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JAN 12 2006

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DOE-0054-06

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Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF THE FINAL CERTIFICATION REPORT FOR AREA 4B - PART ONE

References:
1) Letter, J. Saric to J. Reising, "Area 4B-Part One Certification Report," dated December 5, 2005
2) Letter, T. Schneider to J. Reising, "Approval - Certification Report for Area 4B - Part One," dated January 5, 2006

Enclosed for your information is the final Certification Report for Area 4B - Part One. As noted in the references above, both the U.S. Environmental Protection Agency and the Ohio Environmental Protection Agency have approved the draft report.

If you have any questions or require additional information, please contact me at (513) 648-3139.

Sincerely,

Johnny Reising

Johnny W. Reising
Director

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6094

CERTIFICATION REPORT FOR AREA 4B - PART ONE

FERNALD CLOSURE PROJECT
FERNALD, OHIO

JANUARY 2006

U.S. DEPARTMENT OF ENERGY

20810-RP-0008
REVISION 0
FINAL

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LIST OF ACRONYMS AND ABBREVIATIONS

ASCOC	area-specific constituent of concern
ASL	analytical support level
BTV	benchmark toxicity value
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
CRDL	Contract Required Detection Limit
CU	certification unit
D&D	Decontamination and Demolition
DHWM	Division of Hazardous Waste Management
DOE	U.S. Department of Energy
ECOC	ecological constituent of concern
EPA	U.S. Environmental Protection Agency
FCP	Fernald Closure Project
FPA	Former Production Area
FRL	final remediation level
FTF	Fire Training Facility
GCN	General Cleanup Numbers
HAMDC	highest allowable minimum detectable concentration
HWMU	hazardous waste management unit
ICP-AES	inductively coupled plasma-atomic emission spectroscopy
ICP-MS	inductively coupled plasma-mass spectrometry
MDC	Main Drainage Corridor
µg/g	micrograms per gram
MDL	minimum detection level
mg/kg	milligrams per kilogram
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OU	Operable Unit
PCB	polychlorinated biphenyl
pCi/g	picoCuries per gram
ppm	parts per million
PSP	Project Specific Plan
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
STP	Sewage Treatment Plant
SVOC	semi-volatile organic compound
TAL	Target Analyte List

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

TPU	total propagated uncertainty
UCL	upper confidence limit
UST	underground storage tank
V/FCN	Variance/Field Change Notice
V&V	verification and validation
VOC	volatile organic compound
WAC	waste acceptance criteria
yd^3	cubic yards

EXECUTIVE SUMMARY

This Certification Report presents the information and data used by the U.S. Department of Energy (DOE) to determine that soils in Area 4B - Part One meet established final remediation levels (FRLs). Area 4B - Part One is located in the southwest quadrant of the Former Production Area of the Fernald Closure Project (FCP). Predominant structures formerly located in Area 4B - Part One included Plant 2/3, Plant 8, and the Pilot Plant. The majority of Area 4B - Part One is located within a high leachability zone where the FRL for total uranium is 20 milligrams per kilograms (mg/kg). As a conservative measure, 20 mg/kg was used as the FRL for total uranium across Area 4B.

This Certification Report includes details of the certification sampling, analysis, and validation that took place in Area 4B - Part One. The certification of Area 4B was reduced due to the location of the Main Drainage Corridor and the field location of the run-on/run-off control ditches. Figure 1-1 depicts the original layout of Area 4B and Figure 1-2 depicts the area in Area 4B that is to be certified.

Consistent with the Sitewide Excavation Plan (DOE 1998), these areas underwent predesign, excavation, and precertification activities, including the use of real-time instrumentation as well as physical sampling and analysis. As a result of these activities, it was determined that no further remediation was necessary prior to certification.

All Area 4B - Part One certification units (CUs) were sampled and statistical analysis was conducted where necessary to ensure the certification criteria was met. As discussed in the Certification Design Letter and Certification Sampling Project Specific Plan for Area 4B - Part One (DOE 2005) the certification criteria are that the average primary area-specific constituent of concern (ASCOC) concentrations within a CU are below-FRLs at a 95 percent upper confidence level (UCL, 90 percent UCL for secondary ASCOCs), and that no certification result is greater than twice the FRL (the hotspot criterion).

Although there were no reported results greater than two times the FRL in Area 4B, CUs A4B-C02 and A4B-C06 failed one of the certification requirements (*a posteriori Sample* size was greater than the number of samples collected) for the primary ASCOC total uranium. Although the hot spot criterion was met with all uranium results in these CUs (i.e., less than two-times the FRL), the entire sub-CUs for each of these CUs with the above-FRL results were excavated and re-sampled as a conservative approach to decrease the residual uranium levels. Following the re-sample, the pre-excavated data was replaced with the new data.

Similarly, CU 6 had one technetium-99 result greater than the waste acceptance criteria (WAC). Technetium-99 presents a unique case during certification as the On-Site Disposal Facility WAC is less than the FRL. Although this result would not have caused a failure when compared to the FRL, the above-WAC hotspot was delineated and excavated as a conservative measure, and another sample was collected to replace the pre-excavation sample. The pre-excavated above-WAC data was replaced with the new data.

Upon completion of final certification statistics, all of the Area 4B - Part One CUs pass the certification criteria. Additionally, following the protocols of the Closure Plan Review Guidance for Resource Conservation and Recovery Act Facilities (OEPA 2004), written by the Ohio Environmental Protection Agency Division of Hazardous Waste Management all Hazardous Waste Management Units within this area are closed. On the basis of this reported information and supporting project files, DOE has determined that no additional remedial actions are required in this portion of the site. The area will be considered certified when the U.S. Environmental Protection Agency and the Ohio Environmental Protection Agency concur that certification criteria have been met. DOE intends to proceed with final land use activities as outlined in the Natural Resource Restoration Plan (DOE 2002a).

