0.92 - | 0.92 - | 17.00 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.21 @ | 1.13 @ | 1.13 @ | 1.13 @ | 17.00 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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).



000034

## Appendix B: Certification Statistics for A2P3-C-03

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-03-02-R | 0.86 - | 0.69 - | 0.67 - | 0.69 - | 6.63 - |
| A2P3-C-03-03-R | 0.84 - | 0.86 - | 0.84 - | 0.86 - | 17.11 - |
| A2P3-C-03-04-R | 0.94 - | 0.89 - | 0.85 - | 0.89 - | 14.80 - |
| A2P3-C-03-05-R | 1.20 - | 0.93 - | 0.90 - | 0.93 - | 14.37 - |
| A2P3-C-03-07-R | 0.83 - | 0.82 - | 0.80 - | 0.82 - | 7.54 - |
| A2P3-C-03-08-R | 0.84 - | 0.82 - | 0.79 - | 0.82 - | 16.98 - |
| A2P3-C-03-09-R | 1.07 J | 0.84 J | 0.83 J | 0.84 J | 3.82 J |
| A2P3-C-03-09-R-D | 0.70 J | 0.69 J | 0.69 J | 0.69 J | 3.02 UJ |
| A2P3-C-03-11-R | 1.03 - | 0.81 - | 0.81 - | 0.81 - | 3.66 J |
| A2P3-C-03-12-R | 1.08 - | 0.86 - | 0.84 - | 0.86 - | 3.19 U |
| A2P3-C-03-14-R | 0.85 - | 0.65 - | 0.65 - | 0.65 - | 3.51 J |
| A2P3-C-03-15-R | 0.76 - | 0.71 - | 0.71 - | 0.71 - | 4.06 J |
| A2P3-C-03-16-R | 0.88 - | 1.01 - | 0.97 - | 1.01 - | 12.72 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.20 @ | 1.01 @ | 0.97 @ | 1.01 @ | 17.11 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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).

000035

## Appendix B: Certification Statistics for A2P3-C-04

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-04-02-R | 1.03 - | 0.85 - | 0.84 - | 0.85 - | 6.48 - |
| A2P3-C-04-02-R-D | 1.03 - | 0.87 - | 0.89 - | 0.87 - | 6.88 - |
| A2P3-C-04-03-R | 1.08 - | 0.93 - | 0.92 - | 0.93 - | 3.56 J |
| A2P3-C-04-04-R | 1.04 - | 0.92 - | 0.91 - | 0.92 - | 3.91 J |
| A2P3-C-04-05-R | 0.91 - | 0.83 - | 0.82 - | 0.83 - | 9.79 - |
| A2P3-C-04-06-R | 1.09 - | 1.04 - | 1.02 - | 1.04 - | 8.09 - |
| A2P3-C-04-08-R | 1.06 - | 1.00 - | 0.97 - | 1.00 - | 11.30 - |
| A2P3-C-04-09-R | 1.01 - | 0.77 - | 0.77 - | 0.77 - | 3.21 J |
| A2P3-C-04-10-R | 1.02 - | 0.99 - | 0.97 - | 0.99 - | 3.58 J |
| A2P3-C-04-12-R | 1.07 - | 1.01 - | 0.98 - | 1.01 - | 7.03 - |
| A2P3-C-04-13-R | 1.16 - | 1.03 - | 1.00 - | 1.03 - | 10.36 - |
| A2P3-C-04-14-R | 1.13 - | 1.02 - | 0.97 - | 1.02 - | 11.35 - |
| A2P3-C-04-16-R | 1.20 - | 1.07 - | 1.05 - | 1.07 - | 10.75 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.20 @ | 1.07 @ | 1.05 @ | 1.07 @ | 11.35 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-C-05

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-05-02-R | 0.94 J | 1.07 - | 1.08 - | 1.07 - | 9.76 - |
| A2P3-C-05-02-R-D | 1.10 J | 1.03 - | 1.01 - | 1.03 - | 11.76 - |
| A2P3-C-05-03-R | 1.07 - | 0.91 - | 0.87 - | 0.91 - | 11.28 - |
| A2P3-C-05-04-R | 1.08 - | 1.05 - | 1.03 - | 1.05 - | 10.44 - |
| A2P3-C-05-06-R | 1.05 - | 1.00 - | 0.96 - | 1.00 - | 12.04 - |
| A2P3-C-05-07-R | 0.92 - | 0.95 - | 0.97 - | 0.95 - | 8.40 - |
| A2P3-C-05-08-R | 1.00 - | 1.11 - | 1.11 - | 1.11 - | 9.46 - |
| A2P3-C-05-09-R | 1.03 - | 1.14 - | 1.18 - | 1.14 - | 4.70 J |
| A2P3-C-05-11-R | 1.13 - | 1.17 - | 1.15 - | 1.17 - | 6.26 J |
| A2P3-C-05-12-R | 1.18 - | 1.10 - | 1.07 - | 1.10 - | 11.18 - |
| A2P3-C-05-13-R | 1.07 - | 0.94 - | 0.90 - | 0.94 - | 9.46 - |
| A2P3-C-05-14-R | 1.20 - | 1.20 - | 1.17 - | 1.20 - | 10.48 - |
| A2P3-C-05-15-R | 0.94 - | 0.98 - | 0.99 - | 0.98 - | 7.15 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.20 @ | 1.20 @ | 1.18 @ | 1.20 @ | 12.04 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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).

000037

## Appendix B: Certification Statistics for A2P3-C-06

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-06-01-R | 1.12 - | 1.04 - | 1.02 - | 1.04 - | 4.46 J |
| A2P3-C-06-02-R | 0.88 - | 0.88 - | 0.86 - | 0.88 - | 6.69 - |
| A2P3-C-06-04-R | 0.74 - | 0.57 - | 0.56 - | 0.57 - | 8.47 - |
| A2P3-C-06-06-R | 0.93 - | 0.90 - | 0.89 - | 0.90 - | 9.15 - |
| A2P3-C-06-07-R | 0.93 - | 0.88 - | 0.85 - | 0.88 - | 11.37 - |
| A2P3-C-06-08-R | 0.80 - | 0.72 - | 0.68 - | 0.72 - | 3.34 U |
| A2P3-C-06-09-R | 0.62 - | 0.83 - | 0.76 - | 0.83 - | 12.92 - |
| A2P3-C-06-09-R-D | 0.92 - | 0.81 - | 0.76 - | 0.81 - | 15.21 - |
| A2P3-C-06-10-R | 0.82 - | 0.91 - | 0.84 - | 0.91 - | 6.30 - |
| A2P3-C-06-12-R | 1.02 - | 0.96 - | 0.91 - | 0.96 - | 3.91 U |
| A2P3-C-06-14-R | 0.79 - | 0.48 - | 0.46 - | 0.48 - | 2.34 J |
| A2P3-C-06-15-R | 0.84 - | 0.68 - | 0.65 - | 0.68 - | 3.34 J |
| A2P3-C-06-16-R | 1.01 - | 0.98 - | 0.89 - | 0.98 - | 5.32 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.12 @ | 1.04 @ | 1.02 @ | 1.04 @ | 15.21 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-C-07

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-07-01-R | 0.77 - | 1.00 - | 0.98 - | 1.00 - | 9.38 - |
| A2P3-C-07-03-R | 0.65 - | 0.72 - | 0.70 - | 0.72 - | 3.95 J |
| A2P3-C-07-04-R | 0.84 - | 0.96 - | 0.95 - | 0.96 - | 5.44 J |
| A2P3-C-07-05-R | 0.67 - | 0.55 - | 0.55 - | 0.55 - | 2.77 J |
| A2P3-C-07-06-R | 1.07 - | 0.96 - | 0.94 - | 0.96 - | 5.34 - |
| A2P3-C-07-08-R | 0.86 - | 0.85 - | 0.85 - | 0.85 - | 6.25 - |
| A2P3-C-07-10-R | 0.79 - | 0.60 - | 0.60 - | 0.60 - | 3.18 U |
| A2P3-C-07-11-R | 0.88 - | 0.80 - | 0.80 - | 0.80 - | 3.44 U |
| A2P3-C-07-12-R | 0.94 - | 0.77 J | 0.76 J | 0.77 J | 3.97 J |
| A2P3-C-07-12-R-D | 0.96 - | 0.99 J | 1.00 J | 0.99 J | 4.50 - |
| A2P3-C-07-13-R | 1.01 - | 1.06 - | 1.07 - | 1.06 - | 6.35 - |
| A2P3-C-07-14-R | 0.92 - | 0.89 - | 0.84 - | 0.89 - | 8.98 - |
| A2P3-C-07-15-R | 0.90 - | 0.89 - | 0.89 - | 0.89 - | 5.84 J |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.07 @ | 1.06 @ | 1.07 @ | 1.06 @ | 9.38 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-C-08

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-08-02-R | 0.91 - | 0.99 - | 0.98 - | 0.99 - | 8.88 - |
| A2P3-C-08-03-R | 0.84 - | 1.08 - | 1.06 - | 1.08 - | 9.06 - |
| A2P3-C-08-04-R | 1.05 - | 1.02 - | 1.00 - | 1.02 - | 5.96 - |
| A2P3-C-08-05-R | 0.99 - | 1.02 - | 1.03 - | 1.02 - | 8.91 - |
| A2P3-C-08-07-R | 0.99 - | 1.14 - | 1.12 - | 1.14 - | 7.16 - |
| A2P3-C-08-08-R | 0.91 - | 0.92 - | 0.90 - | 0.92 - | 10.27 - |
| A2P3-C-08-09-R | 1.14 - | 1.06 J | 1.09 J | 1.06 J | 7.63 - |
| A2P3-C-08-09-R-D | 1.05 - | 0.93 J | 0.89 J | 0.93 J | 7.82 - |
| A2P3-C-08-10-R | 1.10 - | 0.99 - | 0.98 - | 0.99 - | 7.73 - |
| A2P3-C-08-11-R | 1.06 - | 1.05 - | 1.00 - | 1.05 - | 7.73 - |
| A2P3-C-08-13-R | 1.12 - | 1.09 - | 1.07 - | 1.09 - | 7.78 - |
| A2P3-C-08-14-R | 1.14 - | 1.02 - | 0.97 - | 1.02 - | 7.20 - |
| A2P3-C-08-16-R | 0.76 - | 0.74 - | 0.70 - | 0.74 - | 8.57 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.14 @ | 1.14 @ | 1.12 @ | 1.14 @ | 10.27 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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).

