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Fernald Environmental Management Project
Letter No. C:OOTP:98-0341

Mr. Jack R. Craig, Director
Department of Energy
Fernald Environmental Management Project
P. O. Box 538705
Cincinnati, Ohio 45253-8705

Dear Mr. Craig:

CONTRACT DE-AC24-92OR21972, CERTIFICATION REPORT FOR AREA 8, PHASE I

This letter transmits the attached Certification Report for Area 8, Phase I (A8PI) for your review. This document describes the certification approach, analysis, analytical results, statistical analysis and conclusion for A8PI. Upon concurrence by your staff, please forward this document to the U.S. and Ohio Environmental Protection Agencies as soon as possible to facilitate the beginning of construction on the Habitat Area Project in early September 1998.

If you have any questions or concerns regarding these documents, please contact Jyh-Dong Chiou at 648-3726 or Eric Woods at 648-5268.

Sincerely,

Dennis Carr for

John Bradburne
President

JCB:WEW:jkp
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CERTIFICATION REPORT FOR AREA 8 PHASE I

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

ORIGINAL

JULY 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

A8PI	Area 8, Phase I
ASCOC	area specific constituent of concern
ASL	analytical support level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COC	constituent of concern
CRDL	contract required detection limit
CU	certification unit
DOE	U.S. Department of Energy
EPA	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
μg/kg	milligrams per kilogram
OU	Operable Unit
OSDF	On-Site Disposal Facility
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
ppm	parts per million
PSP	Project Specific Plan
QA/QC	Quality Assurance/Quality Control
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RTRAK	Radiation Tracking System
ROD	Record of Decision
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
TNU	Thermo Nutech
TPU	total propagated uncertainty
UCL	upper confidence level
V&V	verification and validation
WAC	Waste Acceptance Criteria

EXECUTIVE SUMMARY

This certification report presents the information and data used by the U.S. Department of Energy (DOE) to determine that existing soil contamination do not exceed the FRLs in Area 8, Phase I (A8PI) 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 this area of the site; therefore, this area can be considered "certified". Upon approval from the regulatory agencies, DOE intends to proceed with projects planned for A8PI according to the Operable Unit (OU) 4 Dispute Resolution Agreement.

A8PI was divided into four certification units (CUs), as identified in the Certification Design Letter (CDL) for A8PI. Certification sampling was conducted in A8PI to verify that the certification criteria 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 final remediation levels (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 development of the final land use. A8PI will be considered certified when the U.S. and Ohio EPAs agree that the certification criteria have been achieved within all four A8PI CUs.

Based on historical data and precertification real-time scanning data, no contamination above the FRLs was present within A8PI soil, and as a result, certification began without conducting remedial activities. The A8PI samples were analyzed at laboratories on the FEMP Approved Laboratories List per the Sitewide CERCLA Quality Assurance Project Plan (SCQ). 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 A8PI CUs achieved the certification criteria. The determination of passing or failing certification was based on a review of certification sample analytical results from each CU against the certification criteria. Statistical analysis was not necessary to determine if a ASCOC passed certification for a

particular CU in most cases, since only one result (including all ASCOCs, all CUs) exceeded the associated FRL. When the statistical analyses were run, all 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 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 of this report by the Ohio and U.S. Environmental Protection Agencies (EPAs), construction of the native habitat area project will begin in this area.

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 FRLs within Area 8 Phase I (A8PI). As identified in the A8PI Certification Design Letter (CDL, DOE 1998a), this soil is being certified in order to proceed with future land use activities. On the basis of this reported information, DOE considers remedial goals achieved in A8PI.

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 final remediation levels (FRLs) with final disposition of the excavated material in the On-Site Disposal Facility (OSDF) or at an off-site disposal facility if the 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). Approximately 1.8 million cubic yards of contaminated soil are anticipated to be excavated and placed within the OSDF.

In the OU5 Remedial Action Work Plan (RAWP) (DOE 1996b), DOE committed to preparing a Sitewide Excavation Plan (SEP) 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. Subsequently, the FEMP has been divided into distinct remedial areas and phases for soil remediation, based on the operable units' remediation schedule. One of these remedial areas/phases is Area 8, Phase I (A8PI), which is addressed in this certification report.

Figure 3-1 of the draft final SEP shows the general soil remediation process at the FEMP. According to the SEP, excavation Approach E was followed in A8PI. Precertification activities were conducted within A8PI during December 1997, and data indicated that no soil excavation activities were required. All precertification and certification activities for A8PI were conducted in compliance with the SEP (DOE 1998b).

1.3 AREA DESCRIPTION

A8PI is an approximately 13-acre area located west of Paddys Run, as shown on Figure 1-1. A8PI contains several hills that slope steeply toward Paddys Run, along with several terraces including the Paddys Run flood plain (see Figure 1-2). A8PI is isolated from the drainage of other areas of the FEMP, though a stormwater culvert diverts stormwater from a small area off-site, beneath Paddys Run Road, and into a drainage ditch in A8PI. The area is primarily open meadow, except for wooded areas along Paddys Run, several slopes, and the drainage ditches.

As part of the OU4 Dispute Resolution Agreement, funds have been approved to develop supplemental projects in A8PI, making it the first priority for Area 8 certification. A public-accessible park will be constructed within A8PI. Also, several university research projects will take place within this area. These supplemental projects will result in the establishment of a tallgrass prairie and expansion of the wooded corridor along Paddys Run.

1.4 SCOPE

The scope of this report includes the certification of A8PI, as described above. This area has been divided into four certification units (CUs). The certification design for A8PI CUs follows the general approach as outlined in Section 3.4 of the SEP.

1.5 OBJECTIVES

The objectives of this Certification Report for A8PI 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 4 CUs being certified
- Present the statistical analysis showing that all 4 CUs have passed the certification criteria, including FRL attainment and hot spot criteria, as discussed in Section 2.0
- Describe access controls implemented to prevent recontamination.

1.6 REPORT FORMAT

This certification report is presented in five 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 to sampling and analysis used for certification
Section 3.0	Overview of Field Activities: Area preparation, excavation, and changes to work scope
Section 4.0	Analytical Methodologies, Data Validation Processes, and Data Reduction
Section 5.0	Certification Evaluation and Conclusions
Section 6.0	Protection of Certified Areas
Appendix A	CU Maps and Statistics Tables

1.7 FEMP CERTIFICATION MASTER MAP

In order to track certification and characterization for reuse areas at the FEMP, DOE will include a controlled map showing the status of the soil remediation areas and phased areas with all Certification Reports and CDLs. This map is included in this Certification Report as Figure 1-3, and has been updated to reflect the status of A8PI.