DOE has restricted access to certified areas in order to maintain their integrity prior to final land use development. FCP procedure EP-0008 has been developed to implement a process to protect certified areas from becoming re-contaminated.

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 soils in Area 4B - Part One meet established final remediation levels (FRLs). Area 4B, as defined for this certification effort, is located in the southern half of the Former Production Area (FPA) of the Fernald Closure Project (FCP) and consists of the former Lab Building, Plants 2/3, Plant 8, Pilot Plant, roads, perimeter areas, etc. On the basis of this reported information and supporting project files, DOE has determined that no additional remedial actions are required in this portion of the site.

1.2 BACKGROUND

In the Operable Unit (OU) 5 Record of Decision (ROD, DOE 1996a), DOE made a commitment to excavate contaminated soil that exceeds health-based FRLs. The excavated material may be disposed of at the On-Site Disposal Facility (OSDF) or at an off-site disposal facility if it does not meet OSDF waste acceptance criteria (WAC). The OU5 Remedial Investigation Report (RI, DOE 1995a) defined the extent of above-FRL soil contamination and, in general, indicated widespread contamination occurring in approximately 430 acres of the 1,050-acre FCP.

In the OU5 Remedial Action Work Plan (RAWP, DOE 1996b), DOE agreed to prepare a Sitewide Excavation Plan (SEP, DOE 1998) that defined the overall approach to cleaning up soil and at- and below-grade debris in accordance with the OU2 ROD (DOE 1995b), OU3 ROD (DOE 1996c), and OU5 ROD.

In the SEP, the FCP was divided into distinct remedial areas and phases for soil remediation, based on the operable units' remediation schedule. After all necessary remediation is completed within each area/phase, the soil is certified as having attained all clean up goals (i.e., FRLs). The general approach for the removal of contaminated soil and debris in Area 4B - Part One followed "Excavation Approach D - Excavation Following D&D in the Former Production Area, STP and FTF," as described in Section 4.4 of the SEP.

1.3 SCOPE AND AREA DESCRIPTION

The scope of this Certification Report includes details of certification sampling, analysis and validation that took place in Area 4B - Part One. The Area 4B certification area has been reduced from the original boundary of Area 4B due to the location of the Main Drainage Corridor (MDC) and the field location of the run-on/run-off control ditches, which were based on the current area topography. Figure 1-1 depicts the original layout of Area 4B and Figure 1-2 depicts the area in 4B (i.e., Area 4B - Part One) that is to be certified under this Certification Report.

Area 4B - Part One is located in the southwest quadrant of the FPA and is bound by Area 3B to the north, "B" Street to the east, 1st Street to the south, and "A" Street to the west, as shown on Figure 1-1. Predominant structures formerly located in Area 4B - Part One included Plants 2, 3, 8, and Pilot Plant. The majority of Area 4B - Part One also includes a high leachability zone where the total uranium FRL is 20 milligrams per kilogram (mg/kg); Underground Storage Tanks (UST) 11, 12, and 13; and Hazardous Waste Management Unit (HWMU) 4, 18, 28, 46, 47, 49, and 50 as shown on Figure 1-3. The entire Area 4B is approximately 25 acres. However, as discussed above, only approximately 15.1 acres will be included in the scope of this Certification Report (Figure 1-2). The portion of the original Area 4B that is outside of the perimeter of Area 4B - Part One, to the south and to the west outside of the run-on control ditches, as well as HWMUs 5, 17, and 22 will be included in the scope of another certification effort to be defined at a later time.

1.4 OBJECTIVES

The objectives of this Certification Report are:

- Summarize the precertification and remedial activities,
- Describe the analytical methods, data validation processes, data reduction and statistical processes used to support the certification process,
- Present certification sampling results for all certification units (CUs),
- Present the statistical analysis showing that all CUs have passed the certification criteria, including FRL attainment and hotspot criteria, and
- Describe access controls implemented to prevent recontamination.

1.5 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: Historical data evaluation, precertification, 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 Failing Preliminary Certification Statistics