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## Appendix B: Certification Statistics for A2P3-C-09

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-09-01-R | 1.11 - | 1.15 - | 1.13 - | 1.15 - | 14.93 J |
| A2P3-C-09-02-R | 0.85 - | 0.87 - | 0.78 - | 0.87 - | 7.31 - |
| A2P3-C-09-04-R | 0.72 - | 0.58 - | 0.59 - | 0.58 - | 3.21 U |
| A2P3-C-09-05-R | 1.12 - | 1.01 - | 0.99 - | 1.01 - | 8.85 - |
| A2P3-C-09-06-R | 0.92 - | 0.64 - | 0.64 - | 0.64 - | 3.74 J |
| A2P3-C-09-08-R | 1.13 - | 0.89 - | 0.86 - | 0.89 - | 10.62 - |
| A2P3-C-09-10-R | 0.90 - | 0.94 - | 0.93 - | 0.94 - | 8.57 - |
| A2P3-C-09-11-R | 1.10 - | 1.06 - | 1.03 - | 1.06 - | 7.48 - |
| A2P3-C-09-12-R | 0.84 - | 0.55 - | 0.54 - | 0.55 - | 3.84 J |
| A2P3-C-09-12-R-D | 0.92 - | 0.57 - | 0.57 - | 0.57 - | 3.82 J |
| A2P3-C-09-13-R | 1.27 - | 1.03 - | 0.99 - | 1.03 - | 9.79 - |
| A2P3-C-09-15-R | 0.85 - | 0.60 - | 0.59 - | 0.60 - | 3.03 U |
| A2P3-C-09-16-R | 0.87 - | 0.72 - | 0.70 - | 0.72 - | 2.49 J |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.27 @ | 1.15 @ | 1.13 @ | 1.15 @ | 14.93 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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).

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## Appendix B: Certification Statistics for A2P3-C-10

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-10-01-R | 0.75 - | 0.66 - | 0.63 - | 0.66 - | 3.06 U |
| A2P3-C-10-03-R | 0.91 - | 0.99 - | 1.00 - | 0.99 - | 5.74 J |
| A2P3-C-10-04-R | 0.90 - | 1.05 - | 1.05 - | 1.05 - | 6.06 - |
| A2P3-C-10-05-R | 0.84 - | 1.01 - | 0.98 - | 1.01 - | 7.69 - |
| A2P3-C-10-07-R | 0.85 - | 0.85 - | 0.84 - | 0.85 - | 5.19 J |
| A2P3-C-10-08-R | 0.64 - | 0.45 - | 0.43 - | 0.45 - | 3.70 J |
| A2P3-C-10-09-R | 1.04 - | 1.05 - | 1.08 - | 1.05 - | 7.03 - |
| A2P3-C-10-10-R | 1.09 - | 1.00 - | 0.99 - | 1.00 - | 6.53 - |
| A2P3-C-10-11-R | 0.53 - | 0.34 - | 0.34 - | 0.34 - | 3.82 J |
| A2P3-C-10-13-R | 0.93 - | 0.91 - | 0.89 - | 0.91 - | 6.71 - |
| A2P3-C-10-14-R | 0.96 - | 0.86 - | 0.86 - | 0.86 - | 11.99 - |
| A2P3-C-10-15-R | 0.97 J | 0.90 - | 0.88 - | 0.90 - | 10.08 J |
| A2P3-C-10-15-R-D | 0.81 J | 0.86 - | 0.86 - | 0.86 - | 4.13 U |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.09 @ | 1.05 @ | 1.08 @ | 1.05 @ | 11.99 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 ass
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognorm

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

## Appendix B: Certification Statistics for A2P3-C-11

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-11-02-R | 0.45 - | 0.32 - | 0.30 - | 0.32 - | 2.83 U |
| A2P3-C-11-03-R | 0.85 - | 0.76 - | 0.75 - | 0.76 - | 6.21 - |
| A2P3-C-11-04-R | 0.75 - | 0.79 - | 0.78 - | 0.79 - | 3.28 J |
| A2P3-C-11-05-R | 0.80 - | 0.82 - | 0.84 - | 0.82 - | 6.29 J |
| A2P3-C-11-07-R | 0.75 - | 0.73 - | 0.71 - | 0.73 - | 3.30 U |
| A2P3-C-11-08-R | 0.65 - | 0.56 - | 0.56 - | 0.56 - | 4.05 J |
| A2P3-C-11-09-R | 0.75 - | 0.70 - | 0.70 - | 0.70 - | 5.20 - |
| A2P3-C-11-09-R-D | 0.71 - | 0.61 - | 0.61 - | 0.61 - | 6.72 - |
| A2P3-C-11-10-R | 0.67 - | 0.59 - | 0.60 - | 0.59 - | 2.81 J |
| A2P3-C-11-12-R | 0.79 - | 0.86 - | 0.83 - | 0.86 - | 6.07 - |
| A2P3-C-11-13-R | 0.75 - | 0.82 - | 0.81 - | 0.82 - | 8.20 - |
| A2P3-C-11-14-R | 0.70 - | 0.63 - | 0.60 - | 0.63 - | 9.13 - |
| A2P3-C-11-15-R | 0.91 - | 0.93 - | 0.89 - | 0.93 - | 5.85 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 0.91 @ | 0.93 @ | 0.89 @ | 0.93 @ | 9.13 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 ass
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognorm
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).

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## Appendix B: Certification Statistics for A2P3-C-12

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-12-01-R | 1.08 - | 0.74 - | 0.73 - | 0.74 - | 5.00 J |
| A2P3-C-12-03-R | 0.91 - | 0.86 - | 0.86 - | 0.86 - | 3.16 J |
| A2P3-C-12-04-R | 0.85 - | 0.74 - | 0.71 - | 0.74 - | 4.21 - |
| A2P3-C-12-06-R | 1.03 - | 0.98 - | 0.96 - | 0.98 - | 5.12 J |
| A2P3-C-12-07-R | 0.91 - | 0.72 - | 0.71 - | 0.72 - | 6.58 - |
| A2P3-C-12-08-R | 1.45 - | 1.12 - | 1.09 - | 1.12 - | 2.77 UJ |
| A2P3-C-12-09-R | 1.48 - | 1.11 - | 1.08 - | 1.11 - | 7.29 - |
| A2P3-C-12-10-R | 1.33 - | 1.32 - | 1.31 - | 1.32 - | 8.85 - |
| A2P3-C-12-10-R-D | 1.42 - | 1.34 - | 1.33 - | 1.34 - | 5.75 - |
| A2P3-C-12-11-R | 0.85 - | 0.67 - | 0.67 - | 0.67 - | 4.32 J |
| A2P3-C-12-14-R | 1.04 - | 0.93 - | 0.91 - | 0.93 - | 6.75 - |
| A2P3-C-12-15-R | 0.97 - | 0.97 - | 0.93 - | 0.97 - | 5.99 - |
| A2P3-C-12-16-R | 1.23 - | 1.20 - | 1.16 - | 1.20 - | 5.08 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.48 @ | 1.34 @ | 1.33 @ | 1.34 @ | 8.85 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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: Certification Statistics for A2P3-C-13

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-13-01-R | 1.00 - | 1.00 - | 1.01 - | 1.00 - | 3.64 U |
| A2P3-C-13-03-R | 0.79 - | 0.63 - | 0.60 - | 0.63 - | 3.35 U |
| A2P3-C-13-04-R | 1.01 - | 0.76 - | 0.75 - | 0.76 - | 4.55 - |
| A2P3-C-13-06-R | 0.77 - | 0.61 - | 0.60 - | 0.61 - | 4.50 J |
| A2P3-C-13-07-R | 0.93 - | 0.70 - | 0.70 - | 0.70 - | 3.27 U |
| A2P3-C-13-08-R | 0.75 - | 0.59 - | 0.57 - | 0.59 - | 6.60 - |
| A2P3-C-13-09-R | 0.74 - | 0.61 - | 0.62 - | 0.61 - | 3.21 U |
| A2P3-C-13-09-R-D | 0.81 - | 0.63 - | 0.63 - | 0.63 - | 5.40 J |
| A2P3-C-13-10-R | 0.95 - | 0.79 - | 0.78 - | 0.79 - | 3.55 U |
| A2P3-C-13-11-R | 0.63 - | 0.54 - | 0.51 - | 0.54 - | 2.99 U |
| A2P3-C-13-13-R | 0.67 - | 0.47 - | 0.47 - | 0.47 - | 2.48 U |
| A2P3-C-13-15-R | 0.86 - | 0.75 - | 0.72 - | 0.75 - | 5.87 - |
| A2P3-C-13-16-R | 0.71 - | 0.61 - | 0.60 - | 0.61 - | 3.33 U |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.01 @ | 1.00 @ | 1.01 @ | 1.00 @ | 6.60 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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).