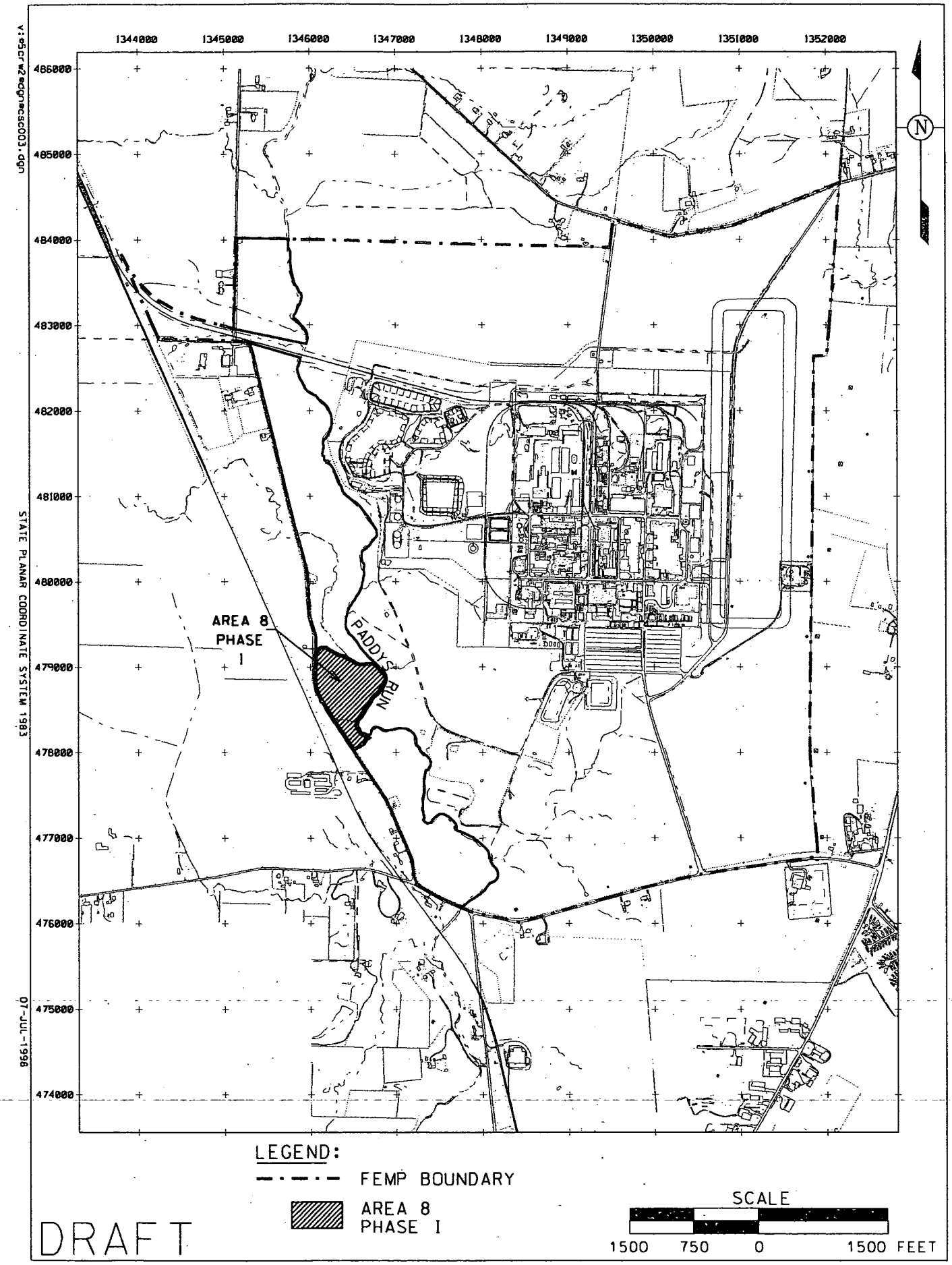

FIGURE 1-1. AREA 8, PHASE I LOCATION MAP

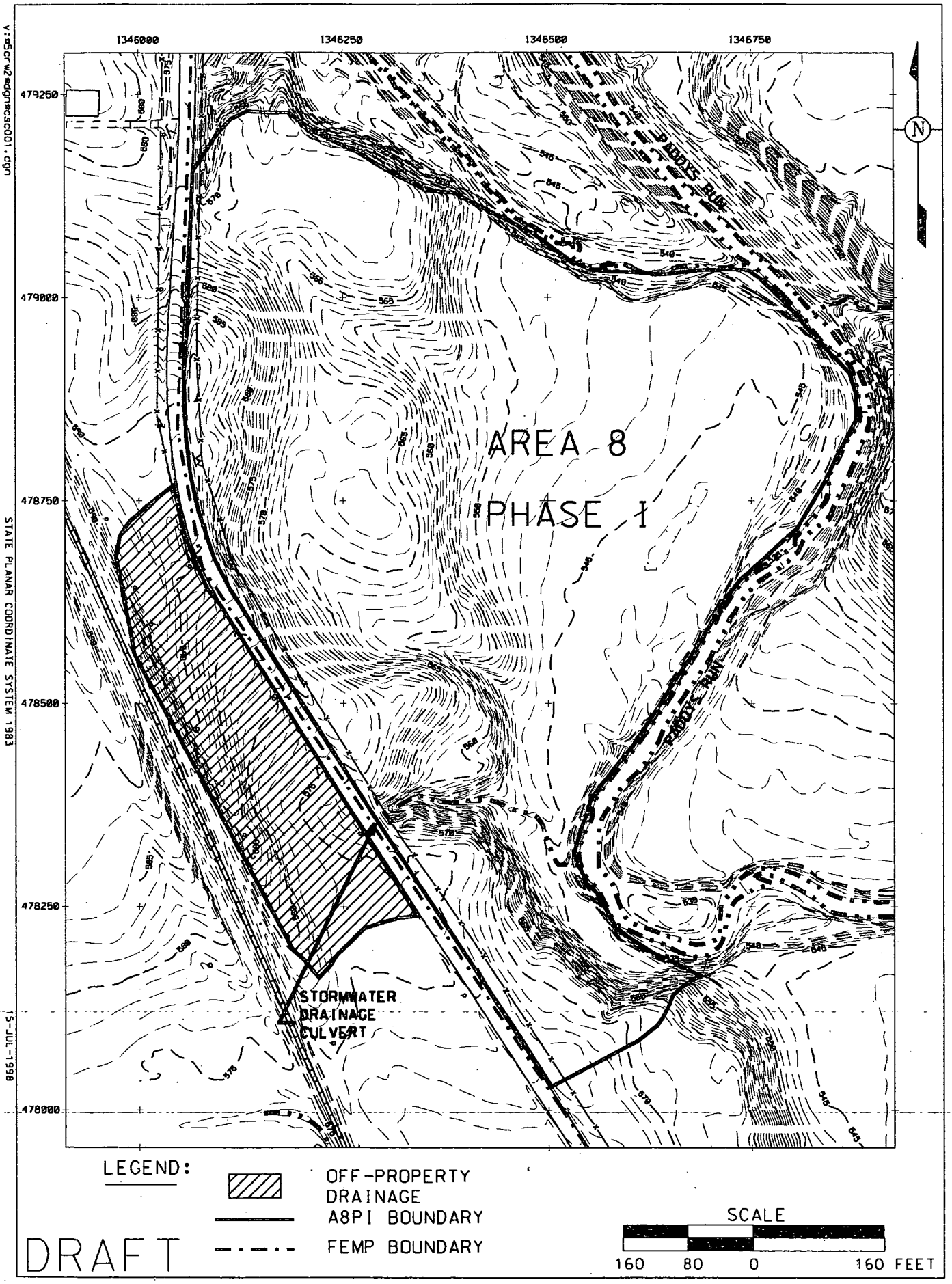

FIGURE 1-2. REMEDIATION AREA 8, PHASE I DRAINAGE

2.0 CERTIFICATION APPROACH

2.1 CERTIFICATION STRATEGY

This section summarizes the area specific constituents of concern (ASCOCs) 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 the 95 percent upper confidence level (UCL), and at the 90 percent UCL for secondary ASCOCs, although none are retained for A8PI. The certification process also includes the hot spot criterion, which states that if any of the certification samples 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 draft final SEP (DOE 1998b), and the A8PI-specific strategy is described in the CDL for A8PI (DOE 1998a).

2.1.1 A8PI 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 that contaminant. 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.

2.1.2 ASCOC Selection Criteria

As committed in the SEP (DOE 1998b), total uranium, radium-226, radium-228, thorium-228, and thorium-232, the primary radiological COCs 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 a concentration above its FRL, and the COC greater than the FRL criterion is not attributable to false positives or elevated CRDLs.

2.1.3 ASCOC Selection Process for A8PI

Though few samples were collected and analyzed, historical soil data from A8PI show no FRL exceedences. Moreover, no above-FRL contamination is anticipated within A8PI because: 1) process history and aerial photos indicated no production related land uses in the vicinity, 2) A8PI is upwind of the production area, and 3) Paddys Run effectively isolates A8PI from surface water drainage that contaminated other portions of the site. As a result, only total uranium, radium-226, and radium-228, thorium-228, and thorium-232 (the five sitewide primary radiological ASCOCs) were retained as ASCOCs in A8PI even though historical data did not indicate any FRL exceedences in the area. The ASCOCs identified for A8PI are summarized in Table 2-1.

TABLE 2 -1
ASCOC LIST FOR A8PI CUs

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

2.2 CERTIFICATION APPROACH

2.2.1 Certification Design

The certification design for A8PI CUs follows Approach E, as outlined in the draft final SEP (DOE 1998b). Based primarily on topography and drainage, A8PI has been divided into four of the larger "Group 2" CUs which can have area no larger than 250,000 square feet (see Figure 2-1). These CUs are as follows:

- CU A8PI-01 was established to cover the Paddys Run flood plain.
- CUs A8PI-02 and A8PI-03 cover the upland areas of A8PI along Paddys Run Road.
- CU A8PI-04 covers a smaller area along the southern tip of A8PI where the drainage is isolated from other portions of A8PI.

2.2.2 Sample Selection Process

In order to establish certification sampling locations, each CU was first divided into 16 sub-CUs. Within each sub-CU, 16 soil sample locations were randomly selected. As necessary, alternate locations were randomly selected to meet the minimum distance criterion. The minimum distance criterion is the smallest distance allowed between two sampling locations within a CU, and is a function of the CU size. The formula for calculating the minimum distance is presented in the CDL for A8PI, as well as in the draft final SEP (DOE 1998b). The sample locations for all the CUs within the scope of this report are shown in Figure 2-2.

2.2.3 Certification Sampling and Analysis

Each sample was collected from the 0 to 6-inch (surface) soil interval at the designated and surveyed location. A double push was performed to obtain the necessary volume of soil to complete the prescribed analyses. 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. Within CU A8PI-01, an additional sample (A8PI-01-17R) was collected to investigate the area where no real-time data were collected until after the CDL was submitted (see Section 3.2). This sample was also submitted for analysis, bringing the total to 17 samples collected and 13 analyzed within this CU. All samples were analyzed at a FDF-approved off-site laboratory for the five primary ASCOCs using the gamma spectrometry method.

2.2.4 Statistical Analysis

The statistical analysis of certification samples is discussed in the revised Appendix G of the SEP. The revised Appendix G will be included in the final SEP, which will be submitted to the EPAs in Summer 1998. 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) does exceed 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 the revised 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 draft final SEP (DOE 1998b). Specifically, if the contamination is not widespread in the CU and limited to an individual sample location, the high purity germanium detector (HPGe) will be used to delineate the area as described in Section 3.3.3 of the Real-Time User's Manual (DOE 1998c). If the area is less than 10 meters squared (m^2) then the acceptable concentration is three times the FRL. If the area is larger than 10 m^2, then the acceptable concentration is two times the FRL. When the given UCL on the mean for each COC is less than its FRL, and the hot spot criterion is met, the CU has met both criteria and will be considered certified.