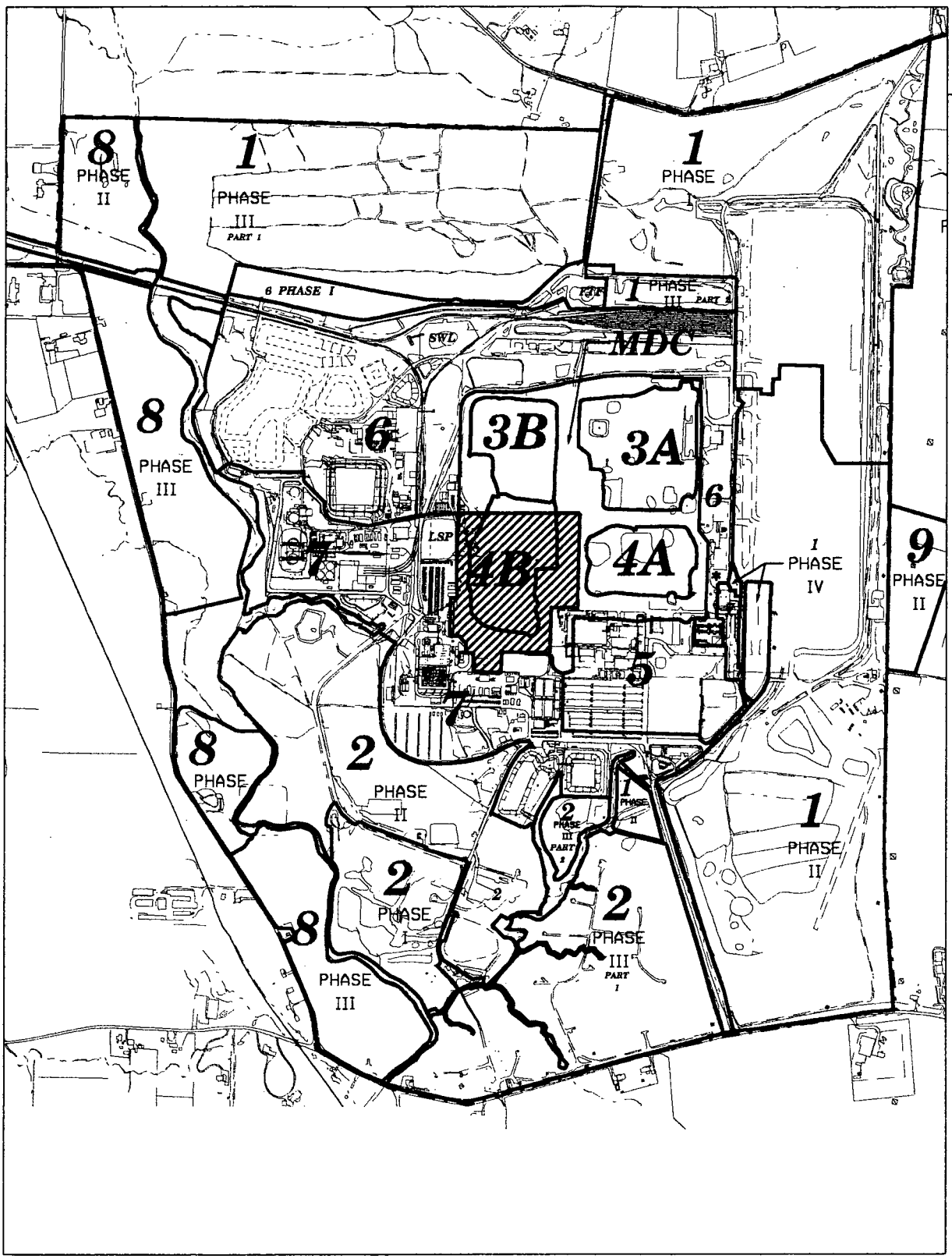
Appendix B Certification Samples, Analytical Results and Final Statistics Tables

Appendix C HWMUs 04, 18, 28, 46, 47, 49, and 50 RCRA Calculations

Appendix D Variances/Field Change Notices (V/FCNs) for the Area 4B - Part One for the Certification Design Letter (CDL) and Certification Sampling Project Specific Plan (PSP, DOE 2005)

1.6 FCP MASTER CERTIFICATION MAP

In order to track certification and characterization for reuse areas at the FCP, DOE updates a controlled map (Figure 1-4) showing the status of the soil remediation areas and phased areas with all Certification Reports. This map has been updated to include certification of Area 4B - Part One.



LEGEND:

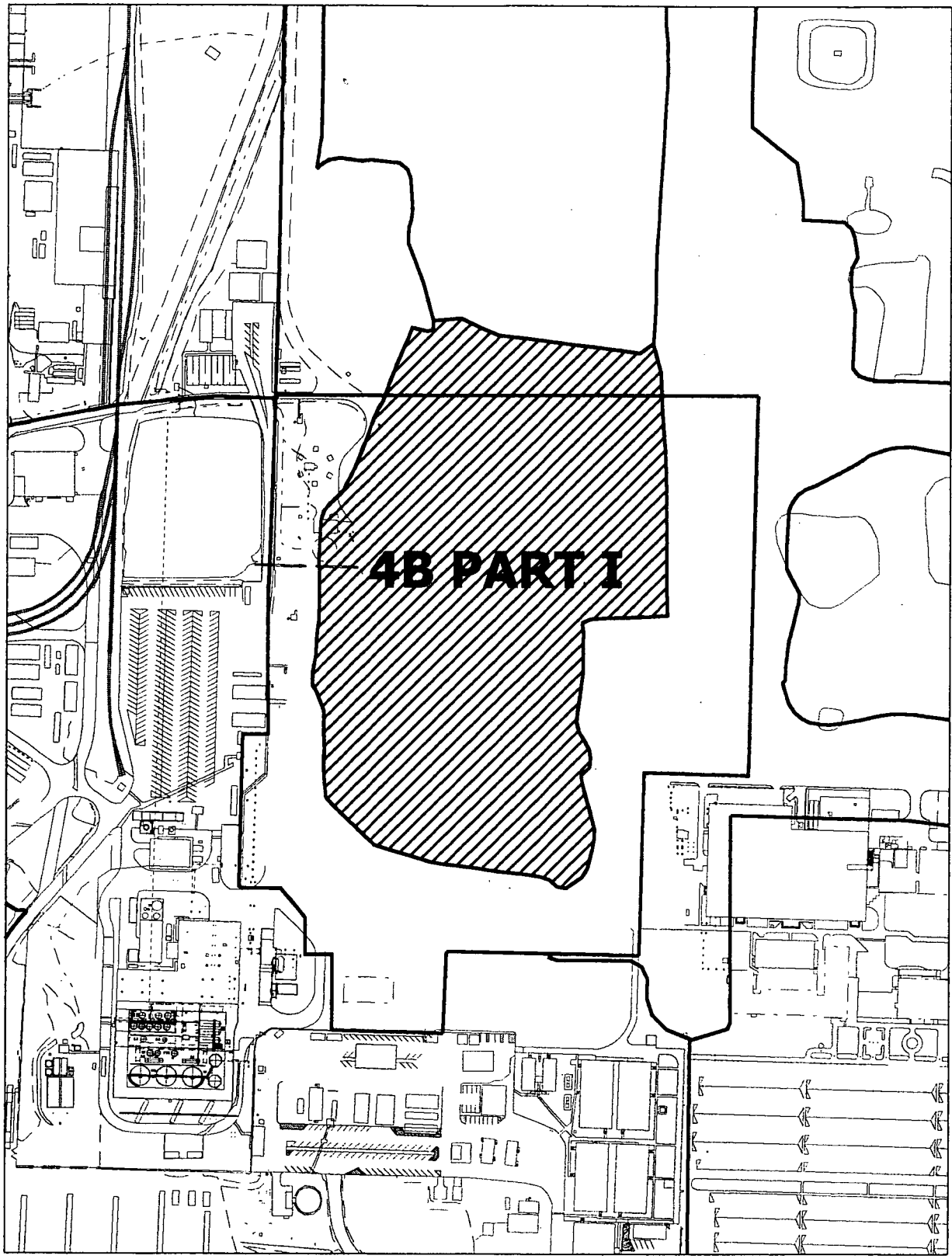
—·—·— FCP BOUNDARY

SCALE

1200 600 0 1200 FEET

FIGURE 1-1. AREA 4B LOCATION MAP

v:\02fm12\dgn\4b_008.dgn
STATE PLANAR COORDINATE SYSTEM 1983
17-NOV-2005



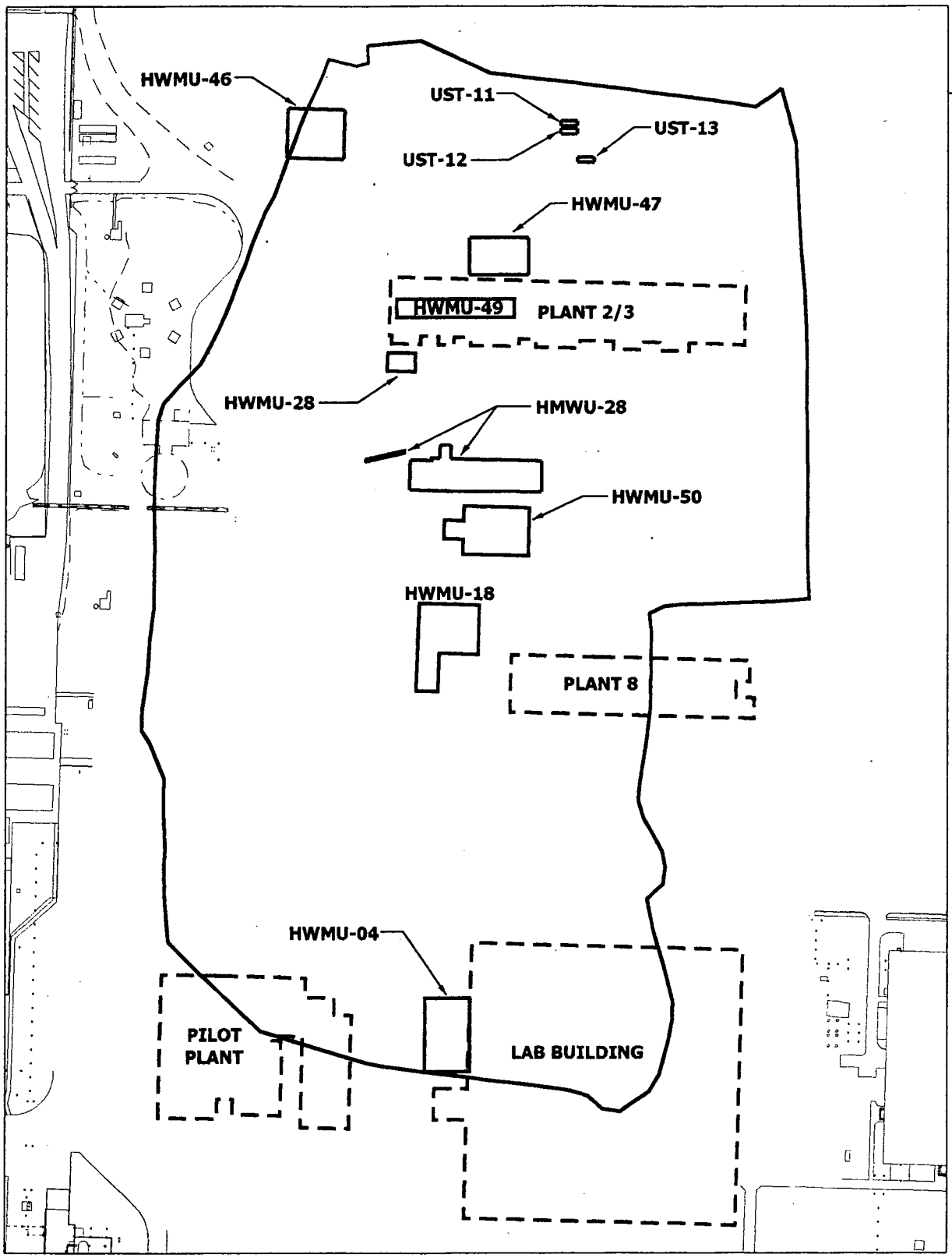
LEGEND:

SCALE

300 150 0 300 FEET

FIGURE 1-2. AREA 4B - PART ONE CERTIFICATION AREA

v:\2fm12\dgn\4b_010.dgn STATE PLANAR COORDINATE SYSTEM 1983 17-NOV-2005



LEGEND:

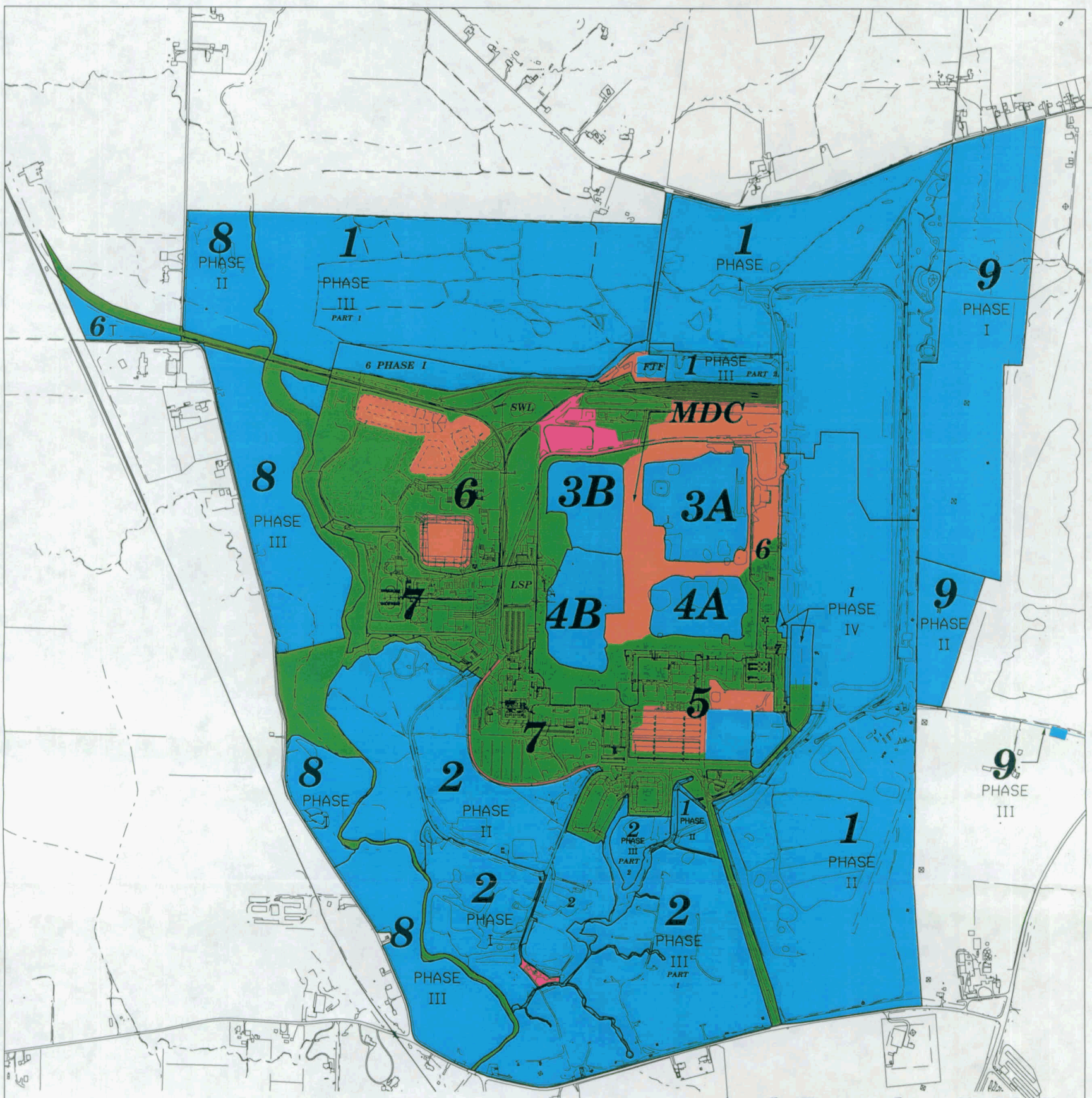
SCALE

160 80 0 160 FEET

STATE PLANAR COORDINATE SYSTEM 1983

17-NOV-2005

FIGURE 1-3. AREA 4B PART ONE HISTORICAL FEATURES



revised December 5, 2005

AREAS	TOTAL ACRES	APPROVED CERT. ACRES	CERT. ACRES IN PROGRESS	REMEDIATION ACRES IN PROGRESS	PREDESIGN ACRES IN PROGRESS	REMAINING ACRES
AREA 1	395.8	394.0	0	1.7	0	0
AREA 2	174.7	173.9	0	0	0.8	0
AREA 3A/4A	29.3	29.3	0	0	0	0
AREA 3B/4B	26.2	26.2	0	0	0	0
AREA 5	26.9	7.6	8.4	11.0	0	0
AREA 6	140.8	18.8	31.9	83.4	6.8	0
AREA 7	85.1	0	1.2	84.0	0	0
AREA 8	98.9	98.9	0	0	0	0
MDC	39.0	0	17.9	21.1	0	0
PR/SSOD/PPDD	32.7	7.0	0	25.8	0	0
TOTAL ON SITE	1049.4	755.6	59.3	227.0	7.6	0
AREA 9	85.6	85.6	0	0	0	0
TOTAL OFF SITE	85.6	85.6	0	0	0	0

* ONSITE AREA9 REMAINING ACRES INCLUDE THE DISSOLVED OXYGEN FACILITY AREA. THE INTERIM LEACHATE LINE CORRIDOR IS INCLUDED IN AREA 6.

AREA 10 INCLUDES PIPELINES RELATED TO GROUNDWATER REMEDIATION AND OTHER UTILITIES NOT SPECIFICALLY LISTED.

SCALE

1100 550 0 1100 FEET

FIGURE 1-4. FCP CONTROLLED CERTIFICATION MAP

v:\5cj31\dgn\mp\certmap5.dgn

STATE PLANAR COORDINATE SYSTEM 1983

16-NOV-2005

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2.0 CERTIFICATION APPROACH

2.1 CERTIFICATION STRATEGY

This section summarizes the area-specific constituent of concern (ASCOC) selection process and the certification approach, including CU establishment, sampling design, and statistical analysis. The general certification strategy is described in Section 3.4 of the SEP, and the specific strategy for Area 4B - Part One is described in the CDL and Certification Sampling PSP for Area 4B - Part One.