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## Appendix B: Certification Statistics for A2P3-C-14

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-14-02-R | 0.92 - | 0.79 - | 0.76 - | 0.79 - | 3.02 U |
| A2P3-C-14-03-R | 0.72 - | 0.45 - | 0.44 - | 0.45 - | 2.34 U |
| A2P3-C-14-04-R | 0.89 - | 0.98 - | 0.96 - | 0.98 - | 6.20 - |
| A2P3-C-14-05-R | 0.85 - | 0.93 - | 0.92 - | 0.93 - | 3.10 U |
| A2P3-C-14-06-R | 0.90 - | 0.96 - | 0.97 - | 0.96 - | 5.88 - |
| A2P3-C-14-08-R | 1.08 - | 0.99 - | 0.98 - | 0.99 - | 6.44 - |
| A2P3-C-14-09-R | 0.78 - | 0.75 - | 0.75 - | 0.75 - | 3.13 J |
| A2P3-C-14-10-R | 1.17 - | 1.11 - | 1.08 - | 1.11 - | 7.25 - |
| A2P3-C-14-12-R | 0.86 J | 0.98 - | 0.98 - | 0.98 - | 3.10 U |
| A2P3-C-14-12-R-D | 1.19 J | 1.00 - | 0.96 - | 1.00 - | 4.03 J |
| A2P3-C-14-14-R | 0.95 - | 0.87 - | 0.83 - | 0.87 - | 4.68 - |
| A2P3-C-14-15-R | 0.89 - | 1.03 - | 1.03 - | 1.03 - | 5.19 - |
| A2P3-C-14-16-R | 1.00 - | 1.04 - | 1.03 - | 1.04 - | 6.67 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.19 @ | 1.11 @ | 1.08 @ | 1.11 @ | 7.25 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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: Certification Statistics for A2P3-C-15

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-C-15-01-R | 0.90 - | 0.96 - | 0.94 - | 0.96 - | 3.60 J |
| A2P3-C-15-02-R | 1.03 - | 1.06 - | 1.04 - | 1.06 - | 8.93 - |
| A2P3-C-15-03-R | 0.58 - | 0.30 - | 0.31 - | 0.30 - | 2.30 U |
| A2P3-C-15-05-R | 1.07 - | 1.06 - | 1.04 - | 1.06 - | 6.92 - |
| A2P3-C-15-06-R | 0.95 - | 0.87 - | 0.86 - | 0.87 - | 8.72 - |
| A2P3-C-15-08-R | 1.01 - | 0.93 - | 0.93 - | 0.93 - | 11.07 - |
| A2P3-C-15-09-R | 0.96 - | 0.95 - | 0.95 - | 0.95 - | 6.21 - |
| A2P3-C-15-11-R | 1.26 - | 1.10 - | 1.07 - | 1.10 - | 8.38 - |
| A2P3-C-15-12-R | 1.07 - | 1.07 - | 1.06 - | 1.07 - | 5.98 - |
| A2P3-C-15-13-R | 1.16 - | 1.15 - | 1.11 - | 1.15 - | 5.21 J |
| A2P3-C-15-14-R | 1.08 J | 1.01 - | 0.99 - | 1.01 - | 8.01 - |
| A2P3-C-15-14-R-D | 1.24 J | 1.01 - | 0.98 - | 1.01 - | 9.40 - |
| A2P3-C-15-16-R | 1.04 - | 0.93 - | 0.96 - | 0.93 - | 6.77 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.26 @ | 1.15 @ | 1.11 @ | 1.15 @ | 11.07 @ |
| 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 | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 ass
The test is performed on the raw data (untransformed) data (Normal) and the log-transformed data (LogNormal) to test for lognorm
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).

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## Appendix B: Certification Statistics for A2P3-1S

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-1S-02-R | 0.99 - | 1.09 - | 1.04 - | 1.09 - | 3.44 U |
| A2P3-1S-03-R | 0.91 - | 0.76 - | 0.73 - | 0.76 - | 3.25 U |
| A2P3-1S-04-R | 1.12 - | 0.87 - | 0.81 - | 0.87 - | 8.01 - |
| A2P3-1S-06-R | 1.06 - | 0.96 - | 0.94 - | 0.96 - | 5.97 - |
| A2P3-1S-08-R | 0.74 - | 0.82 - | 0.81 - | 0.82 - | 3.36 U |
| A2P3-1S-09-R | 0.91 - | 0.71 - | 0.71 - | 0.71 - | 5.55 J |
| A2P3-1S-09-R-D | 0.81 - | 0.80 - | 0.79 - | 0.80 - | 3.23 U |
| A2P3-1S-10-R | 1.02 - | 0.89 - | 0.83 - | 0.89 - | 3.38 U |
| A2P3-1S-12-R | 1.05 - | 0.87 - | 0.83 - | 0.87 - | 3.55 U |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.12 @ | 1.09 @ | 1.04 @ | 1.09 @ | 8.01 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 8 | 8 | 8 | 8 | 8 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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).

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## Appendix B: Certification Statistics for A2P3-2S

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-2S-01-R | 1.06 - | 0.98 - | 0.96 - | 0.98 - | 9.19 - |
| A2P3-2S-02-R | 0.92 - | 1.03 - | 1.02 - | 1.03 - | 14.22 - |
| A2P3-2S-04-R | 0.79 - | 0.84 - | 0.82 - | 0.84 - | 5.90 - |
| A2P3-2S-06-R | 0.99 - | 1.07 - | 1.05 - | 1.07 - | 6.48 - |
| A2P3-2S-07-R | 1.00 - | 0.91 - | 0.85 - | 0.91 - | 12.22 - |
| A2P3-2S-09-R | 0.94 - | 0.93 - | 0.92 - | 0.93 - | 6.24 - |
| A2P3-2S-10-R | 0.92 - | 0.88 - | 0.85 - | 0.88 - | 10.45 - |
| A2P3-2S-13-R | 0.99 - | 1.06 J | 1.05 - | 1.06 J | 6.29 - |
| A2P3-2S-13-R-D | 0.98 - | 0.91 J | 0.91 - | 0.91 J | 8.70 - |
| A2P3-2S-14-R | 1.02 - | 1.01 - | 1.02 - | 1.01 - | 11.13 - |
| A2P3-2S-16-R | 1.01 - | 0.92 - | 0.89 - | 0.92 - | 6.09 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.06 @ | 1.07 @ | 1.05 @ | 1.07 @ | 14.22 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 10 | 10 | 10 | 10 | 10 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-3S

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-3S-02-R | 0.98 - | 1.02 - | 1.03 - | 1.02 - | 6.96 - |
| A2P3-3S-04-R | 1.12 - | 1.02 - | 0.99 - | 1.02 - | 6.09 - |
| A2P3-3S-05-R | 1.08 - | 0.91 - | 0.88 - | 0.91 - | 7.09 - |
| A2P3-3S-07-R | 1.01 - | 0.79 - | 0.79 - | 0.79 - | 3.65 J |
| A2P3-3S-08-R | 0.94 - | 0.95 - | 0.92 - | 0.95 - | 6.64 - |
| A2P3-3S-09-R | 0.97 - | 0.98 - | 0.97 - | 0.98 - | 11.76 - |
| A2P3-3S-11-R | 0.83 - | 0.82 - | 0.78 - | 0.82 - | 2.63 U |
| A2P3-3S-11-R-D | 0.91 - | 0.79 - | 0.76 - | 0.79 - | 5.15 - |
| A2P3-3S-14-R | 1.06 - | 0.91 - | 0.90 - | 0.91 - | 10.02 - |
| A2P3-3S-15-R | 1.05 - | 1.04 - | 1.02 - | 1.04 - | 5.59 - |
| A2P3-3S-16-R | 1.02 - | 0.96 - | 0.97 - | 0.96 - | 8.10 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.12 @ | 1.04 @ | 1.03 @ | 1.04 @ | 11.76 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 10 | 10 | 10 | 10 | 10 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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).

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## Appendix B: Certification Statistics for A2P3-4S

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-4S-01-R | 0.91 - | 0.80 - | 0.79 - | 0.80 - | 4.34 J |
| A2P3-4S-02-R | 1.11 - | 1.01 - | 1.01 - | 1.01 - | 7.14 - |
| A2P3-4S-04-R | 0.91 - | 0.94 - | 0.90 - | 0.94 - | 10.73 - |
| A2P3-4S-05-R | 0.83 - | 0.77 - | 0.74 - | 0.77 - | 7.68 - |
| A2P3-4S-06-R | 0.84 - | 0.83 - | 0.80 - | 0.83 - | 3.79 J |
| A2P3-4S-07-R | 1.01 - | 1.11 - | 1.11 - | 1.11 - | 13.68 - |
| A2P3-4S-08-R | 0.95 - | 0.87 - | 0.86 - | 0.87 - | 12.31 - |
| A2P3-4S-08-R-D | 0.83 - | 0.90 - | 0.87 - | 0.90 - | 8.84 - |
| A2P3-4S-09-R | 0.84 - | 0.85 - | 0.81 - | 0.85 - | 17.89 - |
| A2P3-4S-11-R | 0.88 - | 0.92 - | 0.87 - | 0.92 - | 9.45 - |
| A2P3-4S-12-R | 0.86 - | 0.80 - | 0.78 - | 0.80 - | 7.29 - |
| A2P3-4S-13-R | 0.82 J | 0.79 - | 0.77 - | 0.79 - | 5.88 - |
| A2P3-4S-15-R | 1.00 - | 0.95 - | 0.91 - | 0.95 - | 6.69 - |
| A2P3-4S-16-R | 0.97 - | 0.98 - | 0.94 - | 0.98 - | 14.88 - |
| A2P3-4S-18-R | 0.97 - | 1.07 - | 1.06 - | 1.07 - | 7.82 J |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.11 @ | 1.11 @ | 1.11 @ | 1.11 @ | 17.89 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 14 | 14 | 14 | 14 | 14 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption.

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## Appendix B: Certification Statistics for A2P3-1SF

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-1SF-02-R | 1.05 - | 1.26 - | 1.25 - | 1.26 - | 4.41 J |
| A2P3-1SF-03-R | 0.89 - | 0.91 - | 0.90 - | 0.91 - | 8.90 - |
| A2P3-1SF-04-R | 0.89 - | 0.93 - | 0.87 - | 0.93 - | 13.01 - |
| A2P3-1SF-06-R | 1.07 - | 1.23 - | 1.21 - | 1.23 - | 5.63 - |
| A2P3-1SF-08-R | 1.26 - | 1.16 - | 1.10 - | 1.16 - | 3.68 U |
| A2P3-1SF-09-R | 0.98 J | 0.95 - | 0.93 - | 0.95 - | 6.59 - |
| A2P3-1SF-09-R-D | 0.81 J | 0.94 - | 0.94 - | 0.94 - | 5.97 - |
| A2P3-1SF-10-R | 0.84 - | 0.85 - | 0.84 - | 0.85 - | 6.93 - |
| A2P3-1SF-12-R | 0.93 - | 1.11 - | 1.09 - | 1.11 - | 6.62 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.26 @ | 1.26 @ | 1.25 @ | 1.26 @ | 13.01 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 8 | 8 | 8 | 8 | 8 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-2SF