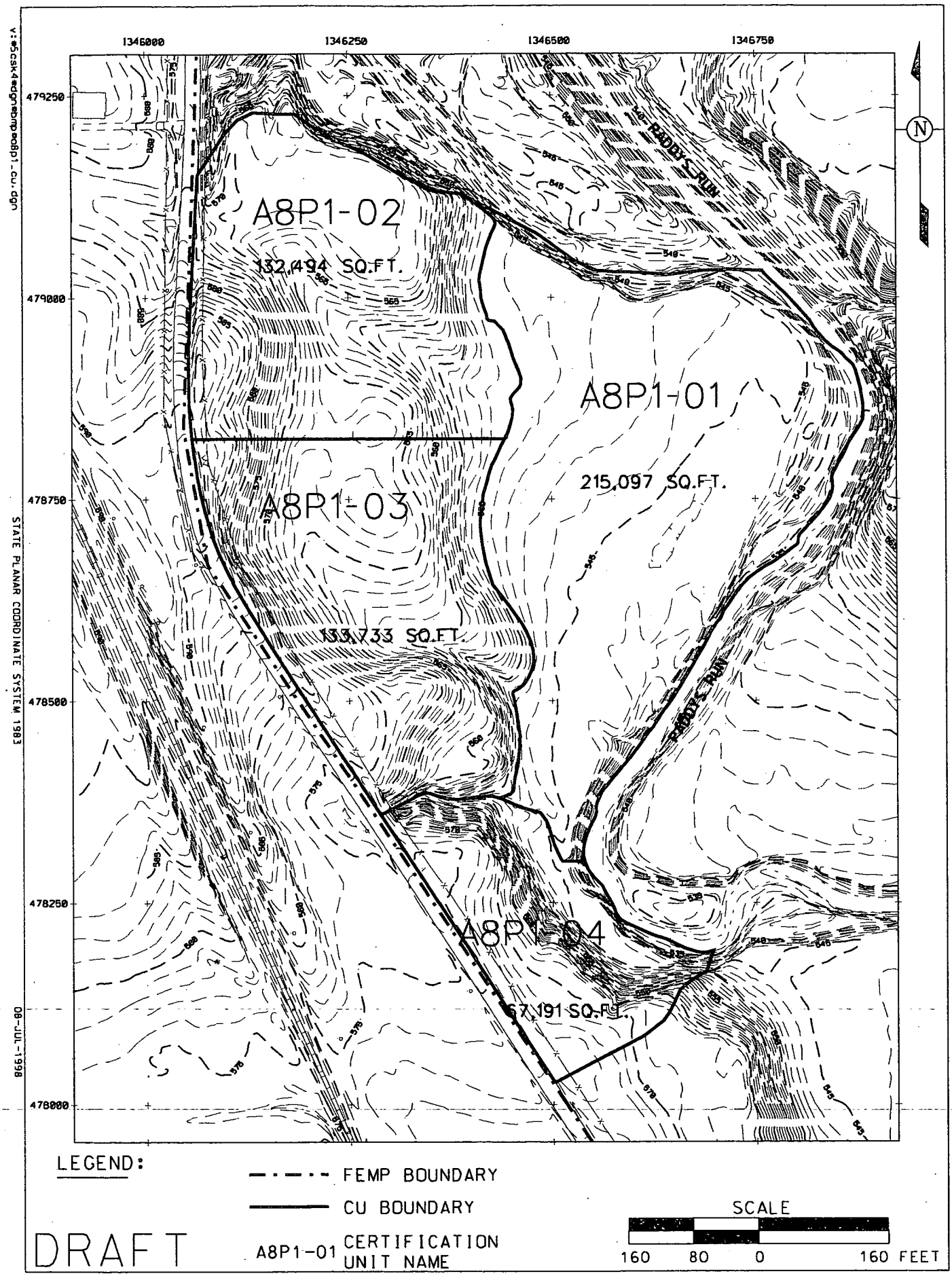

FIGURE 2-1. AREA 8, PHASE 1 CERTIFICATION UNITS

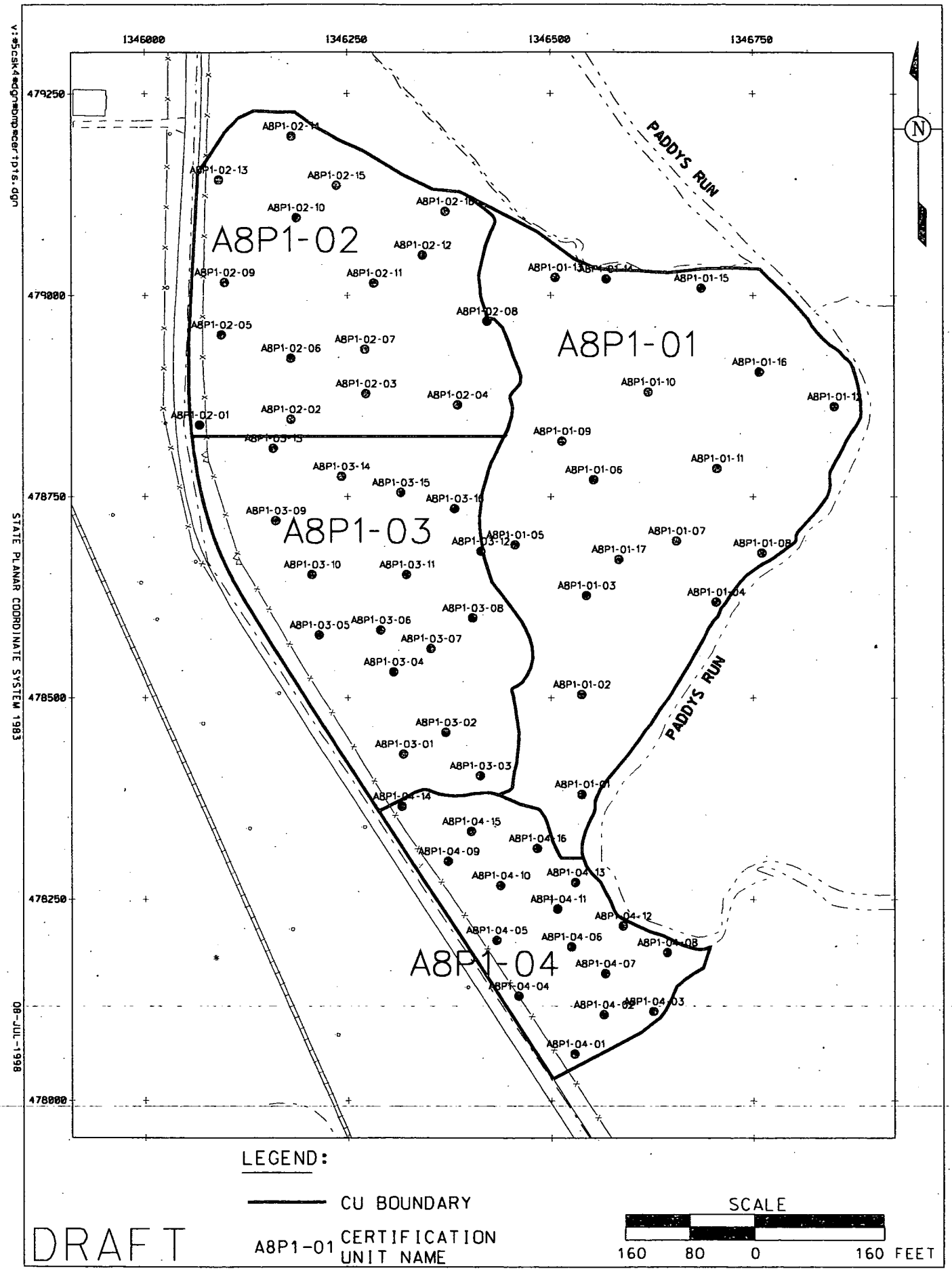

FIGURE 2-2. FINAL AREA 8, PHASE 1 CERTIFICATION SAMPLING LOCATIONS

3.0 OVERVIEW OF FIELD ACTIVITIES

3.1 AREA PREPARATION

Based on historical data and precertification surveys from A8PI, no soil required remedial activities prior to certification sampling. A8PI historical and precertification data are discussed in detail in the CDL (DOE 1998a).

3.2 CHANGES TO SCOPE OF WORK

The scope of work for A8PI certification sampling was documented in the final CDL (DOE 1998a), and there were no changes during field implementation. Final certification sampling locations and CU boundaries remained as identified, and all analyses were carried out as planned.

There were two notable changes to Revision B of the CDL that occurred after this draft was submitted to the Ohio and U.S. EPAs for review, but before the final CDL was issued. These changes resulted from two U.S. EPA concerns with the draft CDL. The first U.S. EPA concern was that two pairs of sample locations in CU-02 that did not meet the minimum distance criterion. Locations A8P1-02-05 and A8P1-02-09 were positioned slightly closer than the minimum distance, as were locations A8P1-02-13 and A8P1-02-14. In response, DOE proposed that new random sampling locations be selected within sub-CUs 5 and 14 of CU-02, and that these new locations be verified against the minimum distance criterion and surveyed in the field.

The second U.S. EPA concern with the draft CDL was regarding the open area in the south-central portion of CU-01 where no real-time data were collected. To address this issue, DOE-FEMP proposed to collect a seventeenth certification sample (location A8PI-01-17) within the area where no real-time data were collected. Location A8PI-01-17 was also verified against the minimum distance criterion, and the sample was collected and analyzed, thus bringing the total to 13 samples analyzed within A8PI CU-01. This new location was added to provide additional data on ASCOC concentrations within the area where no real-time data were collected, and these data were included in the A8PI certification decision.

To be sure these issues were addressed in time for certification sampling to begin as planned, DOE documented their comment responses in an Informal Note dated May 1, 1998. These responses were

agreed to by the U.S. EPA and incorporated into the final CDL for A8PI. A Variance/Field Change Notice was issued to document resulting changes to the Project Specific Plan (PSP) for A8PI Certification Sampling.

Other minor changes to the scope of work as documented in the A8PI Certification PSP are as follows:

- Additional sample volume was collected in order to perform the analyses by gamma spectrometry. The additional soil was collected by performing a double push at each sample location. Extra rinsate water was collected by rinsing four liners with 2 liters of water each, in order to obtain the necessary 8 liters of rinsate water.

- Some stainless steel liners were used to collect samples, in addition to the plastic liners as originally specified in the PSP. Consequently, additional rinsate samples were collected at a rate of 1 per 20 stainless steel liners used.

- Finally, as documented in V/FCN 50.03.74.02-4, two of the archive samples from each of the four CUs were analyzed at the on-site laboratory for comparability purposes. These results were not validated, nor were they included in the certification statistical analysis or the certification decision. Of note, none of these analytical results exceeded the FRL for any ASCOC.

4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

4.1 ANALYTICAL METHODOLOGIES

The samples for A8PI were analyzed at Thermo Nutech (TNU), a laboratory on the FEMP Approved Laboratories List per the Sitewide CERCLA Quality Assurance Project Plan (SCQ). To be on the FEMP Approved Laboratories List, a laboratory must comply with SCQ requirements. Furthermore, each laboratory was audited within one year of the analysis of A8PI samples. The SCQ is also the source for analytical methodologies (Appendix G), data validation and verification, and analytical and field QA/QC requirements.

For all the certification data, ASL D analytical requirements were selected per Appendix G of the SCQ and the laboratory reported an ASL D data package, which includes all the raw data. For the total uranium data, the detection limit was set at 10 percent of the FRL (8.2 μg/kg), which is higher than the detection limit documented in Appendix G. Similarly, the detection limit was set at approximately 10 percent of the FRL (1.5 pCi/g) for thorium-228 and thorium-232, which is also higher than the detection limit documented in Appendix G. Therefore, by definition, the ASL detection limit for uranium, thorium-228 and thorium-232 is ASL E, although all other ASL D requirements are met for these analyses. The analytical data packages provided by the contract laboratory included sample results with associated QA/QC data and all applicable raw data. Certification analytical results are provided in Appendix A, 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 highest allowable minimum detectable concentration (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 were specified for each analyte. Laboratories were required to meet these specifications using the methodologies described below.

Total Uranium

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

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

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

Radium-226

Samples were analyzed by gamma spectrometry, and radium-226 was quantified by measuring gamma rays emitted by members of its decay chain. This method does not require chemical separation, but the samples must be allowed a 20-day progeny ingrowth period before counting. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A8PI 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 off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A8PI certification results.

Isotopic Thorium

Isotopic thorium was also quantified by gamma spectrometry. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A8PI 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 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 the following:

- 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 ten 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. In exceedence of the project requirement for 10 percent

validation, two of the four analytical releases (i.e., all data from CUs 01 and 02) were validated to level D, while all remaining data were verified for completeness but were not validated.

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 significant problems with the data set. However, this process did reveal that the gamma spectrometry software used by the laboratory did not identify the 1764 keV peak for radium-226. As a result, results were reprocessed by the laboratory using a wider window to allow the software to identify and quantify the 1764 keV peak. The reprocessed results are reported in this Certification Report.

4.3 DATA REDUCTION

Each sample used to support the A8PI 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 A8PI 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 A8PI passed final certification relative to the average concentration of COCs and the 2 x 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 Appendix A. A review of the A8PI certification results reveals only one FRL exceedence, as a thorium-228 result of 1.56 pCi/g exceeded the FRL of 1.5 pCi/g at location A8PI-04-5. Of note, all other ASCOC results at this location were below their respective FRLs.

5.2 A8PI 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 2x FRL "hot spot" criterion. Based on these results, DOE has determined that the remedial objectives in the OU5 ROD have been achieved in A8PI, and no remedial actions are required. The subject areas will be released for final land use, and development of the public-accessible park and university research grants as part of the OU4 Dispute Resolution Agreement can begin upon receiving EPA concurrence with the certification conclusion.

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
- Signs will be posted upon the temporary perimeter fencing to require access approval for entry into the "certified" area
- To gain access to the "certified" area, the individual(s) 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 clean in accordance with FEMP certified area access procedure subsequent to any use in a uncertified areas; or for any work, before entry into a "certified" area
- FEMP management team representatives must instruct general employees/operators on the entry and exit requirements for a "certified" area.

After DOE certifies the remediated area, it will be transferred 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

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APPENDIX A

CERTIFICATION SAMPLES, ANALYTICAL RESULTS AND STATISTICS TABLES

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TABLE A-1.
AREA 8, PHASE I CERTIFICATION SAMPLES

CERTIFICATION UNIT	SAMPLE ID	ANALYSIS	EASTING	NORTHING
A8P1-01	A8P1-C-01-1R	TAL A	1346538	478380
A8P1-01	A8P1-C-01-2R	TAL A	1346538	478504
A8P1-01	A8P1-C-01-2R-D	TAL A	1346538	478504
A8P1-01	A8P1-C-01-3R	Archive	1346544	478627
A8P1-01	A8P1-C-01-4R	TAL A	1346705	478619
A8P1-01	A8P1-C-01-5R	TAL A	1346456	478690
A8P1-01	A8P1-C-01-6R	Archive	1346553	478771
A8P1-01	A8P1-C-01-7R	TAL A	1346656	478695
A8P1-01	A8P1-C-01-8R	TAL A	1346761	478680
A8P1-01	A8P1-C-01-9R	TAL A	1346514	478819
A8P1-01	A8P1-C-01-10R	Archive	1346621	478880
A8P1-01	A8P1-C-01-11R	TAL A	1346706	478785
A8P1-01	A8P1-C-01-12R	TAL A	1346850	478862
A8P1-01	A8P1-C-01-13R	TAL A	1346506	479022
A8P1-01	A8P1-C-01-14R	TAL A	1346569	479020
A8P1-01	A8P1-C-01-15R	Archive	1346687	479009
A8P1-01	A8P1-C-01-16R	TAL A	1346758	478905
A8P1-01	A8P1-C-01-17R	TAL A	1346584	478672
A8P1-02	A8P1-C-02-1R	Archive	1346067	478839
A8P1-02	A8P1-C-02-2R	TAL A	1346180	478846
A8P1-02	A8P1-C-02-3R	TAL A	1346273	478878
A8P1-02	A8P1-C-02-4R	TAL A	1346386	478864
A8P1-02	A8P1-C-02-5R	TAL A	1346094	478951
A8P1-02	A8P1-C-02-6R	TAL A	1346180	478922
A8P1-02	A8P1-C-02-7R	TAL A	1346272	478933
A8P1-02	A8P1-C-02-8R	Archive	1346422	478968
A8P1-02	A8P1-C-02-9R	TAL A	1346098	479016
A8P1-02	A8P1-C-02-10R	TAL A	1346187	479096
A8P1-02	A8P1-C-02-11R	TAL A	1346283	479015
A8P1-02	A8P1-C-02-12R	Archive	1346343	479050
A8P1-02	A8P1-C-02-13R	Archive	1346091	479143
A8P1-02	A8P1-C-02-14R	TAL A	1346181	479197
A8P1-02	A8P1-C-02-15R	TAL A	1346237	479136
A8P1-02	A8P1-C-02-15R-D	TAL A	1346237	479136
A8P1-02	A8P1-C-02-16R	TAL A	1346371	479104
A8P1-03	A8P1-C-03-1R	TAL A	1346319	478430
A8P1-03	A8P1-C-03-2R	Archive	1346371	478457
A8P1-03	A8P1-C-03-3R	TAL A	1346413	478403
A8P1-03	A8P1-C-03-4R	TAL A	1346307	478532
A8P1-03	A8P1-C-03-5R	TAL A	1346215	478578
A8P1-03	A8P1-C-03-6R	TAL A	1346291	478584