2.1.1 Area-Specific Constituents of Concern

Total uranium, radium-226, radium-228, thorium-228 and thorium-232 are sitewide primary constituents of concern (COCs) and were retained as ASCOCs for this remediation effort. Secondary ASCOCs for Area 4 are listed in the SEP; however, some COCs were not retained for Area 4B - Part One based on the area investigations.

2.1.2 ASCOC Selection Criteria

The selection process for retaining ASCOCs for a remediation area is driven by applying a set of decision criteria. A soil contaminant is retained as an ASCOC if:

- It is listed as a soil COC in the OU5 ROD and, it is listed as an ASCOC in Table 2-7 of the SEP for the Remediation Area of interest;
- It is listed as a COC for a HWMU or UST that lies within the certification area boundary;
- It can be traced to site use in the remediation area of interest, either through process knowledge or known release of the constituent to the environment;
- Analytical results indicated that a contaminant is present above its FRL, and the above-FRL concentrations are not attributed to false positives or elevated Contract Required Detection Limits (CRDLs);
- Physical characteristics of the contaminant, such as degradation rate or volatility, indicated it is likely to persist in the soil between time of release and remediation; or
- The contaminant is one of the sitewide primary COCs (total uranium, radium-226, radium-228, thorium-238, and thorium-232).

Table 2-1 lists the secondary ASCOCs identified in Table 2-1 of the SEP. Using the above process, the ASCOCs were refined to those listed in Table 2-2, which presents all of the ASCOCs listed in Table 2-1 as well as the applicable UST and HWMU COCs identified in Table 2-1 of the SEP. Additionally, Table 2-2 lists the justification for retaining or not retaining the ASCOCs and the ecological COCs for each CU in Area 4B - Part One.

Table 2-7 of the SEP also identifies antimony as an ecological COC in Area 4 based on a screening process presented in Appendix C of the SEP. However, antimony was not specifically identified for Area 4B.

2.1.3 ASCOC Selection Process

Each COC on the Remediation Area 4 ASCOC list (Table 2-1) was evaluated for its relevance to Area 4B. Table 2-2 presents the reasoning for either retaining or eliminating the ASCOCs listed in Table 2-1. Table 2-2 also lists the applicable HWMU and UST COCs listed in Table 2-1 and Table 2-2 of the SEP.

2.2 CERTIFICATION APPROACH

The certification design for Area 4B - Part One followed the general approach outlined in Section 3.4 of the SEP. The design for Area 4B - Part One is depicted on Figure 2-1 and the sample locations are depicted in Figures 2-2 through 2-11. The five primary ASCOCs (total uranium, radium-226, radium-228, thorium-228, and thorium-232), technetium-99, beryllium, and aroclor-1254 were retained in each CU. Additional COCs are identified for specific CUs within the certification area as well as unique COCs for the HWMUs and USTs.

Many factors were taken into consideration when determining the boundaries for each CU within Area 4B - Part One. These factors included: areas defined as high leachability zones, historical land use, proximity to other areas of the site, residual COC data, and previous existence of USTs and HWMUs. Additionally, since Area 4B - Part One falls within the FPA, it is considered to be an impacted area, and was therefore comprised of Group 1 CUs to allow for more concentrated sampling and ensure excavation activities had no effect on the soil.

2.2.1 Area 4B - Part One Certification Unit Design

Area 4B - Part One consists of 22 CUs, 11 of which are Group 1 CUs that cover all of Area 4B - Part One. The remaining 11 CUs are either USTs or HWMUs as shown in Figure 2-1. A significant portion of Area 4B - Part One falls within the high leachability zone; therefore, all CUs were treated as being within the zone.

Due to the presence of seven HWMUs (4, 18, 28, 46, 47, 49, and 50) in Area 4B, this certification includes the demonstration of soil FRL attainment and HWMU closure. Per Section 2.2.5 of the SEP:

- Each HWMU footprint will form a distinct CU, with the exception of HWMU 28, which formed two distinct CUs
- At least eight samples will be collected from the excavated base and sidewalls for each HWMU/CU

- Samples will be analyzed for the COCs identified for each particular HWMU in Table 2-1 of the SEP. If the HWMU was discovered during remediation, the samples will be analyzed for the COCs that were defined following discovery.

Methyl ethyl ketone (2-butanone), which is a COC for HWMU 18, does not have a FRL. However, eight samples were collected for methyl ethyl ketone analysis and the Residential Generic Cleanup Number (23.5 mg/kg) was used in place of a FRL. This number is listed on the Closure Plan Review Guidance for Resource Conservation and Recovery Act (RCRA) Facilities (OEPA 2004), written by the Ohio Environmental Protection Agency (OEPA) Division of Hazardous Waste Management. The Residential Generic Cleanup Number was used for the statistical analysis described in the SEP if any residual methyl ethyl ketone was detected in the samples collected for this analyte.

Due to the presence of USTs 11, 12, and 13 in Area 4B - Part One, the certification effort must include demonstration of soil FRL attainment and UST closure. Per Section 2.2.6 of the SEP:

- Each UST footprint will form a distinct CU
- At least eight samples will be collected from the excavated base and sidewalls for each UST
- Samples will be analyzed for the COCs identified for each particular UST in Table 2-2 of the SEP.

Methyl isobutyl ketone, which is a COC for USTs 11 and 13, does not have a FRL. However, eight samples were collected from each UST for methyl isobutyl ketone analysis and the Residential Generic Cleanup Number (8.44 mg/kg) was used in place of a FRL. The Residential Generic Cleanup Number was also used for statistical analysis if any residual methyl isobutyl ketone was detected in the samples collected for this analyte.