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-2SF-01-R | 1.10 - | 0.95 - | 0.94 - | 0.95 - | 9.35 - |
| A2P3-2SF-02-R | 1.15 - | 1.07 - | 1.05 - | 1.07 - | 14.29 - |
| A2P3-2SF-04-R | 1.03 - | 0.99 - | 0.93 - | 0.99 - | 6.96 - |
| A2P3-2SF-06-R | 1.04 - | 1.02 - | 1.02 - | 1.02 - | 9.15 - |
| A2P3-2SF-07-R | 1.02 - | 0.98 - | 0.98 - | 0.98 - | 7.90 - |
| A2P3-2SF-09-R | 1.07 - | 1.32 - | 1.31 - | 1.32 - | 3.60 U |
| A2P3-2SF-09-R-D | 1.19 - | 1.18 - | 1.15 - | 1.18 - | 5.29 J |
| A2P3-2SF-10-R | 1.18 - | 1.22 - | 1.23 - | 1.22 - | 5.32 - |
| A2P3-2SF-13-R | 1.01 - | 1.03 - | 1.02 - | 1.03 - | 9.44 - |
| A2P3-2SF-14-R | 1.01 - | 1.03 - | 1.01 - | 1.03 - | 4.49 J |
| A2P3-2SF-16-R | 1.10 - | 1.01 - | 0.99 - | 1.01 - | 7.19 - |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.19 @ | 1.32 @ | 1.31 @ | 1.32 @ | 14.29 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 10 | 10 | 10 | 10 | 10 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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: Certification Statistics for A2P3-3SF

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-3SF-02-R | 1.20 J | 1.08 - | 1.07 - | 1.08 - | 6.71 - |
| A2P3-3SF-04-R | 0.95 - | 0.95 - | 0.93 - | 0.95 - | 7.37 - |
| A2P3-3SF-05-R | 1.16 - | 0.91 - | 0.91 - | 0.91 - | 8.32 - |
| A2P3-3SF-05-R-D | 1.05 - | 0.96 - | 0.94 - | 0.96 - | 4.38 J |
| A2P3-3SF-07-R | 1.38 - | 1.01 - | 1.01 - | 1.01 - | 8.43 - |
| A2P3-3SF-08-R | 0.97 - | 1.00 - | 0.99 - | 1.00 - | 6.59 - |
| A2P3-3SF-09-R | 1.13 - | 1.11 - | 1.07 - | 1.11 - | 6.98 - |
| A2P3-3SF-11-R | 0.91 - | 0.94 - | 0.95 - | 0.94 - | 5.43 - |
| A2P3-3SF-14-R | 1.10 - | 0.93 - | 0.89 - | 0.93 - | 6.83 J |
| A2P3-3SF-15-R | 1.17 - | 1.03 - | 0.97 - | 1.03 - | 6.66 - |
| A2P3-3SF-16-R | 1.31 - | 1.20 - | 1.18 - | 1.20 - | 14.31 J |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.38 @ | 1.20 @ | 1.18 @ | 1.20 @ | 14.31 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 10 | 10 | 10 | 10 | 10 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.
(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 assumption. 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: Certification Statistics for A2P3-4SF

| Station Number | RADIONUCLIDES | | | | |
|---|---|---|---|---|---|
| | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total |
| A2P3-4SF-01-R | 0.96 - | 0.94 - | 0.90 - | 0.94 - | 12.46 - |
| A2P3-4SF-02-R | 0.86 - | 0.88 - | 0.82 - | 0.88 - | 9.21 J |
| A2P3-4SF-04-R | 1.35 - | 1.16 - | 1.12 - | 1.16 - | 6.88 - |
| A2P3-4SF-05-R | 1.16 - | 0.95 - | 0.94 - | 0.95 - | 8.27 - |
| A2P3-4SF-06-R | 0.89 - | 0.93 - | 0.93 - | 0.93 - | 11.69 - |
| A2P3-4SF-07-R | 0.91 - | 0.93 - | 0.92 - | 0.93 - | 12.38 - |
| A2P3-4SF-08-R | 1.06 - | 1.03 - | 1.01 - | 1.03 - | 6.83 J |
| A2P3-4SF-08-R-D | 1.09 - | 1.10 - | 1.09 - | 1.10 - | 13.24 J |
| A2P3-4SF-09-R | 1.14 - | 1.10 - | 1.07 - | 1.10 - | 13.43 - |
| A2P3-4SF-11-R | 0.98 - | 0.95 - | 0.94 - | 0.95 - | 10.92 - |
| A2P3-4SF-12-R | 0.87 - | 0.83 - | 0.81 - | 0.83 - | 8.84 - |
| A2P3-4SF-13-R | 0.83 - | 0.73 - | 0.70 - | 0.73 - | 7.19 - |
| A2P3-4SF-15-R | 1.12 - | 0.90 - | 0.87 - | 0.90 - | 6.55 - |
| A2P3-4SF-16-R | 0.89 - | 0.81 - | 0.79 - | 0.81 - | 16.44 - |
| A2P3-4SF-18-R | 1.01 - | 1.14 - | 1.11 - | 1.14 - | 3.32 U |
| FRL | 1.70 | 1.80 | 1.70 | 1.50 | 82.00 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | ug/g |
| Confidence Level | 95% | 95% | 95% | 95% | 95% |
| Max Result | 1.35 @ | 1.16 @ | 1.12 @ | 1.16 @ | 16.44 @ |
| Standardized Skewness | -- | -- | -- | -- | -- |
| W-Statistic Probability* | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- |
| Sample Size | 14 | 14 | 14 | 14 | 14 |
| Estimated Mean | -- | -- | -- | -- | -- |
| UCL on the Mean** | -- | -- | -- | -- | -- |
| Non-Parametric Prob. | -- | -- | -- | -- | -- |
| Est. Mean - Pass / Fail | Pass | Pass | Pass | Pass | Pass |
| 2x Rule Pass / Fail | -- | -- | -- | -- | -- |
| *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.

(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 assumption. 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).

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# APPENDIX C

# CERTIFICATION SAMPLE RESULTS

## LIST OF TABLES

Table C-1 A2PIII Part One Open Field Certification Results
Table C-2 A2PIII Part One Stockpile Footprint Certification Results
Table C-3 A2PIII Part One Stockpile Certification Results

## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-02-01-R | 477809 | 1349296 | 1.21 | - | 1.13 | - | 1.13 | J | 1.13 | - | 2.89 | J |
| A2P3-C-02-02-R | 477957 | 1349374 | 1.00 | - | 0.81 | - | 0.80 | - | 0.81 | - | 4.42 | J |
| A2P3-C-02-02-R-D | 477957 | 1349374 | 1.12 | - | 0.87 | - | 0.87 | - | 0.87 | - | 4.11 | J |
| A2P3-C-02-04-R | 477882 | 1349564 | 1.13 | - | 1.06 | - | 1.03 | - | 1.06 | - | 6.69 | - |
| A2P3-C-02-06-R | 477984 | 1349539 | 1.11 | - | 0.95 | - | 0.94 | - | 0.95 | - | 8.23 | - |
| A2P3-C-02-07-R | 478193 | 1349447 | 0.89 | - | 0.87 | - | 0.82 | - | 0.87 | - | 7.07 | - |
| A2P3-C-02-08-R | 478099 | 1349632 | 0.86 | - | 0.80 | - | 0.80 | - | 0.80 | - | 4.86 | - |
| A2P3-C-02-09-R | 477836 | 1349730 | 1.05 | - | 1.09 | - | 1.07 | - | 1.09 | - | 10.67 | - |
| A2P3-C-02-10-R | 477886 | 1349789 | 1.07 | - | 0.85 | - | 0.84 | - | 0.85 | - | 6.74 | - |
| A2P3-C-02-11-R | 478009 | 1349735 | 0.89 | - | 0.77 | - | 0.76 | - | 0.77 | - | 4.67 | J |
| A2P3-C-02-13-R | 477909 | 1349924 | 1.05 | - | 0.99 | - | 1.01 | - | 0.99 | - | 15.07 | - |
| A2P3-C-02-14-R | 477896 | 1350020 | 1.00 | - | 0.99 | - | 1.01 | - | 0.99 | - | 15.73 | - |
| A2P3-C-02-15-R | 478078 | 1349917 | 0.89 | - | 0.92 | - | 0.92 | - | 0.92 | - | 17.00 | - |
| A2P3-C-03-02-R | 477324 | 1348994 | 0.86 | - | 0.69 | - | 0.67 | - | 0.69 | - | 6.63 | - |
| A2P3-C-03-03-R | 477519 | 1348826 | 0.84 | - | 0.86 | - | 0.84 | - | 0.86 | - | 17.11 | - |
| A2P3-C-03-04-R | 477495 | 1348977 | 0.94 | - | 0.89 | - | 0.85 | - | 0.89 | - | 14.80 | - |
| A2P3-C-03-05-R | 477283 | 1349124 | 1.20 | - | 0.93 | - | 0.90 | - | 0.93 | - | 14.37 | - |
| A2P3-C-03-07-R | 477451 | 1349138 | 0.83 | - | 0.82 | - | 0.80 | - | 0.82 | - | 7.54 | - |
| A2P3-C-03-08-R | 477549 | 1349106 | 0.84 | - | 0.82 | - | 0.79 | - | 0.82 | - | 16.98 | - |
| A2P3-C-03-09-R | 477282 | 1349247 | 1.07 | J | 0.84 | J | 0.83 | J | 0.84 | J | 3.82 | J |
| A2P3-C-03-09-R-D | 477282 | 1349247 | 0.70 | J | 0.69 | J | 0.69 | J | 0.69 | J | 3.02 | UJ |
| A2P3-C-03-11-R | 477424 | 1349276 | 1.03 | - | 0.81 | - | 0.81 | - | 0.81 | - | 3.66 | J |
| A2P3-C-03-12-R | 477462 | 1349388 | 1.08 | - | 0.86 | - | 0.84 | - | 0.86 | - | 3.19 | U |
| A2P3-C-03-14-R | 477606 | 1349411 | 0.85 | - | 0.65 | - | 0.65 | - | 0.65 | - | 3.51 | J |
| A2P3-C-03-15-R | 477680 | 1349316 | 0.76 | - | 0.71 | - | 0.71 | - | 0.71 | - | 4.06 | J |
| A2P3-C-03-16-R | 477693 | 1349397 | 0.88 | - | 1.01 | - | 0.97 | - | 1.01 | - | 12.72 | - |
| A2P3-C-04-02-R | 477314 | 1349603 | 1.03 | - | 0.85 | - | 0.84 | - | 0.85 | - | 6.48 | - |
| A2P3-C-04-02-R-D | 477314 | 1349603 | 1.03 | - | 0.87 | - | 0.89 | - | 0.87 | - | 6.88 | - |
| A2P3-C-04-03-R | 477412 | 1349440 | 1.08 | - | 0.93 | - | 0.92 | - | 0.93 | - | 3.56 | J |
| A2P3-C-04-04-R | 477348 | 1349543 | 1.04 | - | 0.92 | - | 0.91 | - | 0.92 | - | 3.91 | J |
| A2P3-C-04-05-R | 477255 | 1349653 | 0.91 | - | 0.83 | - | 0.82 | - | 0.83 | - | 9.79 | - |
| A2P3-C-04-06-R | 477274 | 1349816 | 1.09 | - | 1.04 | - | 1.02 | - | 1.04 | - | 8.09 | - |
| A2P3-C-04-08-R | 477384 | 1349798 | 1.06 | - | 1.00 | - | 0.97 | - | 1.00 | - | 11.30 | - |
| A2P3-C-04-09-R | 477595 | 1349460 | 1.01 | - | 0.77 | - | 0.77 | - | 0.77 | - | 3.21 | J |
| A2P3-C-04-10-R | 477632 | 1349532 | 1.02 | - | 0.99 | - | 0.97 | - | 0.99 | - | 3.58 | J |
| A2P3-C-04-12-R | 477748 | 1349595 | 1.07 | - | 1.01 | - | 0.98 | - | 1.01 | - | 7.03 | - |