TABLE A-1.
AREA 8, PHASE I CERTIFICATION SAMPLES

CERTIFICATION UNIT	SAMPLE ID	ANALYSIS	EASTING	NORTHING
A8P1-03	A8P1-C-03-6R-D	TAL A	1346291	478584
A8P1-03	A8P1-C-03-7R	TAL A	1346353	478561
A8P1-03	A8P1-C-03-8R	Archive	1346404	478599
A8P1-03	A8P1-C-03-9R	TAL A	1346161	478720
A8P1-03	A8P1-C-03-10R	Archive	1346206	478653
A8P1-03	A8P1-C-03-11R	TAL A	1346323	478653
A8P1-03	A8P1-C-03-12R	TAL A	1346414	478682
A8P1-03	A8P1-C-03-13R	TAL A	1346158	478810
A8P1-03	A8P1-C-03-14R	TAL A	1346243	478775
A8P1-03	A8P1-C-03-15R	Archive	1346316	478755
A8P1-03	A8P1-C-03-16R	TAL A	1346382	478735
A8P1-04	A8P1-C-04-1R	Archive	1346529	478058
A8P1-04	A8P1-C-04-2R	TAL A	1346565	478107
A8P1-04	A8P1-C-04-3R	TAL A	1346627	478111
A8P1-04	A8P1-C-04-4R	TAL A	1346460	478130
A8P1-04	A8P1-C-04-4R-D	TAL A	1346438	478267
A8P1-04	A8P1-C-04-5R	TAL A	1346433	478199
A8P1-04	A8P1-C-04-6R	Archive	1346525	478191
A8P1-04	A8P1-C-04-7R	TAL A	1346567	478158
A8P1-04	A8P1-C-04-8R	TAL A	1346644	478184
A8P1-04	A8P1-C-04-9R	TAL A	1346374	478297
A8P1-04	A8P1-C-04-10R	Archive	1346438	478267
A8P1-04	A8P1-C-04-11R	TAL A	1346508	478238
A8P1-04	A8P1-C-04-12R	TAL A	1346589	478217
A8P1-04	A8P1-C-04-13R	TAL A	1346530	478271
A8P1-04	A8P1-C-04-14R	TAL A	1346317	478365
A8P1-04	A8P1-C-04-15R	TAL A	1346402	478334
A8P1-04	A8P1-C-04-16R	Archive	1346483	478313

TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-01-1	A8P1-C-01-1R	6-May-98	0	0.5	1346538	478380	Radium-226	1.005	J	pCi/g	NORMAL
A8P1-C-01-1	A8P1-C-01-1R	6-May-98	0	0.5	1346538	478380	Radium-228	1.089	J	pCi/g	NORMAL
A8P1-C-01-1	A8P1-C-01-1R	6-May-98	0	0.5	1346538	478380	Thorium-228	1.057	J	pCi/g	NORMAL
A8P1-C-01-1	A8P1-C-01-1R	6-May-98	0	0.5	1346538	478380	Thorium-232	1.089	J	pCi/g	NORMAL
A8P1-C-01-1	A8P1-C-01-1R	6-May-98	0	0.5	1346538	478380	Uranium, Total	14.834	J	ug/g	NORMAL
A8P1-C-01-11	A8P1-C-01-11R	6-May-98	0	0.5	1346706	478785	Radium-226	0.939	-	pCi/g	NORMAL
A8P1-C-01-11	A8P1-C-01-11R	6-May-98	0	0.5	1346706	478785	Radium-228	0.863	-	pCi/g	NORMAL
A8P1-C-01-11	A8P1-C-01-11R	6-May-98	0	0.5	1346706	478785	Thorium-228	0.825	-	pCi/g	NORMAL
A8P1-C-01-11	A8P1-C-01-11R	6-May-98	0	0.5	1346706	478785	Thorium-232	0.863	-	pCi/g	NORMAL
A8P1-C-01-11	A8P1-C-01-11R	6-May-98	0	0.5	1346706	478785	Uranium, Total	7.464	J	ug/g	NORMAL
A8P1-C-01-12	A8P1-C-01-12R	6-May-98	0	0.5	1346850	478862	Radium-226	1.107	-	pCi/g	NORMAL
A8P1-C-01-12	A8P1-C-01-12R	6-May-98	0	0.5	1346850	478862	Radium-228	0.519	-	pCi/g	NORMAL
A8P1-C-01-12	A8P1-C-01-12R	6-May-98	0	0.5	1346850	478862	Thorium-228	0.461	-	pCi/g	NORMAL
A8P1-C-01-12	A8P1-C-01-12R	6-May-98	0	0.5	1346850	478862	Thorium-232	0.519	-	pCi/g	NORMAL
A8P1-C-01-12	A8P1-C-01-12R	6-May-98	0	0.5	1346850	478862	Uranium, Total	5.37	UJ	ug/g	NORMAL
A8P1-C-01-13	A8P1-C-01-13R	6-May-98	0	0.5	1346506	479022	Radium-226	1.218	J	pCi/g	NORMAL
A8P1-C-01-13	A8P1-C-01-13R	6-May-98	0	0.5	1346506	479022	Radium-228	0.918	J	pCi/g	NORMAL
A8P1-C-01-13	A8P1-C-01-13R	6-May-98	0	0.5	1346506	479022	Thorium-228	0.886	J	pCi/g	NORMAL
A8P1-C-01-13	A8P1-C-01-13R	6-May-98	0	0.5	1346506	479022	Thorium-232	0.918	J	pCi/g	NORMAL
A8P1-C-01-13	A8P1-C-01-13R	6-May-98	0	0.5	1346506	479022	Uranium, Total	13.056	J	ug/g	NORMAL
A8P1-C-01-14	A8P1-C-01-14R	6-May-98	0	0.5	1346569	479020	Radium-226	1.188	-	pCi/g	NORMAL
A8P1-C-01-14	A8P1-C-01-14R	6-May-98	0	0.5	1346569	479020	Radium-228	0.688	-	pCi/g	NORMAL
A8P1-C-01-14	A8P1-C-01-14R	6-May-98	0	0.5	1346569	479020	Thorium-228	0.668	-	pCi/g	NORMAL
A8P1-C-01-14	A8P1-C-01-14R	6-May-98	0	0.5	1346569	479020	Thorium-232	0.688	-	pCi/g	NORMAL
A8P1-C-01-14	A8P1-C-01-14R	6-May-98	0	0.5	1346569	479020	Uranium, Total	6.067	J	ug/g	NORMAL
A8P1-C-01-16	A8P1-C-01-16R	6-May-98	0	0.5	1346758	478905	Radium-226	1.053	-	pCi/g	NORMAL
A8P1-C-01-16	A8P1-C-01-16R	6-May-98	0	0.5	1346758	478905	Radium-228	0.679	-	pCi/g	NORMAL
A8P1-C-01-16	A8P1-C-01-16R	6-May-98	0	0.5	1346758	478905	Thorium-228	0.673	-	pCi/g	NORMAL
A8P1-C-01-16	A8P1-C-01-16R	6-May-98	0	0.5	1346758	478905	Thorium-232	0.679	-	pCi/g	NORMAL
A8P1-C-01-16	A8P1-C-01-16R	6-May-98	0	0.5	1346758	478905	Uranium, Total	6.59	UJ	ug/g	NORMAL
A8P1-C-01-17	A8P1-C-01-17R	6-May-98	0	0.5	1346584	478672	Radium-226	1.11	-	pCi/g	NORMAL
A8P1-C-01-17	A8P1-C-01-17R	6-May-98	0	0.5	1346584	478672	Radium-228	0.952	-	pCi/g	NORMAL
A8P1-C-01-17	A8P1-C-01-17R	6-May-98	0	0.5	1346584	478672	Thorium-228	0.937	-	pCi/g	NORMAL
A8P1-C-01-17	A8P1-C-01-17R	6-May-98	0	0.5	1346584	478672	Thorium-232	0.952	-	pCi/g	NORMAL
A8P1-C-01-17	A8P1-C-01-17R	6-May-98	0	0.5	1346584	478672	Uranium, Total	7.827	J	ug/g	NORMAL
A8P1-C-01-2	A8P1-C-01-2R	6-May-98	0	0.5	1346538	478504	Radium-226	1.013	J	pCi/g	NORMAL
A8P1-C-01-2	A8P1-C-01-2R	6-May-98	0	0.5	1346538	478504	Radium-228	1.066	J	pCi/g	NORMAL
A8P1-C-01-2	A8P1-C-01-2R	6-May-98	0	0.5	1346538	478504	Thorium-228	1.069	J	pCi/g	NORMAL

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-01-2	A8P1-C-01-2R	6-May-98	0	0.5	1346538	478504	Thorium-232	1.066	J	pCi/g	NORMAL
A8P1-C-01-2	A8P1-C-01-2R	6-May-98	0	0.5	1346538	478504	Uranium, Total	14.523	J	ug/g	NORMAL
A8P1-C-01-2	A8P1-C-01-2R-D	6-May-98	0	0.5	1346538	478504	Radium-226	1.012	J	pCi/g	DUPLICATE
A8P1-C-01-2	A8P1-C-01-2R-D	6-May-98	0	0.5	1346538	478504	Radium-228	1.056	J	pCi/g	DUPLICATE
A8P1-C-01-2	A8P1-C-01-2R-D	6-May-98	0	0.5	1346538	478504	Thorium-228	1.029	J	pCi/g	DUPLICATE
A8P1-C-01-2	A8P1-C-01-2R-D	6-May-98	0	0.5	1346538	478504	Thorium-232	1.056	J	pCi/g	DUPLICATE
A8P1-C-01-2	A8P1-C-01-2R-D	6-May-98	0	0.5	1346538	478504	Uranium, Total	10.115	J	ug/g	DUPLICATE
A8P1-C-01-4	A8P1-C-01-4R	6-May-98	0	0.5	1346705	478619	Radium-226	1.059	-	pCi/g	NORMAL
A8P1-C-01-4	A8P1-C-01-4R	6-May-98	0	0.5	1346705	478619	Radium-228	0.664	-	pCi/g	NORMAL
A8P1-C-01-4	A8P1-C-01-4R	6-May-98	0	0.5	1346705	478619	Thorium-228	0.657	-	pCi/g	NORMAL
A8P1-C-01-4	A8P1-C-01-4R	6-May-98	0	0.5	1346705	478619	Thorium-232	0.664	-	pCi/g	NORMAL
A8P1-C-01-4	A8P1-C-01-4R	6-May-98	0	0.5	1346705	478619	Uranium, Total	11.583	J	ug/g	NORMAL
A8P1-C-01-5	A8P1-C-01-5R	6-May-98	0	0.5	1346456	478690	Radium-226	0.985	-	pCi/g	NORMAL
A8P1-C-01-5	A8P1-C-01-5R	6-May-98	0	0.5	1346456	478690	Radium-228	1.014	-	pCi/g	NORMAL
A8P1-C-01-5	A8P1-C-01-5R	6-May-98	0	0.5	1346456	478690	Thorium-228	0.997	-	pCi/g	NORMAL
A8P1-C-01-5	A8P1-C-01-5R	6-May-98	0	0.5	1346456	478690	Thorium-232	1.014	-	pCi/g	NORMAL
A8P1-C-01-5	A8P1-C-01-5R	6-May-98	0	0.5	1346456	478690	Uranium, Total	13.238	J	ug/g	NORMAL
A8P1-C-01-7	A8P1-C-01-7R	6-May-98	0	0.5	1346656	478695	Radium-226	1.031	J	pCi/g	NORMAL
A8P1-C-01-7	A8P1-C-01-7R	6-May-98	0	0.5	1346656	478695	Radium-228	1.044	J	pCi/g	NORMAL
A8P1-C-01-7	A8P1-C-01-7R	6-May-98	0	0.5	1346656	478695	Thorium-228	1.051	J	pCi/g	NORMAL
A8P1-C-01-7	A8P1-C-01-7R	6-May-98	0	0.5	1346656	478695	Thorium-232	1.044	J	pCi/g	NORMAL
A8P1-C-01-7	A8P1-C-01-7R	6-May-98	0	0.5	1346656	478695	Uranium, Total	11.282	J	ug/g	NORMAL
A8P1-C-01-8	A8P1-C-01-8R	6-May-98	0	0.5	1346761	478680	Radium-226	1.295	-	pCi/g	NORMAL
A8P1-C-01-8	A8P1-C-01-8R	6-May-98	0	0.5	1346761	478680	Radium-228	0.452	-	pCi/g	NORMAL
A8P1-C-01-8	A8P1-C-01-8R	6-May-98	0	0.5	1346761	478680	Thorium-228	0.438	-	pCi/g	NORMAL
A8P1-C-01-8	A8P1-C-01-8R	6-May-98	0	0.5	1346761	478680	Thorium-232	0.452	-	pCi/g	NORMAL
A8P1-C-01-8	A8P1-C-01-8R	6-May-98	0	0.5	1346761	478680	Uranium, Total	5.96	UJ	ug/g	NORMAL
A8P1-C-01-9	A8P1-C-01-9R	6-May-98	0	0.5	1346514	478819	Radium-226	1.138	J	pCi/g	NORMAL
A8P1-C-01-9	A8P1-C-01-9R	6-May-98	0	0.5	1346514	478819	Radium-228	1.116	J	pCi/g	NORMAL
A8P1-C-01-9	A8P1-C-01-9R	6-May-98	0	0.5	1346514	478819	Thorium-228	1.11	J	pCi/g	NORMAL
A8P1-C-01-9	A8P1-C-01-9R	6-May-98	0	0.5	1346514	478819	Thorium-232	1.116	J	pCi/g	NORMAL
A8P1-C-01-9	A8P1-C-01-9R	6-May-98	0	0.5	1346514	478819	Uranium, Total	15.164	J	ug/g	NORMAL
A8P1-C-02-10	A8P1-C-02-10R	5-May-98	0	0.5	1346187	479096	Radium-226	0.986	-	pCi/g	NORMAL
A8P1-C-02-10	A8P1-C-02-10R	5-May-98	0	0.5	1346187	479096	Radium-228	0.674	-	pCi/g	NORMAL
A8P1-C-02-10	A8P1-C-02-10R	5-May-98	0	0.5	1346187	479096	Thorium-228	0.652	-	pCi/g	NORMAL
A8P1-C-02-10	A8P1-C-02-10R	5-May-98	0	0.5	1346187	479096	Thorium-232	0.674	-	pCi/g	NORMAL
A8P1-C-02-10	A8P1-C-02-10R	5-May-98	0	0.5	1346187	479096	Uranium, Total	27.83	-	ug/g	NORMAL
A8P1-C-02-11	A8P1-C-02-11R	5-May-98	0	0.5	1346283	479015	Radium-226	1.089	J	pCi/g	NORMAL