2.2.2 Sample Selection Process

For the 11 Group 1 CUs, the selection of certification sampling locations was conducted according to Section 3.4.2 of the SEP. Each CU was first divided into 16 approximately equal sub-CUs. Sample locations were then generated by randomly selecting an easting and northing coordinate within the boundaries of each sub-CU, then testing those locations against the minimum distance criteria for the CU. If the minimum distance criteria were not met, an alternative random location was selected for that sub-CU, and all the locations were re-tested. This process continued, until all 16 random locations met the minimum distance criteria. The sub-CUs and planned certification sampling locations are shown on Figure 2-2. Four of the 16 sample locations (one location from each quadrant of the CU) were designated with a "V," indicating archive sample locations. One sample location in the CU was designated with a "D," indicating a field duplicate sample collection location. Samples were collected for analysis from the 0 to 6-inch interval at 12 of the 16 locations in each CU. The four samples designated as "archive" were not planned to be collected unless they were needed for additional analysis.

The selection of sampling locations for the eight HWMU and three UST CUs was also conducted according to Section 3.4.2 of the SEP however, there were only eight sample locations (with the exception of CU 3) and no archive sample locations were designated. HWMU 28 was divided into two CUs (CU 3 and CU 22) due to its size and that it covers three distinct areas. Ten samples were collected from CU 3 and eight samples were collected from CU 22. Samples were collected for analysis from the 0 to 6-inch interval at all locations.

Prior to commencement of certification sampling field activities, all certification sample locations were surveyed and field verified to make sure no surface obstacles would prevent collection at the planned location. It was not necessary to move any planned certification sample locations.

2.2.3 Certification Sampling

Samples were collected for analysis from 0 to 6 inches at 12 of the 16 locations in each Group 1 CU and all sampling locations within the HWMU and UST CUs. The four samples designated as "archive" were not collected because they were not needed for additional analysis.

2.2.4 Statistical Analysis

Two criteria must be met for the CU to pass certification. If the data distribution is normal or lognormal, the first criterion compares the 95 percent upper confidence limit (UCL) on the mean of each primary COC to its FRL, or the 90 percent UCL on the mean of each secondary ASCOC. On an individual CU basis, any ASCOC with the 95 percent UCL (for primary ASCOCs) or 90 percent UCL (for secondary ASCOCs) above the FRL results in that CU failing certification. If the data distribution is not normal or lognormal, the appropriate nonparametric approach discussed in Appendix G of the SEP will be used to evaluate the second criterion; the *a posteriori* test will be performed to determine whether the sample size is sufficient for a meaningful conclusion of this comparison. The second criterion is the hotspot criterion, which states that primary or secondary ASCOC results must not exceed two times the FRL. When the given UCL on the mean for each COC is less that its FRL and the hotspot criterion is met, the CU will be considered certified.

In the event that a CU passes the *a posteriori* test but fails certification, the following two scenarios will be evaluated: 1) localized contamination, and 2) widespread contamination. Details on the evaluation and responses to these possible outcomes are provided in Section 3.4.5 of the SEP.

TABLE 2-1
AREA 4 ASCOC LIST[a]

ASCOC	FRL/(*BTV*)[b]
Radionuclides	
Total Uranium[c]	20 mg/kg
Radium-226	1.7 pCi/g
Radium-228	1.8 pCi/g
Thorium-228	1.7 pCi/g
Thorium-232	1.5 pCi/g
Cesium-137	1.4 pCi/g
Plutonium-238	78 pCi/g
Strontium-90	14 pCi/g
Technetium-99	30.0 pCi/g
Thorium-230	280 pCi/g
Organic	
Aroclor-1254	0.13 mg/kg
Aroclor-1260	0.13 mg/kg
Benzo(a)pyrene	2.0 mg/kg
Bromodichloromethane	4.0 mg/kg
Dieldrin	0.015 mg/kg
Fluoride	78,000 mg/kg
Tetrachloroethene	3.6 mg/kg
Metals	
Arsenic	12.0 mg/kg
Beryllium	1.5 mg/kg
Lead	400 mg/kg
Ecological	
Antimony	96 mg/kg/(*10 mg/kg*)

[a] As listed in Table 2-7 of the SEP.

[b] Benchmark toxicity value (BTV) applies to Ecological COCs.

[c] The total uranium FRL is lower in the defined high leachability zones.

pCi/g - picoCuries per gram

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TABLE 2-2
ASCOC LIST FOR AREA 4B - PART ONE

ASCOC	Retained as ASCOC?	Justification	CU(s)
Radionuclides			
Total Uranium	Yes	Primary Radionuclide	All
Radium-226	Yes	Primary Radionuclide	All
Radium-228	Yes	Primary Radionuclide	All
Thorium-228	Yes	Primary Radionuclide	All
Thorium-232	Yes	Primary Radionuclide	All
Cesium-137	No	Not detected at concentrations above the FRL	None
Plutonium-238	No	Not detected at concentrations above the FRL	None
Strontium-90	No	Only one above-FRL concentrations detected within Area 4B. This single exceedance was located within the excavation footprint in the 0 to 0.5-foot interval and will therefore not be retained as a secondary COC.	None
Technetium-99	Yes	Above-FRL and above-WAC concentrations within Area 4B	All
Thorium-230	No	Only one above-FRL concentrations detected within Area 4B. This single exceedance was located within the excavation footprint in the 0 to 0.5-foot interval and will therefore not be retained as a secondary COC.	None
Organic			
1,1,1-Tricholoroethane	Yes	HWMU 28, UST 11, and UST 13 specific COC	H28, U11, U13
Aroclor-1254	Yes	Above-FRL concentrations within Area 4B	All
Aroclor-1260	No	Not detected at concentrations above the FRL	None
Benzo(a)pyrene	No	Not detected at concentrations above the FRL	None
Benzene	Yes	HWMU 4, UST 11, 12, and 13 specific COC	H04, U11, U12, U13
Bromodichloromethane	No	Not detected at concentrations above the FRL	None
Dieldrin	No	Not detected at concentrations above the FRL	None
Ethylbenzene	Yes	UST 11 and 13 specific COC	U11, U13
Fluoride	No	Not detected at concentrations above the FRL	None
Methyl Ethyl Ketone	Yes	HWMU 18 specific COC	H18
Methyl Isobutyl Ketone	Yes	UST 11 and 13 specific COC	U11, U13
Tetrachloroethene	Yes	Not detected at concentrations above the FRL; HWMU 4 specific COC	H04
Toluene	Yes	HWMU 4, UST 11, and UST 13 specific COC	H04, U11, U13
Xylene	Yes	HWMU 18, UST 11, and UST 13 specific COC	H18, U11, U13