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## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-04-13-R | 477506 | 1349815 | 1.16 | - | 1.03 | - | 1.00 | - | 1.03 | - | 10.36 | - |
| A2P3-C-04-14-R | 477595 | 1349713 | 1.13 | - | 1.02 | - | 0.97 | - | 1.02 | - | 11.35 | - |
| A2P3-C-04-16-R | 477807 | 1349690 | 1.20 | - | 1.07 | - | 1.05 | - | 1.07 | - | 10.75 | - |
| A2P3-C-05-02-R | 477354 | 1350010 | 0.94 | J | 1.07 | - | 1.08 | - | 1.07 | - | 9.76 | - |
| A2P3-C-05-02-R-D | 477354 | 1350010 | 1.10 | J | 1.03 | - | 1.01 | - | 1.03 | - | 11.76 | - |
| A2P3-C-05-03-R | 477392 | 1349888 | 1.07 | - | 0.91 | - | 0.87 | - | 0.91 | - | 11.28 | - |
| A2P3-C-05-04-R | 477469 | 1349968 | 1.08 | - | 1.05 | - | 1.03 | - | 1.05 | - | 10.44 | - |
| A2P3-C-05-06-R | 477321 | 1350196 | 1.05 | - | 1.00 | - | 0.96 | - | 1.00 | - | 12.04 | - |
| A2P3-C-05-07-R | 477393 | 1350076 | 0.92 | - | 0.95 | - | 0.97 | - | 0.95 | - | 8.40 | - |
| A2P3-C-05-08-R | 477406 | 1350203 | 1.00 | - | 1.11 | - | 1.11 | - | 1.11 | - | 9.46 | - |
| A2P3-C-05-09-R | 477580 | 1349829 | 1.03 | - | 1.14 | - | 1.18 | - | 1.14 | - | 4.70 | J |
| A2P3-C-05-11-R | 477722 | 1349826 | 1.13 | - | 1.17 | - | 1.15 | - | 1.17 | - | 6.26 | J |
| A2P3-C-05-12-R | 477790 | 1349936 | 1.18 | - | 1.10 | - | 1.07 | - | 1.10 | - | 11.18 | - |
| A2P3-C-05-13-R | 477538 | 1350088 | 1.07 | - | 0.94 | - | 0.90 | - | 0.94 | - | 9.46 | - |
| A2P3-C-05-14-R | 477663 | 1350157 | 1.20 | - | 1.20 | - | 1.17 | - | 1.20 | - | 10.48 | - |
| A2P3-C-05-15-R | 477726 | 1350036 | 0.94 | - | 0.98 | - | 0.99 | - | 0.98 | - | 7.15 | - |
| A2P3-C-06-01-R | 476820 | 1348877 | 1.12 | - | 1.04 | - | 1.02 | - | 1.04 | - | 4.46 | J |
| A2P3-C-06-02-R | 476884 | 1348906 | 0.88 | - | 0.88 | - | 0.86 | - | 0.88 | - | 6.69 | - |
| A2P3-C-06-04-R | 476953 | 1348888 | 0.74 | - | 0.57 | - | 0.56 | - | 0.57 | - | 8.47 | - |
| A2P3-C-06-06-R | 476813 | 1349094 | 0.93 | - | 0.90 | - | 0.89 | - | 0.90 | - | 9.15 | - |
| A2P3-C-06-07-R | 476884 | 1349023 | 0.93 | - | 0.88 | - | 0.85 | - | 0.88 | - | 11.37 | - |
| A2P3-C-06-08-R | 476981 | 1348986 | 0.80 | - | 0.72 | - | 0.68 | - | 0.72 | - | 3.34 | U |
| A2P3-C-06-09-R | 477100 | 1348860 | 0.62 | - | 0.83 | - | 0.76 | - | 0.83 | - | 12.92 | - |
| A2P3-C-06-09-R-D | 477100 | 1348860 | 0.92 | - | 0.81 | - | 0.76 | - | 0.81 | - | 15.21 | - |
| A2P3-C-06-10-R | 477130 | 1348948 | 0.82 | - | 0.91 | - | 0.84 | - | 0.91 | - | 6.30 | - |
| A2P3-C-06-12-R | 477201 | 1349008 | 1.02 | - | 0.96 | - | 0.91 | - | 0.96 | - | 3.91 | U |
| A2P3-C-06-14-R | 477032 | 1349201 | 0.79 | - | 0.48 | - | 0.46 | - | 0.48 | - | 2.34 | J |
| A2P3-C-06-15-R | 477181 | 1349179 | 0.84 | - | 0.68 | - | 0.65 | - | 0.68 | - | 3.34 | J |
| A2P3-C-06-16-R | 477194 | 1349303 | 1.01 | - | 0.98 | - | 0.89 | - | 0.98 | - | 5.32 | - |
| A2P3-C-07-01-R | 476643 | 1349157 | 0.77 | - | 1.00 | - | 0.98 | - | 1.00 | - | 9.38 | - |
| A2P3-C-07-03-R | 476887 | 1349160 | 0.65 | - | 0.72 | - | 0.70 | - | 0.72 | - | 3.95 | J |
| A2P3-C-07-04-R | 476879 | 1349319 | 0.84 | - | 0.96 | - | 0.95 | - | 0.96 | - | 5.44 | J |
| A2P3-C-07-05-R | 476720 | 1349464 | 0.67 | - | 0.55 | - | 0.55 | - | 0.55 | - | 2.77 | J |
| A2P3-C-07-06-R | 476817 | 1349564 | 1.07 | - | 0.96 | - | 0.94 | - | 0.96 | - | 5.34 | - |
| A2P3-C-07-08-R | 476798 | 1349710 | 0.86 | - | 0.85 | - | 0.85 | - | 0.85 | - | 6.25 | - |
| A2P3-C-07-10-R | 476941 | 1349397 | 0.79 | - | 0.60 | - | 0.60 | - | 0.60 | - | 3.18 | U |



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## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-07-11-R | 477039 | 1349324 | 0.88 | - | 0.80 | - | 0.80 | - | 0.80 | - | 3.44 | U |
| A2P3-C-07-12-R | 477106 | 1349362 | 0.94 | - | 0.77 | J | 0.76 | J | 0.77 | J | 3.97 | J |
| A2P3-C-07-12-R-D | 477106 | 1349362 | 0.96 | - | 0.99 | J | 1.00 | J | 0.99 | J | 4.50 | - |
| A2P3-C-07-13-R | 476999 | 1349526 | 1.01 | - | 1.06 | - | 1.07 | - | 1.06 | - | 6.35 | - |
| A2P3-C-07-14-R | 476942 | 1349648 | 0.92 | - | 0.89 | - | 0.84 | - | 0.89 | - | 8.98 | - |
| A2P3-C-07-15-R | 477066 | 1349445 | 0.90 | - | 0.89 | - | 0.89 | - | 0.89 | - | 5.84 | J |
| A2P3-C-08-02-R | 476888 | 1349933 | 0.91 | - | 0.99 | - | 0.98 | - | 0.99 | - | 8.88 | - |
| A2P3-C-08-03-R | 476991 | 1349750 | 0.84 | - | 1.08 | - | 1.06 | - | 1.08 | - | 9.06 | - |
| A2P3-C-08-04-R | 476997 | 1349921 | 1.05 | - | 1.02 | - | 1.00 | - | 1.02 | - | 5.96 | - |
| A2P3-C-08-05-R | 476961 | 1350035 | 0.99 | - | 1.02 | - | 1.03 | - | 1.02 | - | 8.91 | - |
| A2P3-C-08-07-R | 476930 | 1350210 | 0.99 | - | 1.14 | - | 1.12 | - | 1.14 | - | 7.16 | - |
| A2P3-C-08-08-R | 476991 | 1350383 | 0.91 | - | 0.92 | - | 0.90 | - | 0.92 | - | 10.27 | - |
| A2P3-C-08-09-R | 477143 | 1349664 | 1.14 | - | 1.06 | J | 1.09 | J | 1.06 | J | 7.63 | - |
| A2P3-C-08-09-R-D | 477143 | 1349664 | 1.05 | - | 0.93 | J | 0.89 | J | 0.93 | J | 7.82 | - |
| A2P3-C-08-10-R | 477159 | 1349798 | 1.10 | - | 0.99 | - | 0.98 | - | 0.99 | - | 7.73 | - |
| A2P3-C-08-11-R | 477061 | 1349877 | 1.06 | - | 1.05 | - | 1.00 | - | 1.05 | - | 7.73 | - |
| A2P3-C-08-13-R | 477182 | 1350034 | 1.12 | - | 1.09 | - | 1.07 | - | 1.09 | - | 7.78 | - |
| A2P3-C-08-14-R | 477143 | 1350144 | 1.14 | - | 1.02 | - | 0.97 | - | 1.02 | - | 7.20 | - |
| A2P3-C-08-16-R | 477204 | 1350292 | 0.76 | - | 0.74 | - | 0.70 | - | 0.74 | - | 8.57 | - |
| A2P3-C-09-01-R | 476510 | 1348546 | 1.11 | - | 1.15 | - | 1.13 | - | 1.15 | - | 14.93 | J |
| A2P3-C-09-02-R | 476585 | 1348496 | 0.85 | - | 0.87 | - | 0.78 | - | 0.87 | - | 7.31 | - |
| A2P3-C-09-04-R | 476702 | 1348509 | 0.72 | - | 0.58 | - | 0.59 | - | 0.58 | - | 3.21 | U |
| A2P3-C-09-05-R | 476703 | 1348300 | 1.12 | - | 1.01 | - | 0.99 | - | 1.01 | - | 8.85 | - |
| A2P3-C-09-06-R | 476695 | 1348348 | 0.92 | - | 0.64 | - | 0.64 | - | 0.64 | - | 3.74 | J |
| A2P3-C-09-08-R | 476704 | 1348415 | 1.13 | - | 0.89 | - | 0.86 | - | 0.89 | - | 10.62 | - |
| A2P3-C-09-10-R | 476753 | 1348338 | 0.90 | - | 0.94 | - | 0.93 | - | 0.94 | - | 8.57 | - |
| A2P3-C-09-11-R | 476808 | 1348321 | 1.10 | - | 1.06 | - | 1.03 | - | 1.06 | - | 7.48 | - |
| A2P3-C-09-12-R | 476891 | 1348368 | 0.84 | - | 0.55 | - | 0.54 | - | 0.55 | - | 3.84 | J |
| A2P3-C-09-12-R-D | 476891 | 1348368 | 0.92 | - | 0.57 | - | 0.57 | - | 0.57 | - | 3.82 | J |
| A2P3-C-09-13-R | 476736 | 1348401 | 1.27 | - | 1.03 | - | 0.99 | - | 1.03 | - | 9.79 | - |
| A2P3-C-09-15-R | 476818 | 1348426 | 0.85 | - | 0.60 | - | 0.59 | - | 0.60 | - | 3.03 | U |
| A2P3-C-09-16-R | 476846 | 1348405 | 0.87 | - | 0.72 | - | 0.70 | - | 0.72 | - | 2.49 | J |
| A2P3-C-10-01-R | 476580 | 1348610 | 0.75 | - | 0.66 | - | 0.63 | - | 0.66 | - | 3.06 | U |
| A2P3-C-10-03-R | 476759 | 1348515 | 0.91 | - | 0.99 | - | 1.00 | - | 0.99 | - | 5.74 | J |
| A2P3-C-10-04-R | 476697 | 1348585 | 0.90 | - | 1.05 | - | 1.05 | - | 1.05 | - | 6.06 | - |
| A2P3-C-10-05-R | 476654 | 1348656 | 0.84 | - | 1.01 | - | 0.98 | - | 1.01 | - | 7.69 | - |