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-02-11	A8P1-C-02-11R	5-May-98	0	0.5	1346283	479015	Radium-228	1.274	J	pCi/g	NORMAL
A8P1-C-02-11	A8P1-C-02-11R	5-May-98	0	0.5	1346283	479015	Thorium-228	1.264	J	pCi/g	NORMAL
A8P1-C-02-11	A8P1-C-02-11R	5-May-98	0	0.5	1346283	479015	Thorium-232	1.274	J	pCi/g	NORMAL
A8P1-C-02-11	A8P1-C-02-11R	5-May-98	0	0.5	1346283	479015	Uranium, Total	15.96	J	ug/g	NORMAL
A8P1-C-02-14	A8P1-C-02-14R	5-May-98	0	0.5	1346181	479197	Radium-226	1.085	J	pCi/g	NORMAL
A8P1-C-02-14	A8P1-C-02-14R	5-May-98	0	0.5	1346181	479197	Radium-228	1.119	J	pCi/g	NORMAL
A8P1-C-02-14	A8P1-C-02-14R	5-May-98	0	0.5	1346181	479197	Thorium-228	1.117	J	pCi/g	NORMAL
A8P1-C-02-14	A8P1-C-02-14R	5-May-98	0	0.5	1346181	479197	Thorium-232	1.119	J	pCi/g	NORMAL
A8P1-C-02-14	A8P1-C-02-14R	5-May-98	0	0.5	1346181	479197	Uranium, Total	17.26	J	ug/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R	5-May-98	0	0.5	1346237	479136	Radium-226	1.041	J	pCi/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R	5-May-98	0	0.5	1346237	479136	Radium-228	0.971	J	pCi/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R	5-May-98	0	0.5	1346237	479136	Thorium-228	0.967	J	pCi/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R	5-May-98	0	0.5	1346237	479136	Thorium-232	0.971	J	pCi/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R	5-May-98	0	0.5	1346237	479136	Uranium, Total	16.476	J	ug/g	NORMAL
A8P1-C-02-15	A8P1-C-02-15R-D	5-May-98	0	0.5	1346237	479136	Radium-226	1.03	J	pCi/g	DUPLICATE
A8P1-C-02-15	A8P1-C-02-15R-D	5-May-98	0	0.5	1346237	479136	Radium-228	0.997	J	pCi/g	DUPLICATE
A8P1-C-02-15	A8P1-C-02-15R-D	5-May-98	0	0.5	1346237	479136	Thorium-228	0.972	J	pCi/g	DUPLICATE
A8P1-C-02-15	A8P1-C-02-15R-D	5-May-98	0	0.5	1346237	479136	Thorium-232	0.997	J	pCi/g	DUPLICATE
A8P1-C-02-15	A8P1-C-02-15R-D	5-May-98	0	0.5	1346237	479136	Uranium, Total	15.917	J	ug/g	DUPLICATE
A8P1-C-02-16	A8P1-C-02-16R	6-May-98	0	0.5	1346371	479104	Radium-226	1.305	J	pCi/g	NORMAL
A8P1-C-02-16	A8P1-C-02-16R	6-May-98	0	0.5	1346371	479104	Radium-228	1.102	J	pCi/g	NORMAL
A8P1-C-02-16	A8P1-C-02-16R	6-May-98	0	0.5	1346371	479104	Thorium-228	1.092	J	pCi/g	NORMAL
A8P1-C-02-16	A8P1-C-02-16R	6-May-98	0	0.5	1346371	479104	Thorium-232	1.102	J	pCi/g	NORMAL
A8P1-C-02-16	A8P1-C-02-16R	6-May-98	0	0.5	1346371	479104	Uranium, Total	19.815	J	ug/g	NORMAL
A8P1-C-02-2	A8P1-C-02-2R	5-May-98	0	0.5	1346180	478846	Radium-226	1.229	J	pCi/g	NORMAL
A8P1-C-02-2	A8P1-C-02-2R	5-May-98	0	0.5	1346180	478846	Radium-228	1.103	J	pCi/g	NORMAL
A8P1-C-02-2	A8P1-C-02-2R	5-May-98	0	0.5	1346180	478846	Thorium-228	1.085	J	pCi/g	NORMAL
A8P1-C-02-2	A8P1-C-02-2R	5-May-98	0	0.5	1346180	478846	Thorium-232	1.103	J	pCi/g	NORMAL
A8P1-C-02-2	A8P1-C-02-2R	5-May-98	0	0.5	1346180	478846	Uranium, Total	14.66	J	ug/g	NORMAL
A8P1-C-02-3	A8P1-C-02-3R	5-May-98	0	0.5	1346273	478878	Radium-226	0.998	-	pCi/g	NORMAL
A8P1-C-02-3	A8P1-C-02-3R	5-May-98	0	0.5	1346273	478878	Radium-228	1.005	-	pCi/g	NORMAL
A8P1-C-02-3	A8P1-C-02-3R	5-May-98	0	0.5	1346273	478878	Thorium-228	0.997	-	pCi/g	NORMAL
A8P1-C-02-3	A8P1-C-02-3R	5-May-98	0	0.5	1346273	478878	Thorium-232	1.005	-	pCi/g	NORMAL
A8P1-C-02-3	A8P1-C-02-3R	5-May-98	0	0.5	1346273	478878	Uranium, Total	16.264	-	ug/g	NORMAL
A8P1-C-02-4	A8P1-C-02-4R	5-May-98	0	0.5	1346386	478864	Radium-226	0.967	-	pCi/g	NORMAL
A8P1-C-02-4	A8P1-C-02-4R	5-May-98	0	0.5	1346386	478864	Radium-228	0.856	-	pCi/g	NORMAL
A8P1-C-02-4	A8P1-C-02-4R	5-May-98	0	0.5	1346386	478864	Thorium-228	0.853	-	pCi/g	NORMAL
A8P1-C-02-4	A8P1-C-02-4R	5-May-98	0	0.5	1346386	478864	Thorium-232	0.856	-	pCi/g	NORMAL

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-02-4	A8P1-C-02-4R	5-May-98	0	0.5	1346386	478864	Uranium, Total	14.308	-	ug/g	NORMAL
A8P1-C-02-5	A8P1-C-02-5R	5-May-98	0	0.5	1346094	478951	Radium-226	1.166	J	pCi/g	NORMAL
A8P1-C-02-5	A8P1-C-02-5R	5-May-98	0	0.5	1346094	478951	Radium-228	1.32	J	pCi/g	NORMAL
A8P1-C-02-5	A8P1-C-02-5R	5-May-98	0	0.5	1346094	478951	Thorium-228	1.301	J	pCi/g	NORMAL
A8P1-C-02-5	A8P1-C-02-5R	5-May-98	0	0.5	1346094	478951	Thorium-232	1.32	J	pCi/g	NORMAL
A8P1-C-02-5	A8P1-C-02-5R	5-May-98	0	0.5	1346094	478951	Uranium, Total	15.632	J	ug/g	NORMAL
A8P1-C-02-6	A8P1-C-02-6R	5-May-98	0	0.5	1346180	478922	Radium-226	1.252	J	pCi/g	NORMAL
A8P1-C-02-6	A8P1-C-02-6R	5-May-98	0	0.5	1346180	478922	Radium-228	1.113	J	pCi/g	NORMAL
A8P1-C-02-6	A8P1-C-02-6R	5-May-98	0	0.5	1346180	478922	Thorium-228	1.083	J	pCi/g	NORMAL
A8P1-C-02-6	A8P1-C-02-6R	5-May-98	0	0.5	1346180	478922	Thorium-232	1.113	J	pCi/g	NORMAL
A8P1-C-02-6	A8P1-C-02-6R	5-May-98	0	0.5	1346180	478922	Uranium, Total	15.966	J	ug/g	NORMAL
A8P1-C-02-7	A8P1-C-02-7R	5-May-98	0	0.5	1346272	478933	Radium-226	0.839	J	pCi/g	NORMAL
A8P1-C-02-7	A8P1-C-02-7R	5-May-98	0	0.5	1346272	478933	Radium-228	0.877	J	pCi/g	NORMAL
A8P1-C-02-7	A8P1-C-02-7R	5-May-98	0	0.5	1346272	478933	Thorium-228	0.858	J	pCi/g	NORMAL
A8P1-C-02-7	A8P1-C-02-7R	5-May-98	0	0.5	1346272	478933	Thorium-232	0.877	J	pCi/g	NORMAL
A8P1-C-02-7	A8P1-C-02-7R	5-May-98	0	0.5	1346272	478933	Uranium, Total	13.137	J	ug/g	NORMAL
A8P1-C-02-9	A8P1-C-02-9R	6-May-98	0	0.5	1346098	479016	Radium-226	1.171	-	pCi/g	NORMAL
A8P1-C-02-9	A8P1-C-02-9R	6-May-98	0	0.5	1346098	479016	Radium-228	1.007	-	pCi/g	NORMAL
A8P1-C-02-9	A8P1-C-02-9R	6-May-98	0	0.5	1346098	479016	Thorium-228	0.997	-	pCi/g	NORMAL
A8P1-C-02-9	A8P1-C-02-9R	6-May-98	0	0.5	1346098	479016	Thorium-232	1.007	-	pCi/g	NORMAL
A8P1-C-02-9	A8P1-C-02-9R	6-May-98	0	0.5	1346098	479016	Uranium, Total	13.014	-	ug/g	NORMAL
A8P1-C-03-1	A8P1-C-03-1R	7-May-98	0	0.5	1346319	478430	Radium-226	1.203	-	pCi/g	NORMAL
A8P1-C-03-1	A8P1-C-03-1R	7-May-98	0	0.5	1346319	478430	Radium-228	1.149	-	pCi/g	NORMAL
A8P1-C-03-1	A8P1-C-03-1R	7-May-98	0	0.5	1346319	478430	Thorium-228	1.125	-	pCi/g	NORMAL
A8P1-C-03-1	A8P1-C-03-1R	7-May-98	0	0.5	1346319	478430	Thorium-232	1.149	-	pCi/g	NORMAL
A8P1-C-03-1	A8P1-C-03-1R	7-May-98	0	0.5	1346319	478430	Uranium, Total	40.926	-	ug/g	NORMAL
A8P1-C-03-10	A8P1-C-03-11R	7-May-98	0	0.5	1346206	478653	Radium-226	1.043	-	pCi/g	NORMAL
A8P1-C-03-10	A8P1-C-03-11R	7-May-98	0	0.5	1346206	478653	Radium-228	0.89	-	pCi/g	NORMAL
A8P1-C-03-10	A8P1-C-03-11R	7-May-98	0	0.5	1346206	478653	Thorium-228	0.865	-	pCi/g	NORMAL
A8P1-C-03-10	A8P1-C-03-11R	7-May-98	0	0.5	1346206	478653	Thorium-232	0.89	-	pCi/g	NORMAL
A8P1-C-03-10	A8P1-C-03-11R	7-May-98	0	0.5	1346206	478653	Uranium, Total	11.61	-	ug/g	NORMAL
A8P1-C-03-12	A8P1-C-03-12R	11-May-98	0	0.5	1346414	478682	Radium-226	0.849	-	pCi/g	NORMAL
A8P1-C-03-12	A8P1-C-03-12R	11-May-98	0	0.5	1346414	478682	Radium-228	0.743	-	pCi/g	NORMAL
A8P1-C-03-12	A8P1-C-03-12R	11-May-98	0	0.5	1346414	478682	Thorium-228	0.726	-	pCi/g	NORMAL
A8P1-C-03-12	A8P1-C-03-12R	11-May-98	0	0.5	1346414	478682	Thorium-232	0.743	-	pCi/g	NORMAL
A8P1-C-03-12	A8P1-C-03-12R	11-May-98	0	0.5	1346414	478682	Uranium, Total	9.548	-	ug/g	NORMAL
A8P1-C-03-13	A8P1-C-03-13R	11-May-98	0	0.5	1346158	478810	Radium-226	1.054	-	pCi/g	NORMAL
A8P1-C-03-13	A8P1-C-03-13R	11-May-98	0	0.5	1346158	478810	Radium-228	0.968	-	pCi/g	NORMAL

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-03-13	A8P1-C-03-13R	11-May-98	0	0.5	1346158	478810	Thorium-228	0.944	-	pCi/g	NORMAL
A8P1-C-03-13	A8P1-C-03-13R	11-May-98	0	0.5	1346158	478810	Thorium-232	0.968	-	pCi/g	NORMAL
A8P1-C-03-13	A8P1-C-03-13R	11-May-98	0	0.5	1346158	478810	Uranium, Total	12.412	-	ug/g	NORMAL
A8P1-C-03-14	A8P1-C-03-14R	11-May-98	0	0.5	1346243	478775	Radium-226	1.047	-	pCi/g	NORMAL
A8P1-C-03-14	A8P1-C-03-14R	11-May-98	0	0.5	1346243	478775	Radium-228	0.993	-	pCi/g	NORMAL
A8P1-C-03-14	A8P1-C-03-14R	11-May-98	0	0.5	1346243	478775	Thorium-228	0.99	-	pCi/g	NORMAL
A8P1-C-03-14	A8P1-C-03-14R	11-May-98	0	0.5	1346243	478775	Thorium-232	0.993	-	pCi/g	NORMAL
A8P1-C-03-14	A8P1-C-03-14R	11-May-98	0	0.5	1346243	478775	Uranium, Total	16.487	-	ug/g	NORMAL
A8P1-C-03-16	A8P1-C-03-16R	11-May-98	0	0.5	1346382	478735	Radium-226	0.995	-	pCi/g	NORMAL
A8P1-C-03-16	A8P1-C-03-16R	11-May-98	0	0.5	1346382	478735	Radium-228	0.783	-	pCi/g	NORMAL
A8P1-C-03-16	A8P1-C-03-16R	11-May-98	0	0.5	1346382	478735	Thorium-228	0.761	-	pCi/g	NORMAL
A8P1-C-03-16	A8P1-C-03-16R	11-May-98	0	0.5	1346382	478735	Thorium-232	0.783	-	pCi/g	NORMAL
A8P1-C-03-16	A8P1-C-03-16R	11-May-98	0	0.5	1346382	478735	Uranium, Total	10.924	-	ug/g	NORMAL
A8P1-C-03-3	A8P1-C-03-3R	7-May-98	0	0.5	1346413	478403	Radium-226	1.068	-	pCi/g	NORMAL
A8P1-C-03-3	A8P1-C-03-3R	7-May-98	0	0.5	1346413	478403	Radium-228	1.018	-	pCi/g	NORMAL
A8P1-C-03-3	A8P1-C-03-3R	7-May-98	0	0.5	1346413	478403	Thorium-228	1.019	-	pCi/g	NORMAL
A8P1-C-03-3	A8P1-C-03-3R	7-May-98	0	0.5	1346413	478403	Thorium-232	1.018	-	pCi/g	NORMAL
A8P1-C-03-3	A8P1-C-03-3R	7-May-98	0	0.5	1346413	478403	Uranium, Total	6.383	-	ug/g	NORMAL
A8P1-C-03-4	A8P1-C-03-4R	7-May-98	0	0.5	1346307	478532	Radium-226	1.255	-	pCi/g	NORMAL
A8P1-C-03-4	A8P1-C-03-4R	7-May-98	0	0.5	1346307	478532	Radium-228	1.214	-	pCi/g	NORMAL
A8P1-C-03-4	A8P1-C-03-4R	7-May-98	0	0.5	1346307	478532	Thorium-228	1.224	-	pCi/g	NORMAL
A8P1-C-03-4	A8P1-C-03-4R	7-May-98	0	0.5	1346307	478532	Thorium-232	1.214	-	pCi/g	NORMAL
A8P1-C-03-4	A8P1-C-03-4R	7-May-98	0	0.5	1346307	478532	Uranium, Total	26.197	-	ug/g	NORMAL
A8P1-C-03-5	A8P1-C-03-5R	7-May-98	0	0.5	1346215	478578	Radium-226	1.289	-	pCi/g	NORMAL
A8P1-C-03-5	A8P1-C-03-5R	7-May-98	0	0.5	1346215	478578	Radium-228	1.164	-	pCi/g	NORMAL
A8P1-C-03-5	A8P1-C-03-5R	7-May-98	0	0.5	1346215	478578	Thorium-228	1.125	-	pCi/g	NORMAL
A8P1-C-03-5	A8P1-C-03-5R	7-May-98	0	0.5	1346215	478578	Thorium-232	1.164	-	pCi/g	NORMAL
A8P1-C-03-5	A8P1-C-03-5R	7-May-98	0	0.5	1346215	478578	Uranium, Total	14.001	-	ug/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R	7-May-98	0	0.5	1346291	478584	Radium-226	1.129	-	pCi/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R	7-May-98	0	0.5	1346291	478584	Radium-228	1.115	-	pCi/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R	7-May-98	0	0.5	1346291	478584	Thorium-228	1.104	-	pCi/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R	7-May-98	0	0.5	1346291	478584	Thorium-232	1.115	-	pCi/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R	7-May-98	0	0.5	1346291	478584	Uranium, Total	19.7	-	ug/g	NORMAL
A8P1-C-03-6	A8P1-C-03-6R-D	7-May-98	0	0.5	1346291	478584	Radium-226	1.161	-	pCi/g	DUPLICATE
A8P1-C-03-6	A8P1-C-03-6R-D	7-May-98	0	0.5	1346291	478584	Radium-228	1.085	-	pCi/g	DUPLICATE
A8P1-C-03-6	A8P1-C-03-6R-D	7-May-98	0	0.5	1346291	478584	Thorium-228	1.06	-	pCi/g	DUPLICATE
A8P1-C-03-6	A8P1-C-03-6R-D	7-May-98	0	0.5	1346291	478584	Thorium-232	1.085	-	pCi/g	DUPLICATE
A8P1-C-03-6	A8P1-C-03-6R-D	7-May-98	0	0.5	1346291	478584	Uranium, Total	20.338	-	ug/g	DUPLICATE