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## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-10-07-R | 476574 | 1348802 | 0.85 | - | 0.85 | - | 0.84 | - | 0.85 | - | 5.19 | J |
| A2P3-C-10-08-R | 476638 | 1348934 | 0.64 | - | 0.45 | - | 0.43 | - | 0.45 | - | 3.70 | J |
| A2P3-C-10-09-R | 476836 | 1348481 | 1.04 | - | 1.05 | - | 1.08 | - | 1.05 | - | 7.03 | - |
| A2P3-C-10-10-R | 476856 | 1348630 | 1.09 | - | 1.00 | - | 0.99 | - | 1.00 | - | 6.53 | - |
| A2P3-C-10-11-R | 476932 | 1348514 | 0.53 | - | 0.34 | - | 0.34 | - | 0.34 | - | 3.82 | J |
| A2P3-C-10-13-R | 476705 | 1348724 | 0.93 | - | 0.91 | - | 0.89 | - | 0.91 | - | 6.71 | - |
| A2P3-C-10-14-R | 476710 | 1348818 | 0.96 | - | 0.86 | - | 0.86 | - | 0.86 | - | 11.99 | - |
| A2P3-C-10-15-R | 476811 | 1348690 | 0.97 | J | 0.90 | - | 0.88 | - | 0.90 | - | 10.08 | J |
| A2P3-C-10-15-R-D | 476811 | 1348690 | 0.81 | J | 0.86 | - | 0.86 | - | 0.86 | - | 4.13 | U |
| A2P3-C-11-02-R | 476154 | 1348014 | 0.45 | - | 0.32 | - | 0.30 | - | 0.32 | - | 2.83 | U |
| A2P3-C-11-03-R | 476237 | 1347899 | 0.85 | - | 0.76 | - | 0.75 | - | 0.76 | - | 6.21 | - |
| A2P3-C-11-04-R | 476233 | 1348002 | 0.75 | - | 0.79 | - | 0.78 | - | 0.79 | - | 3.28 | J |
| A2P3-C-11-05-R | 476140 | 1348128 | 0.80 | - | 0.82 | - | 0.84 | - | 0.82 | - | 6.29 | J |
| A2P3-C-11-07-R | 476273 | 1348164 | 0.75 | - | 0.73 | - | 0.71 | - | 0.73 | - | 3.30 | U |
| A2P3-C-11-08-R | 476156 | 1348249 | 0.65 | - | 0.56 | - | 0.56 | - | 0.56 | - | 4.05 | J |
| A2P3-C-11-09-R | 476348 | 1348052 | 0.75 | - | 0.70 | - | 0.70 | - | 0.70 | - | 5.20 | - |
| A2P3-C-11-09-R-D | 476348 | 1348052 | 0.71 | - | 0.61 | - | 0.61 | - | 0.61 | - | 6.72 | - |
| A2P3-C-11-10-R | 476390 | 1348121 | 0.67 | - | 0.59 | - | 0.60 | - | 0.59 | - | 2.81 | J |
| A2P3-C-11-12-R | 476511 | 1348246 | 0.79 | - | 0.86 | - | 0.83 | - | 0.86 | - | 6.07 | - |
| A2P3-C-11-13-R | 476611 | 1348237 | 0.75 | - | 0.82 | - | 0.81 | - | 0.82 | - | 8.20 | - |
| A2P3-C-11-14-R | 476641 | 1348292 | 0.70 | - | 0.63 | - | 0.60 | - | 0.63 | - | 9.13 | - |
| A2P3-C-11-15-R | 476609 | 1348427 | 0.91 | - | 0.93 | - | 0.89 | - | 0.93 | - | 5.85 | - |
| A2P3-C-12-01-R | 476148 | 1348366 | 1.08 | - | 0.74 | - | 0.73 | - | 0.74 | - | 5.00 | J |
| A2P3-C-12-03-R | 476267 | 1348266 | 0.91 | - | 0.86 | - | 0.86 | - | 0.86 | - | 3.16 | J |
| A2P3-C-12-04-R | 476240 | 1348451 | 0.85 | - | 0.74 | - | 0.71 | - | 0.74 | - | 4.21 | - |
| A2P3-C-12-06-R | 476150 | 1348672 | 1.03 | - | 0.98 | - | 0.96 | - | 0.98 | - | 5.12 | J |
| A2P3-C-12-07-R | 476236 | 1348546 | 0.91 | - | 0.72 | - | 0.71 | - | 0.72 | - | 6.58 | - |
| A2P3-C-12-08-R | 476263 | 1348655 | 1.45 | - | 1.12 | - | 1.09 | - | 1.12 | - | 2.77 | UJ |
| A2P3-C-12-09-R | 476351 | 1348318 | 1.48 | - | 1.11 | - | 1.08 | - | 1.11 | - | 7.29 | - |
| A2P3-C-12-10-R | 476320 | 1348377 | 1.33 | - | 1.32 | - | 1.31 | - | 1.32 | - | 8.85 | - |
| A2P3-C-12-10-R-D | 476320 | 1348377 | 1.42 | - | 1.34 | - | 1.33 | - | 1.34 | - | 5.75 | - |
| A2P3-C-12-11-R | 476468 | 1348334 | 0.85 | - | 0.67 | - | 0.67 | - | 0.67 | - | 4.32 | J |
| A2P3-C-12-14-R | 476342 | 1348606 | 1.04 | - | 0.93 | - | 0.91 | - | 0.93 | - | 6.75 | - |
| A2P3-C-12-15-R | 476474 | 1348492 | 0.97 | - | 0.97 | - | 0.93 | - | 0.97 | - | 5.99 | - |
| A2P3-C-12-16-R | 476464 | 1348581 | 1.23 | - | 1.20 | - | 1.16 | - | 1.20 | - | 5.08 | - |
| A2P3-C-13-01-R | 476217 | 1348708 | 1.00 | - | 1.00 | - | 1.01 | - | 1.00 | - | 3.64 | U |