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-03-7	A8P1-C-03-7R	7-May-98	0	0.5	1346353	478561	Radium-226	1.172	-	pCi/g	NORMAL
A8P1-C-03-7	A8P1-C-03-7R	7-May-98	0	0.5	1346353	478561	Radium-228	1.001	-	pCi/g	NORMAL
A8P1-C-03-7	A8P1-C-03-7R	7-May-98	0	0.5	1346353	478561	Thorium-228	0.996	-	pCi/g	NORMAL
A8P1-C-03-7	A8P1-C-03-7R	7-May-98	0	0.5	1346353	478561	Thorium-232	1.001	-	pCi/g	NORMAL
A8P1-C-03-7	A8P1-C-03-7R	7-May-98	0	0.5	1346353	478561	Uranium, Total	42.905	-	ug/g	NORMAL
A8P1-C-03-9	A8P1-C-03-9R	11-May-98	0	0.5	1346161	478720	Radium-226	1.197	-	pCi/g	NORMAL
A8P1-C-03-9	A8P1-C-03-9R	11-May-98	0	0.5	1346161	478720	Radium-228	1.128	-	pCi/g	NORMAL
A8P1-C-03-9	A8P1-C-03-9R	11-May-98	0	0.5	1346161	478720	Thorium-228	1.132	-	pCi/g	NORMAL
A8P1-C-03-9	A8P1-C-03-9R	11-May-98	0	0.5	1346161	478720	Thorium-232	1.128	-	pCi/g	NORMAL
A8P1-C-03-9	A8P1-C-03-9R	11-May-98	0	0.5	1346161	478720	Uranium, Total	14.625	-	ug/g	NORMAL
A8P1-C-04-11	A8P1-C-04-11R	11-May-98	0	0.5	1346508	478238	Radium-226	1.279	-	pCi/g	NORMAL
A8P1-C-04-11	A8P1-C-04-11R	11-May-98	0	0.5	1346508	478238	Radium-228	1.104	-	pCi/g	NORMAL
A8P1-C-04-11	A8P1-C-04-11R	11-May-98	0	0.5	1346508	478238	Thorium-228	1.102	-	pCi/g	NORMAL
A8P1-C-04-11	A8P1-C-04-11R	11-May-98	0	0.5	1346508	478238	Thorium-232	1.104	-	pCi/g	NORMAL
A8P1-C-04-11	A8P1-C-04-11R	11-May-98	0	0.5	1346508	478238	Uranium, Total	7.933	UJ	ug/g	NORMAL
A8P1-C-04-12	A8P1-C-04-12R	11-May-98	0	0.5	1346589	478217	Radium-226	1.257	-	pCi/g	NORMAL
A8P1-C-04-12	A8P1-C-04-12R	11-May-98	0	0.5	1346589	478217	Radium-228	0.827	-	pCi/g	NORMAL
A8P1-C-04-12	A8P1-C-04-12R	11-May-98	0	0.5	1346589	478217	Thorium-228	0.815	-	pCi/g	NORMAL
A8P1-C-04-12	A8P1-C-04-12R	11-May-98	0	0.5	1346589	478217	Thorium-232	0.827	-	pCi/g	NORMAL
A8P1-C-04-12	A8P1-C-04-12R	11-May-98	0	0.5	1346589	478217	Uranium, Total	6.207	UJ	ug/g	NORMAL
A8P1-C-04-13	A8P1-C-04-13R	11-May-98	0	0.5	1346530	478271	Radium-226	1.337	-	pCi/g	NORMAL
A8P1-C-04-13	A8P1-C-04-13R	11-May-98	0	0.5	1346530	478271	Radium-228	1.267	-	pCi/g	NORMAL
A8P1-C-04-13	A8P1-C-04-13R	11-May-98	0	0.5	1346530	478271	Thorium-228	1.271	-	pCi/g	NORMAL
A8P1-C-04-13	A8P1-C-04-13R	11-May-98	0	0.5	1346530	478271	Thorium-232	1.267	-	pCi/g	NORMAL
A8P1-C-04-13	A8P1-C-04-13R	11-May-98	0	0.5	1346530	478271	Uranium, Total	9.313	-	ug/g	NORMAL
A8P1-C-04-14	A8P1-C-04-14R	11-May-98	0	0.5	1346317	478365	Radium-226	1.374	-	pCi/g	NORMAL
A8P1-C-04-14	A8P1-C-04-14R	11-May-98	0	0.5	1346317	478365	Radium-228	1.136	-	pCi/g	NORMAL
A8P1-C-04-14	A8P1-C-04-14R	11-May-98	0	0.5	1346317	478365	Thorium-228	1.088	-	pCi/g	NORMAL
A8P1-C-04-14	A8P1-C-04-14R	11-May-98	0	0.5	1346317	478365	Thorium-232	1.136	-	pCi/g	NORMAL
A8P1-C-04-14	A8P1-C-04-14R	11-May-98	0	0.5	1346317	478365	Uranium, Total	6.714	UJ	ug/g	NORMAL
A8P1-C-04-15	A8P1-C-04-15R	7-May-98	0	0.5	1346402	478334	Radium-226	1.384	-	pCi/g	NORMAL
A8P1-C-04-15	A8P1-C-04-15R	7-May-98	0	0.5	1346402	478334	Radium-228	1.319	-	pCi/g	NORMAL
A8P1-C-04-15	A8P1-C-04-15R	7-May-98	0	0.5	1346402	478334	Thorium-228	1.287	-	pCi/g	NORMAL
A8P1-C-04-15	A8P1-C-04-15R	7-May-98	0	0.5	1346402	478334	Thorium-232	1.319	-	pCi/g	NORMAL
A8P1-C-04-15	A8P1-C-04-15R	7-May-98	0	0.5	1346402	478334	Uranium, Total	10.567	-	ug/g	NORMAL
A8P1-C-04-2	A8P1-C-04-2R	11-May-98	0	0.5	1346565	478107	Radium-226	1.238	-	pCi/g	NORMAL
A8P1-C-04-2	A8P1-C-04-2R	11-May-98	0	0.5	1346565	478107	Radium-228	0.957	-	pCi/g	NORMAL
A8P1-C-04-2	A8P1-C-04-2R	11-May-98	0	0.5	1346565	478107	Thorium-228	0.93	-	pCi/g	NORMAL

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TABLE A-2. AREA 8, PHASE I CERTIFICATION DATA

LOCATION	SAMPLE	DATE	TOP_DEPTH	BOTTOM_DEPTH	EAST_83	NORTH_83	PARAMETER	RESULT	QUALIFIER	UNITS	QA_TYPE
A8P1-C-04-2	A8P1-C-04-2R	11-May-98	0	0.5	1346565	478107	Thorium-232	0.957	-	pCi/g	NORMAL
A8P1-C-04-2	A8P1-C-04-2R	11-May-98	0	0.5	1346565	478107	Uranium, Total	16.313	-	ug/g	NORMAL
A8P1-C-04-3	A8P1-C-04-3R	11-May-98	0	0.5	1346627	478111	Radium-226	1.407	-	pCi/g	NORMAL
A8P1-C-04-3	A8P1-C-04-3R	11-May-98	0	0.5	1346627	478111	Radium-228	1.001	-	pCi/g	NORMAL
A8P1-C-04-3	A8P1-C-04-3R	11-May-98	0	0.5	1346627	478111	Thorium-228	1.017	-	pCi/g	NORMAL
A8P1-C-04-3	A8P1-C-04-3R	11-May-98	0	0.5	1346627	478111	Thorium-232	1.001	-	pCi/g	NORMAL
A8P1-C-04-3	A8P1-C-04-3R	11-May-98	0	0.5	1346627	478111	Uranium, Total	11.241	-	ug/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R	11-May-98	0	0.5	1346460	478130	Radium-226	1.483	-	pCi/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R	11-May-98	0	0.5	1346460	478130	Radium-228	0.942	-	pCi/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R	11-May-98	0	0.5	1346460	478130	Thorium-228	0.887	-	pCi/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R	11-May-98	0	0.5	1346460	478130	Thorium-232	0.942	-	pCi/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R	11-May-98	0	0.5	1346460	478130	Uranium, Total	8.778	J	ug/g	NORMAL
A8P1-C-04-4	A8P1-C-04-4R-D	11-May-98	0	0.5	1346460	478130	Radium-226	1.421	-	pCi/g	DUPLICATE
A8P1-C-04-4	A8P1-C-04-4R-D	11-May-98	0	0.5	1346460	478130	Radium-228	0.965	-	pCi/g	DUPLICATE
A8P1-C-04-4	A8P1-C-04-4R-D	11-May-98	0	0.5	1346460	478130	Thorium-228	0.972	-	pCi/g	DUPLICATE
A8P1-C-04-4	A8P1-C-04-4R-D	11-May-98	0	0.5	1346460	478130	Thorium-232	0.965	-	pCi/g	DUPLICATE
A8P1-C-04-4	A8P1-C-04-4R-D	11-May-98	0	0.5	1346460	478130	Uranium, Total	10.56	-	ug/g	DUPLICATE
A8P1-C-04-5	A8P1-C-04-5R	7-May-98	0	0.5	1346433	478199	Radium-226	1.446	-	pCi/g	NORMAL
A8P1-C-04-5	A8P1-C-04-5R	7-May-98	0	0.5	1346433	478199	Radium-228	1.556	-	pCi/g	NORMAL
A8P1-C-04-5	A8P1-C-04-5R	7-May-98	0	0.5	1346433	478199	Thorium-228	1.614	-	pCi/g	NORMAL
A8P1-C-04-5	A8P1-C-04-5R	7-May-98	0	0.5	1346433	478199	Thorium-232	1.556	-	pCi/g	NORMAL
A8P1-C-04-5	A8P1-C-04-5R	7-May-98	0	0.5	1346433	478199	Uranium, Total	21.475	-	ug/g	NORMAL
A8P1-C-04-7	A8P1-C-04-7R	11-May-98	0	0.5	1346567	478158	Radium-226	1.192	-	pCi/g	NORMAL
A8P1-C-04-7	A8P1-C-04-7R	11-May-98	0	0.5	1346567	478158	Radium-228	1.431	-	pCi/g	NORMAL
A8P1-C-04-7	A8P1-C-04-7R	11-May-98	0	0.5	1346567	478158	Thorium-228	1.516	-	pCi/g	NORMAL
A8P1-C-04-7	A8P1-C-04-7R	11-May-98	0	0.5	1346567	478158	Thorium-232	1.431	-	pCi/g	NORMAL
A8P1-C-04-7	A8P1-C-04-7R	11-May-98	0	0.5	1346567	478158	Uranium, Total	13.06	-	ug/g	NORMAL
A8P1-C-04-8	A8P1-C-04-8R	11-May-98	0	0.5	1346644	478184	Radium-226	1.1	-	pCi/g	NORMAL
A8P1-C-04-8	A8P1-C-04-8R	11-May-98	0	0.5	1346644	478184	Radium-228	0.896	-	pCi/g	NORMAL
A8P1-C-04-8	A8P1-C-04-8R	11-May-98	0	0.5	1346644	478184	Thorium-228	0.88	-	pCi/g	NORMAL
A8P1-C-04-8	A8P1-C-04-8R	11-May-98	0	0.5	1346644	478184	Thorium-232	0.896	-	pCi/g	NORMAL
A8P1-C-04-8	A8P1-C-04-8R	11-May-98	0	0.5	1346644	478184	Uranium, Total	7.044	UJ	ug/g	NORMAL
A8P1-C-04-9	A8P1-C-04-9R	7-May-98	0	0.5	1346374	478297	Radium-226	1.3	-	pCi/g	NORMAL
A8P1-C-04-9	A8P1-C-04-9R	7-May-98	0	0.5	1346374	478297	Radium-228	1.26	-	pCi/g	NORMAL
A8P1-C-04-9	A8P1-C-04-9R	7-May-98	0	0.5	1346374	478297	Thorium-228	1.242	-	pCi/g	NORMAL
A8P1-C-04-9	A8P1-C-04-9R	7-May-98	0	0.5	1346374	478297	Thorium-232	1.26	-	pCi/g	NORMAL
A8P1-C-04-9	A8P1-C-04-9R	7-May-98	0	0.5	1346374	478297	Uranium, Total	16.533	-	ug/g	NORMAL

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Table A-3. Area 8 Phase I Certification Statistics: A8P1-C-01

Station Number	RADIONUCLIDES									
	Radium-226		Radium-228		Thorium-228		Thorium-232		Uranium, Total	
A8P1-C-01-1R	1.01	J	1.09	J	1.06	J	1.09	J	14.83	J
A8P1-C-01-2R	1.01	J	1.07	J	1.07	J	1.07	J	14.52	J
A8P1-C-01-2R-D	1.01	J	1.06	J	1.03	J	1.06	J	10.12	J
A8P1-C-01-4R	1.06	-	0.66	-	0.66	-	0.66	-	11.58	J
A8P1-C-01-5R	0.99	-	1.01	-	1.00	-	1.01	-	13.24	J
A8P1-C-01-7R	1.03	J	1.04	J	1.05	J	1.04	J	11.28	J
A8P1-C-01-8R	1.30	-	0.45	-	0.44	-	0.45	-	5.96	UJ
A8P1-C-01-9R	1.14	J	1.12	J	1.11	J	1.12	J	15.16	J
A8P1-C-01-11R	0.94	-	0.86	-	0.83	-	0.86	-	7.46	J
A8P1-C-01-12R	1.11	-	0.52	-	0.46	-	0.52	-	5.37	UJ
A8P1-C-01-13R	1.22	J	0.92	J	0.89	J	0.92	J	13.06	J
A8P1-C-01-14R	1.19	-	0.69	-	0.67	-	0.69	-	6.07	J
A8P1-C-01-16R	1.05	-	0.68	-	0.67	-	0.68	-	6.59	UJ
A8P1-C-01-17R	1.11	-	0.95	-	0.94	-	0.95	-	7.83	J
FRL	1.70		1.80		1.70		1.50		82.00	
Units	pCi/g		pCi/g		pCi/g		pCi/g		µg/g	
Confidence Level	95%		95%		95%		95%		95%	
Max Result	1.30	@	1.12	@	1.11	@	1.12	@	15.16	@
Standardized Skewness	- -		- -		- -		- -		- -	
W-Statistic Probability. *	- -		- -		- -		- -		- -	
Test Procedure	- -		- -		- -		- -		- -	
Sample Size	13		13		13		13		13	
Estimated Mean**	- -		- -		- -		- -		- -	
UCL of the Mean	- -		- -		- -		- -		- -	
Non-Parametric Prob.	- -		- -		- -		- -		- -	
Est. Mean - Pass / Fail	Pass		Pass		Pass		Pass		Pass	
2x Rule - Pass /Fail	Pass		Pass		Pass		Pass		Pass	
a posteriori Sample Size Calculation	- -		- -		- -		- -		- -	

Definition of Qualifiers
"-" = not qualified
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
"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 statistical tests performed.
(2) The maximum value of the two duplicate was used in all statistical equations.