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## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-13-03-R | 476288 | 1348696 | 0.79 | - | 0.63 | - | 0.60 | - | 0.63 | - | 3.35 | U |
| A2P3-C-13-04-R | 476347 | 1348792 | 1.01 | - | 0.76 | - | 0.75 | - | 0.76 | - | 4.55 | - |
| A2P3-C-13-06-R | 476315 | 1349014 | 0.77 | - | 0.61 | - | 0.60 | - | 0.61 | - | 4.50 | J |
| A2P3-C-13-07-R | 476218 | 1349051 | 0.93 | - | 0.70 | - | 0.70 | - | 0.70 | - | 3.27 | U |
| A2P3-C-13-08-R | 476304 | 1349152 | 0.75 | - | 0.59 | - | 0.57 | - | 0.59 | - | 6.60 | - |
| A2P3-C-13-09-R | 476373 | 1348714 | 0.74 | - | 0.61 | - | 0.62 | - | 0.61 | - | 3.21 | U |
| A2P3-C-13-09-R-D | 476373 | 1348714 | 0.81 | - | 0.63 | - | 0.63 | - | 0.63 | - | 5.40 | J |
| A2P3-C-13-10-R | 476442 | 1348802 | 0.95 | - | 0.79 | - | 0.78 | - | 0.79 | - | 3.55 | U |
| A2P3-C-13-11-R | 476501 | 1348661 | 0.63 | - | 0.54 | - | 0.51 | - | 0.54 | - | 2.99 | U |
| A2P3-C-13-13-R | 476382 | 1348988 | 0.67 | - | 0.47 | - | 0.47 | - | 0.47 | - | 2.48 | U |
| A2P3-C-13-15-R | 476529 | 1348993 | 0.86 | - | 0.75 | - | 0.72 | - | 0.75 | - | 5.87 | - |
| A2P3-C-13-16-R | 476487 | 1349058 | 0.71 | - | 0.61 | - | 0.60 | - | 0.61 | - | 3.33 | U |
| A2P3-C-14-02-R | 476330 | 1349457 | 0.92 | - | 0.79 | - | 0.76 | - | 0.79 | - | 3.02 | U |
| A2P3-C-14-03-R | 476475 | 1349184 | 0.72 | - | 0.45 | - | 0.44 | - | 0.45 | - | 2.34 | U |
| A2P3-C-14-04-R | 476418 | 1349501 | 0.89 | - | 0.98 | - | 0.96 | - | 0.98 | - | 6.20 | - |
| A2P3-C-14-05-R | 476380 | 1349626 | 0.85 | - | 0.93 | - | 0.92 | - | 0.93 | - | 3.10 | U |
| A2P3-C-14-06-R | 476490 | 1349645 | 0.90 | - | 0.96 | - | 0.97 | - | 0.96 | - | 5.88 | - |
| A2P3-C-14-08-R | 476513 | 1349830 | 1.08 | - | 0.99 | - | 0.98 | - | 0.99 | - | 6.44 | - |
| A2P3-C-14-09-R | 476566 | 1349219 | 0.78 | - | 0.75 | - | 0.75 | - | 0.75 | - | 3.13 | J |
| A2P3-C-14-10-R | 476521 | 1349354 | 1.17 | - | 1.11 | - | 1.08 | - | 1.11 | - | 7.25 | - |
| A2P3-C-14-12-R | 476637 | 1349462 | 0.86 | J | 0.98 | - | 0.98 | - | 0.98 | - | 3.10 | U |
| A2P3-C-14-12-R-D | 476637 | 1349462 | 1.19 | J | 1.00 | - | 0.96 | - | 1.00 | - | 4.03 | J |
| A2P3-C-14-14-R | 476612 | 1349777 | 0.95 | - | 0.87 | - | 0.83 | - | 0.87 | - | 4.68 | - |
| A2P3-C-14-15-R | 476671 | 1349659 | 0.89 | - | 1.03 | - | 1.03 | - | 1.03 | - | 5.19 | - |
| A2P3-C-14-16-R | 476744 | 1349783 | 1.00 | - | 1.04 | - | 1.03 | - | 1.04 | - | 6.67 | - |
| A2P3-C-15-01-R | 476474 | 1349905 | 0.90 | - | 0.96 | - | 0.94 | - | 0.96 | - | 3.60 | J |
| A2P3-C-15-02-R | 476540 | 1350018 | 1.03 | - | 1.06 | - | 1.04 | - | 1.06 | - | 8.93 | - |
| A2P3-C-15-03-R | 476605 | 1349884 | 0.58 | - | 0.30 | - | 0.31 | - | 0.30 | - | 2.30 | U |
| A2P3-C-15-05-R | 476549 | 1350278 | 1.07 | - | 1.06 | - | 1.04 | - | 1.06 | - | 6.92 | - |
| A2P3-C-15-06-R | 476560 | 1350380 | 0.95 | - | 0.87 | - | 0.86 | - | 0.87 | - | 8.72 | - |
| A2P3-C-15-08-R | 476712 | 1350365 | 1.01 | - | 0.93 | - | 0.93 | - | 0.93 | - | 11.07 | - |
| A2P3-C-15-09-R | 476741 | 1349839 | 0.96 | - | 0.95 | - | 0.95 | - | 0.95 | - | 6.21 | - |
| A2P3-C-15-11-R | 476710 | 1350163 | 1.26 | - | 1.10 | - | 1.07 | - | 1.10 | - | 8.38 | - |
| A2P3-C-15-12-R | 476831 | 1350078 | 1.07 | - | 1.07 | - | 1.06 | - | 1.07 | - | 5.98 | - |
| A2P3-C-15-13-R | 476822 | 1350285 | 1.16 | - | 1.15 | - | 1.11 | - | 1.15 | - | 5.21 | J |
| A2P3-C-15-14-R | 476785 | 1350398 | 1.08 | J | 1.01 | - | 0.99 | - | 1.01 | - | 8.01 | - |



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## TABLE C-1
## A2PIII PART ONE OPEN FIELD CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-C-15-14-R-D | 476785 | 1350398 | 1.24 | J | 1.01 | - | 0.98 | - | 1.01 | - | 9.40 | - |
| A2P3-C-15-16-R | 476947 | 1350377 | 1.04 | - | 0.93 | - | 0.96 | - | 0.93 | - | 6.77 | - |

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## TABLE C-2
## A2PIII PART ONE STOCKPILE FOOTPRINT CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-1SF-02-R | 478076 | 1349722 | 1.05 | - | 1.26 | - | 1.25 | - | 1.26 | - | 4.41 | J |
| A2P3-1SF-03-R | 478105 | 1349711 | 0.89 | - | 0.91 | - | 0.90 | - | 0.91 | - | 8.90 | - |
| A2P3-1SF-04-R | 478089 | 1349738 | 0.89 | - | 0.93 | - | 0.87 | - | 0.93 | - | 13.01 | - |
| A2P3-1SF-06-R | 478112 | 1349764 | 1.07 | - | 1.23 | - | 1.21 | - | 1.23 | - | 5.63 | - |
| A2P3-1SF-08-R | 478129 | 1349721 | 1.26 | - | 1.16 | - | 1.10 | - | 1.16 | - | 3.68 | U |
| A2P3-1SF-09-R | 478148 | 1349725 | 0.98 | J | 0.95 | - | 0.93 | - | 0.95 | - | 6.59 | - |
| A2P3-1SF-09-R-D | 478148 | 1349725 | 0.81 | J | 0.94 | - | 0.94 | - | 0.94 | - | 5.97 | - |
| A2P3-1SF-10-R | 478125 | 1349749 | 0.84 | - | 0.85 | - | 0.84 | - | 0.85 | - | 6.93 | - |
| A2P3-1SF-12-R | 478154 | 1349784 | 0.93 | - | 1.11 | - | 1.09 | - | 1.11 | - | 6.62 | - |
| A2P3-2SF-01-R | 477451 | 1349568 | 1.10 | - | 0.95 | - | 0.94 | - | 0.95 | - | 9.35 | - |
| A2P3-2SF-02-R | 477442 | 1349587 | 1.15 | - | 1.07 | - | 1.05 | - | 1.07 | - | 14.29 | - |
| A2P3-2SF-04-R | 477462 | 1349597 | 1.03 | - | 0.99 | - | 0.93 | - | 0.99 | - | 6.96 | - |
| A2P3-2SF-06-R | 477443 | 1349666 | 1.04 | - | 1.02 | - | 1.02 | - | 1.02 | - | 9.15 | - |
| A2P3-2SF-07-R | 477454 | 1349645 | 1.02 | - | 0.98 | - | 0.98 | - | 0.98 | - | 7.90 | - |
| A2P3-2SF-09-R | 477491 | 1349562 | 1.07 | - | 1.32 | - | 1.31 | - | 1.32 | - | 3.60 | U |
| A2P3-2SF-09-R-D | 477491 | 1349562 | 1.19 | - | 1.18 | - | 1.15 | - | 1.18 | - | 5.29 | J |
| A2P3-2SF-10-R | 477491 | 1349591 | 1.18 | - | 1.22 | - | 1.23 | - | 1.22 | - | 5.32 | - |
| A2P3-2SF-13-R | 477483 | 1349634 | 1.01 | - | 1.03 | - | 1.02 | - | 1.03 | - | 9.44 | - |
| A2P3-2SF-14-R | 477481 | 1349668 | 1.01 | - | 1.03 | - | 1.01 | - | 1.03 | - | 4.49 | J |
| A2P3-2SF-16-R | 477518 | 1349659 | 1.10 | - | 1.01 | - | 0.99 | - | 1.01 | - | 7.19 | - |
| A2P3-3SF-02-R | 476697 | 1349312 | 1.20 | J | 1.08 | - | 1.07 | - | 1.08 | - | 6.71 | - |
| A2P3-3SF-04-R | 476741 | 1349300 | 0.95 | - | 0.95 | - | 0.93 | - | 0.95 | - | 7.37 | - |
| A2P3-3SF-05-R | 476692 | 1349341 | 1.16 | - | 0.91 | - | 0.91 | - | 0.91 | - | 8.32 | - |
| A2P3-3SF-05-R-D | 476692 | 1349341 | 1.05 | - | 0.96 | - | 0.94 | - | 0.96 | - | 4.38 | J |
| A2P3-3SF-07-R | 476739 | 1349328 | 1.38 | - | 1.01 | - | 1.01 | - | 1.01 | - | 8.43 | - |
| A2P3-3SF-08-R | 476748 | 1349395 | 0.97 | - | 1.00 | - | 0.99 | - | 1.00 | - | 6.59 | - |
| A2P3-3SF-09-R | 476786 | 1349259 | 1.13 | - | 1.11 | - | 1.07 | - | 1.11 | - | 6.98 | - |
| A2P3-3SF-11-R | 476804 | 1349279 | 0.91 | - | 0.94 | - | 0.95 | - | 0.94 | - | 5.43 | - |
| A2P3-3SF-14-R | 476781 | 1349393 | 1.10 | - | 0.93 | - | 0.89 | - | 0.93 | - | 6.83 | J |
| A2P3-3SF-15-R | 476807 | 1349341 | 1.17 | - | 1.03 | - | 0.97 | - | 1.03 | - | 6.66 | - |
| A2P3-3SF-16-R | 476838 | 1349363 | 1.31 | - | 1.20 | - | 1.18 | - | 1.20 | - | 14.31 | J |
| A2P3-4SF-01-R | 478389 | 1347653 | 0.96 | - | 0.94 | - | 0.90 | - | 0.94 | - | 12.46 | - |
| A2P3-4SF-02-R | 478360 | 1347701 | 0.86 | - | 0.88 | - | 0.82 | - | 0.88 | - | 9.21 | J |
| A2P3-4SF-04-R | 478377 | 1347782 | 1.35 | - | 1.16 | - | 1.12 | - | 1.16 | - | 6.88 | - |
| A2P3-4SF-05-R | 478358 | 1347811 | 1.16 | - | 0.95 | - | 0.94 | - | 0.95 | - | 8.27 | - |
| A2P3-4SF-06-R | 478361 | 1347876 | 0.89 | - | 0.93 | - | 0.93 | - | 0.93 | - | 11.69 | - |
| A2P3-4SF-07-R | 478417 | 1347678 | 0.91 | - | 0.93 | - | 0.92 | - | 0.93 | - | 12.38 | - |