(3) * W-Statistic Probability is the highest calculated probability of the Shapiro-Wilk W-Statistic test for the validity of the normality or lognormality assumption. The test is performed on the raw data (untransformed) data (Normal) to test for normality and the log-transformed data (LogNormal) to test lognormality.
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).

Table A-4. Area 8 Phase I Certification Statistics: A8P1-C-02

Station Number	RADIONUCLIDES									
	Radium-226		Radium-228		Thorium-228		Thorium-232		Uranium, Total	
A8P1-C-02-2R	1.23	J	1.10	J	1.09	J	1.10	J	14.66	J
A8P1-C-02-3R	1.00	-	1.01	-	1.00	-	1.01	-	16.26	-
A8P1-C-02-4R	0.97	-	0.86	-	0.85	-	0.86	-	14.31	-
A8P1-C-02-5R	1.17	J	1.32	J	1.30	J	1.32	J	15.63	J
A8P1-C-02-6R	1.25	J	1.11	J	1.08	J	1.11	J	15.97	J
A8P1-C-02-7R	0.84	J	0.88	J	0.86	J	0.88	J	13.14	J
A8P1-C-02-9R	1.17	-	1.01	-	1.00	-	1.01	-	13.01	-
A8P1-C-02-10R	0.99	-	0.67	-	0.65	-	0.67	-	27.83	-
A8P1-C-02-11R	1.09	J	1.27	J	1.26	J	1.27	J	15.96	J
A8P1-C-02-14R	1.09	J	1.12	J	1.12	J	1.12	J	17.26	J
A8P1-C-02-15R	1.04	J	0.97	J	0.97	J	0.97	J	16.48	J
A8P1-C-02-15R-D	1.03	J	1.00	J	0.97	J	1.00	J	15.92	J
A8P1-C-02-16R	1.31	J	1.10	J	1.09	J	1.10	J	19.82	J
FRL	1.70		1.80		1.70		1.50		82.00	
Units	pCi/g		pCi/g		pCi/g		pCi/g		µg/g	
Confidence Level	95%		95%		95%		95%		95%	
Max Result	1.31	@	1.32	@	1.30	@	1.32	@	27.83	@
Standardized Skewness	--		--		--		--		--	
W-Statistic Probability. *	--		--		--		--		--	
Test Procedure	--		--		--		--		--	
Sample Size	12		12		12		12		12	
Estimated Mean**	--		--		--		--		--	
UCL of the Mean	--		--		--		--		--	
Non-Parametric Prob.	--		--		--		--		--	
Est. Mean - Pass / Fail	Pass		Pass		Pass		Pass		Pass	
2x Rule - Pass /Fail	Pass		Pass		Pass		Pass		Pass	
a posteriori Sample Size Calculation	--		--		--		--		--	

Definition of Qualifiers
"-" = not qualified
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
"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 statistical tests performed.

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

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

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

Table A-5. Area 8 Phase I Certification Statistics: A8P1-C-03

Station Number	RADIONUCLIDES				
	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
A8P1-C-03-1R	1.20 -	1.15 -	1.13 -	1.15 -	40.93 -
A8P1-C-03-3R	1.07 -	1.02 -	1.02 -	1.02 -	6.38 -
A8P1-C-03-4R	1.26 -	1.21 -	1.22 -	1.21 -	26.20 -
A8P1-C-03-5R	1.29 -	1.16 -	1.13 -	1.16 -	14.00 -
A8P1-C-03-6R	1.13 -	1.12 -	1.10 -	1.12 -	19.70 -
A8P1-C-03-6R-D	1.16 -	1.09 -	1.06 -	1.09 -	20.34 -
A8P1-C-03-7R	1.17 -	1.00 -	1.00 -	1.00 -	42.91 -
A8P1-C-03-9R	1.20 -	1.13 -	1.13 -	1.13 -	14.63 -
A8P1-C-03-11R	1.04 -	0.89 -	0.87 -	0.89 -	11.61 -
A8P1-C-03-12R	0.85 -	0.74 -	0.73 -	0.74 -	9.55 -
A8P1-C-03-13R	1.05 -	0.97 -	0.94 -	0.97 -	12.41 -
A8P1-C-03-14R	1.05 -	0.99 -	0.99 -	0.99 -	16.49 -
A8P1-C-03-16R	1.00 -	0.78 -	0.76 -	0.78 -	10.92 -
FRL	1.70	1.80	1.70	1.50	82.00
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Confidence Level	95%	95%	95%	95%	95%
Max Result	1.29 @	1.21 @	1.22 @	1.21 @	42.91 @
Standardized Skewness	--	--	--	--	--
W-Statistic Probability. *	--	--	--	--	--
Test Procedure	--	--	--	--	--
Sample Size	12	12	12	12	12
Estimated Mean**	--	--	--	--	--
UCL of the Mean	--	--	--	--	--
Non-Parametric Prob.	--	--	--	--	--
Est. Mean - Pass / Fail	Pass	Pass	Pass	Pass	Pass
2x Rule - Pass /Fail	Pass	Pass	Pass	Pass	Pass
a posteriori Sample	--	--	--	--	--
Size Calculation	--	--	--	--	--

Definition of Qualifiers
"-" = not qualified
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
"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 statistical tests performed.

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

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

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

Table A-6. Area 8 Phase I Certification Statistics: A8P1-C-04

Station Number	RADIONUCLIDES									
	Radium-226		Radium-228		Thorium-228		Thorium-232		Uranium, Total	
A8P1-C-04-2R	1.24	-	0.96	-	0.93	-	0.96	-	16.31	-
A8P1-C-04-3R	1.41	-	1.00	-	1.02	-	1.00	-	11.24	-
A8P1-C-04-4R	1.48	-	0.94	-	0.89	-	0.94	-	8.78	J
A8P1-C-04-4R-D	1.42	-	0.97	-	0.97	-	0.97	-	10.56	-
A8P1-C-04-5R	1.45	-	1.56	-	1.61	-	1.56	-	21.48	-
A8P1-C-04-7R	1.19	-	1.43	-	1.52	-	1.43	-	13.06	-
A8P1-C-04-8R	1.10	-	0.90	-	0.88	-	0.90	-	7.04	UJ
A8P1-C-04-9R	1.30	-	1.26	-	1.24	-	1.26	-	16.53	-
A8P1-C-04-11R	1.28	-	1.10	-	1.10	-	1.10	-	7.93	UJ
A8P1-C-04-12R	1.26	-	0.83	-	0.82	-	0.83	-	6.21	UJ
A8P1-C-04-13R	1.34	-	1.27	-	1.27	-	1.27	-	9.31	-
A8P1-C-04-14R	1.37	-	1.14	-	1.09	-	1.14	-	6.71	UJ
A8P1-C-04-15R	1.38	-	1.32	-	1.29	-	1.32	-	10.57	-
FRL	1.70		1.80		1.70		1.50		82.00	
Units	pCi/g		pCi/g		pCi/g		pCi/g		µg/g	
Confidence Level	95%		95%		95%		95%		95%	
Max Result	1.48	@	1.56	@	1.61	@	1.56		21.48	@
Standardized Skewness	- -		- -		- -		0.55		- -	
W-Statistic Probability. *	- -		- -		- -		0.862		- -	
Test Procedure	- -		- -		- -		t-Test (LN)		- -	
Sample Size	12		12		12		12		12	
Estimated Mean**	- -		- -		- -		1.15		- -	
UCL of the Mean	- -		- -		- -		1.28		- -	
Non-Parametric Prob.	- -		- -		- -		- -		- -	
Est. Mean - Pass / Fail	Pass		Pass		Pass		Pass		Pass	
2x Rule - Pass /Fail	Pass		Pass		Pass		Pass		Pass	
a posteriori Sample	- -		- -		- -		4		- -	
Size Calculation	- -		- -		- -		Pass		- -	

Definition of Qualifiers
"-" = not qualified
"J" = estimated result
"UJ" = not detected, estimated
"U" = not detected
"NV" = not validated
"UNV" = not detected, not validated

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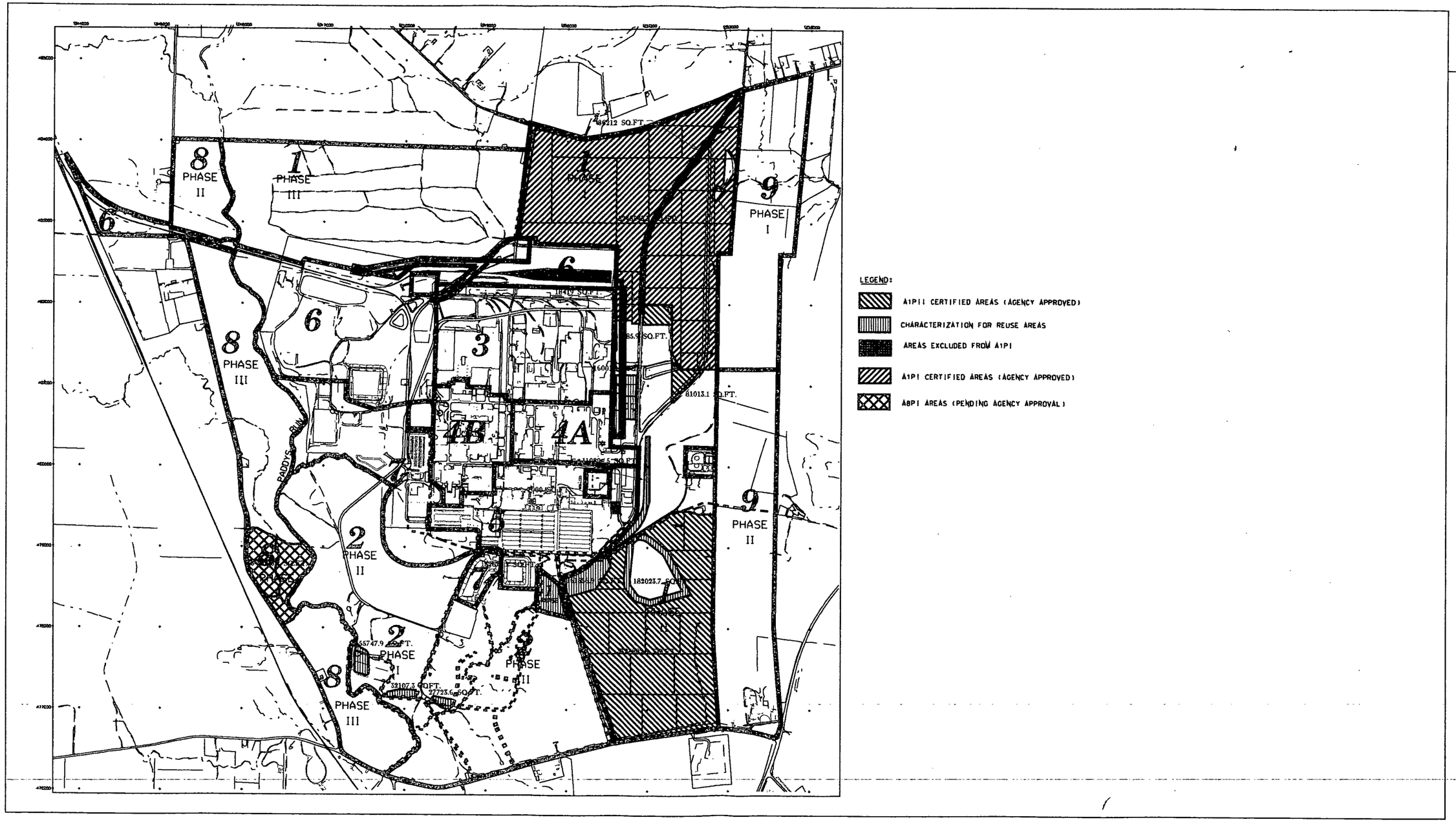
(4) ** Estimated Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median).



DRAFT

SCALE
1200 600 0 1200 FEET

v:\2fm12\dgn\bmp\5csv1-01.dgn STATE PLANAR COORDINATE SYSTEM 1983 27-JUL-1998

FIGURE 1-3. FEMP CONTROLLED CERTIFICATION MASTER MAP