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## TABLE C-2
## A2PIII PART ONE STOCKPILE FOOTPRINT CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-4SF-08-R | 478404 | 1347706 | 1.06 | - | 1.03 | - | 1.01 | - | 1.03 | - | 6.83 | J |
| A2P3-4SF-08-R-D | 478404 | 1347706 | 1.09 | - | 1.10 | - | 1.09 | - | 1.10 | - | 13.24 | J |
| A2P3-4SF-09-R | 478431 | 1347737 | 1.14 | - | 1.10 | - | 1.07 | - | 1.10 | - | 13.43 | - |
| A2P3-4SF-11-R | 478413 | 1347814 | 0.98 | - | 0.95 | - | 0.94 | - | 0.95 | - | 10.92 | - |
| A2P3-4SF-12-R | 478422 | 1347855 | 0.87 | - | 0.83 | - | 0.81 | - | 0.83 | - | 8.84 | - |
| A2P3-4SF-13-R | 478473 | 1347652 | 0.83 | - | 0.73 | - | 0.70 | - | 0.73 | - | 7.19 | - |
| A2P3-4SF-15-R | 478455 | 1347758 | 1.12 | - | 0.90 | - | 0.87 | - | 0.90 | - | 6.55 | - |
| A2P3-4SF-16-R | 478437 | 1347805 | 0.89 | - | 0.81 | - | 0.79 | - | 0.81 | - | 16.44 | - |
| A2P3-4SF-18-R | 478468 | 1347870 | 1.01 | - | 1.14 | - | 1.11 | - | 1.14 | - | 3.32 | U |

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## TABLE C-3
## A2PIII PART ONE STOCKPILE CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | DEPTH INTERVAL | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-1S-02-R | 478076 | 1349722 | 0-0.5 | 0.99 | - | 1.09 | - | 1.04 | - | 1.09 | - | 3.44 | U |
| A2P3-1S-03-R | 478105 | 1349711 | 1-1.5 | 0.91 | - | 0.76 | - | 0.73 | - | 0.76 | - | 3.25 | U |
| A2P3-1S-04-R | 478089 | 1349738 | 0-0.5 | 1.12 | - | 0.87 | - | 0.81 | - | 0.87 | - | 8.01 | - |
| A2P3-1S-06-R | 478112 | 1349764 | 2-2.5 | 1.06 | - | 0.96 | - | 0.94 | - | 0.96 | - | 5.97 | - |
| A2P3-1S-08-R | 478129 | 1349721 | 2-2.5 | 0.74 | - | 0.82 | - | 0.81 | - | 0.82 | - | 3.36 | U |
| A2P3-1S-09-R | 478148 | 1349725 | 1.5-2 | 0.91 | - | 0.71 | - | 0.71 | - | 0.71 | - | 5.55 | J |
| A2P3-1S-09-R-D | 478148 | 1349725 | 1.5-2 | 0.81 | - | 0.80 | - | 0.79 | - | 0.80 | - | 3.23 | U |
| A2P3-1S-10-R | 478125 | 1349749 | 5-5.5 | 1.02 | - | 0.89 | - | 0.83 | - | 0.89 | - | 3.38 | U |
| A2P3-1S-12-R | 478154 | 1349784 | 1-1.5 | 1.05 | - | 0.87 | - | 0.83 | - | 0.87 | - | 3.55 | U |
| A2P3-2S-01-R | 477451 | 1349568 | 1-1.5 | 1.06 | - | 0.98 | - | 0.96 | - | 0.98 | - | 9.19 | - |
| A2P3-2S-02-R | 477442 | 1349587 | 1.5-2 | 0.92 | - | 1.03 | - | 1.02 | - | 1.03 | - | 14.22 | - |
| A2P3-2S-04-R | 477462 | 1349597 | 5-5.5 | 0.79 | - | 0.84 | - | 0.82 | - | 0.84 | - | 5.90 | - |
| A2P3-2S-06-R | 477443 | 1349666 | 0-0.5 | 0.99 | - | 1.07 | - | 1.05 | - | 1.07 | - | 6.48 | - |
| A2P3-2S-07-R | 477454 | 1349645 | 0-0.5 | 1.00 | - | 0.91 | - | 0.85 | - | 0.91 | - | 12.22 | - |
| A2P3-2S-09-R | 477491 | 1349562 | 1.5-2 | 0.94 | - | 0.93 | - | 0.92 | - | 0.93 | - | 6.24 | - |
| A2P3-2S-10-R | 477491 | 1349591 | 4.5-5 | 0.92 | - | 0.88 | - | 0.85 | - | 0.88 | - | 10.45 | - |
| A2P3-2S-13-R | 477483 | 1349634 | 5-5.5 | 0.99 | - | 1.06 | J | 1.05 | - | 1.06 | J | 6.29 | - |
| A2P3-2S-13-R-D | 477483 | 1349634 | 5-5.5 | 0.98 | - | 0.91 | J | 0.91 | - | 0.91 | J | 8.70 | - |
| A2P3-2S-14-R | 477481 | 1349668 | 0.5-1 | 1.02 | - | 1.01 | - | 1.02 | - | 1.01 | - | 11.13 | - |
| A2P3-2S-16-R | 477518 | 1349659 | 1.5-2 | 1.01 | - | 0.92 | - | 0.89 | - | 0.92 | - | 6.09 | - |
| A2P3-3S-02-R | 476697 | 1349312 | 2-2.5 | 0.98 | - | 1.02 | - | 1.03 | - | 1.02 | - | 6.96 | - |
| A2P3-3S-04-R | 476741 | 1349300 | 3-3.5 | 1.12 | - | 1.02 | - | 0.99 | - | 1.02 | - | 6.09 | - |
| A2P3-3S-05-R | 476692 | 1349341 | 0.5-1 | 1.08 | - | 0.91 | - | 0.88 | - | 0.91 | - | 7.09 | - |
| A2P3-3S-07-R | 476739 | 1349328 | 0.5-1 | 1.01 | - | 0.79 | - | 0.79 | - | 0.79 | - | 3.65 | J |
| A2P3-3S-08-R | 476748 | 1349395 | 2-2.5 | 0.94 | - | 0.95 | - | 0.92 | - | 0.95 | - | 6.64 | - |
| A2P3-3S-09-R | 476786 | 1349259 | 0-0.5 | 0.97 | - | 0.98 | - | 0.97 | - | 0.98 | - | 11.76 | - |
| A2P3-3S-11-R | 476804 | 1349279 | 0-0.5 | 0.83 | - | 0.82 | - | 0.78 | - | 0.82 | - | 2.63 | U |
| A2P3-3S-11-R-D | 476804 | 1349279 | 0-0.5 | 0.91 | - | 0.79 | - | 0.76 | - | 0.79 | - | 5.15 | - |
| A2P3-3S-14-R | 476781 | 1349393 | 0-0.5 | 1.06 | - | 0.91 | - | 0.90 | - | 0.91 | - | 10.02 | - |
| A2P3-3S-15-R | 476807 | 1349341 | 2.5-3 | 1.05 | - | 1.04 | - | 1.02 | - | 1.04 | - | 5.59 | - |
| A2P3-3S-16-R | 476838 | 1349363 | 0.5-1 | 1.02 | - | 0.96 | - | 0.97 | - | 0.96 | - | 8.10 | - |
| A2P3-4S-01-R | 478389 | 1347653 | 0.5-1 | 0.91 | - | 0.80 | - | 0.79 | - | 0.80 | - | 4.34 | J |
| A2P3-4S-02-R | 478360 | 1347701 | 0-0.5 | 1.11 | - | 1.01 | - | 1.01 | - | 1.01 | - | 7.14 | - |
| A2P3-4S-04-R | 478377 | 1347782 | 4.5-5 | 0.91 | - | 0.94 | - | 0.90 | - | 0.94 | - | 10.73 | - |
| A2P3-4S-05-R | 478358 | 1347811 | 0.5-1 | 0.83 | - | 0.77 | - | 0.74 | - | 0.77 | - | 7.68 | - |
| A2P3-4S-06-R | 478361 | 1347876 | 1.5-2 | 0.84 | - | 0.83 | - | 0.80 | - | 0.83 | - | 3.79 | J |



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## TABLE C-3
## A2PIII PART ONE STOCKPILE CERTIFICATION RESULTS

| SAMPLE ID | NORTHING | EASTING | DEPTH INTERVAL | RADIUM 226 (pCi/g) | VAL. CODE | RADIUM 228 (pCi/g) | VAL. CODE | THORIUM 228 (pCi/g) | VAL. CODE | THORIUM 232 (pCi/g) | VAL. CODE | TOTAL URANIUM (mg/kg) | VAL. CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P3-4S-07-R | 478417 | 1347678 | 0-0.5 | 1.01 | - | 1.11 | - | 1.11 | - | 1.11 | - | 13.68 | - |
| A2P3-4S-08-R | 478404 | 1347706 | 3-3.5 | 0.95 | - | 0.87 | - | 0.86 | - | 0.87 | - | 12.31 | - |
| A2P3-4S-08-R-D | 478404 | 1347706 | 3-3.5 | 0.83 | - | 0.90 | - | 0.87 | - | 0.90 | - | 8.84 | - |
| A2P3-4S-09-R | 478431 | 1347737 | 3.5-4 | 0.84 | - | 0.85 | - | 0.81 | - | 0.85 | - | 17.89 | - |
| A2P3-4S-11-R | 478413 | 1347814 | 8-8.5 | 0.88 | - | 0.92 | - | 0.87 | - | 0.92 | - | 9.45 | - |
| A2P3-4S-12-R | 478422 | 1347855 | 5.5-6 | 0.86 | - | 0.80 | - | 0.78 | - | 0.80 | - | 7.29 | - |
| A2P3-4S-13-R | 478473 | 1347652 | 0-0.5 | 0.82 | J | 0.79 | - | 0.77 | - | 0.79 | - | 5.88 | - |
| A2P3-4S-15-R | 478455 | 1347758 | 2-2.5 | 1.00 | - | 0.95 | - | 0.91 | - | 0.95 | - | 6.69 | - |
| A2P3-4S-16-R | 478437 | 1347805 | 4.5-5 | 0.97 | - | 0.98 | - | 0.94 | - | 0.98 | - | 14.88 | - |
| A2P3-4S-18-R | 478468 | 1347870 | 0-0.5 | 0.97 | - | 1.07 | - | 1.06 | - | 1.07 | - | 7.82 | J |

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