TABLE 2-2
ASCOC LIST FOR AREA 4B - PART ONE

ASCOC	Retained as ASCOC?	Justification	CU(s)
Metals			
Arsenic	Yes	UST 11 and UST 13 specific COC. Two above-FRL concentrations detected within Area 4B	U11, U13
Barium	Yes	HWMU 46, 47, 49, 50, UST 11, and 13 specific COC	H46, H47, H49, H50, U11, U13
Beryllium	Yes	Above-FRL concentrations detected within Area 4B	All
Chromium	Yes	HWMU 46, 47, 49, 50, UST 11, and 13 specific COC	H46, H47, H49, H50, U11, U13
Lead	Yes	One above-FRL concentrations detected within Area 4B. HWMU 18, 28, 46, 47, 49, 50, UST 11, 12, and 13 specific COC	H18, H28, H46, H47, H49, H50, U11, U12, U13
Mercury	Yes	One above-FRL concentrations detected within Area 4B. HWMU 46, 47, 49, 50, UST 11 and 13 specific COC	H46, H47, H49, H50, U11, U13
Selenium	Yes	UST 11 and 13 specific COC	U11, U13
Ecological			
Antimony	No	Not an ECOC in Area 4B - Part One per Appendix C of the SEP	None

ECOC - ecological constituent of concern

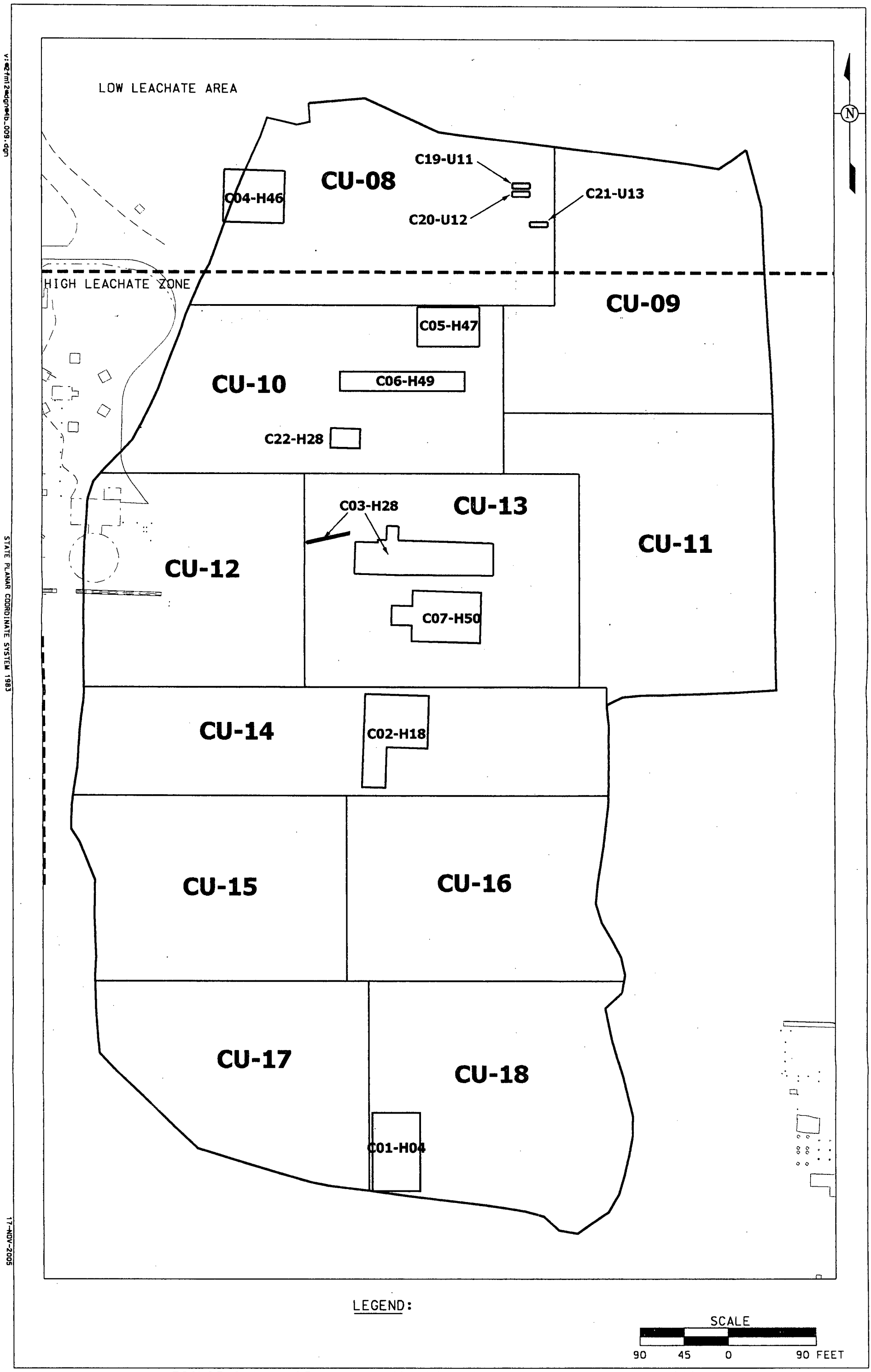
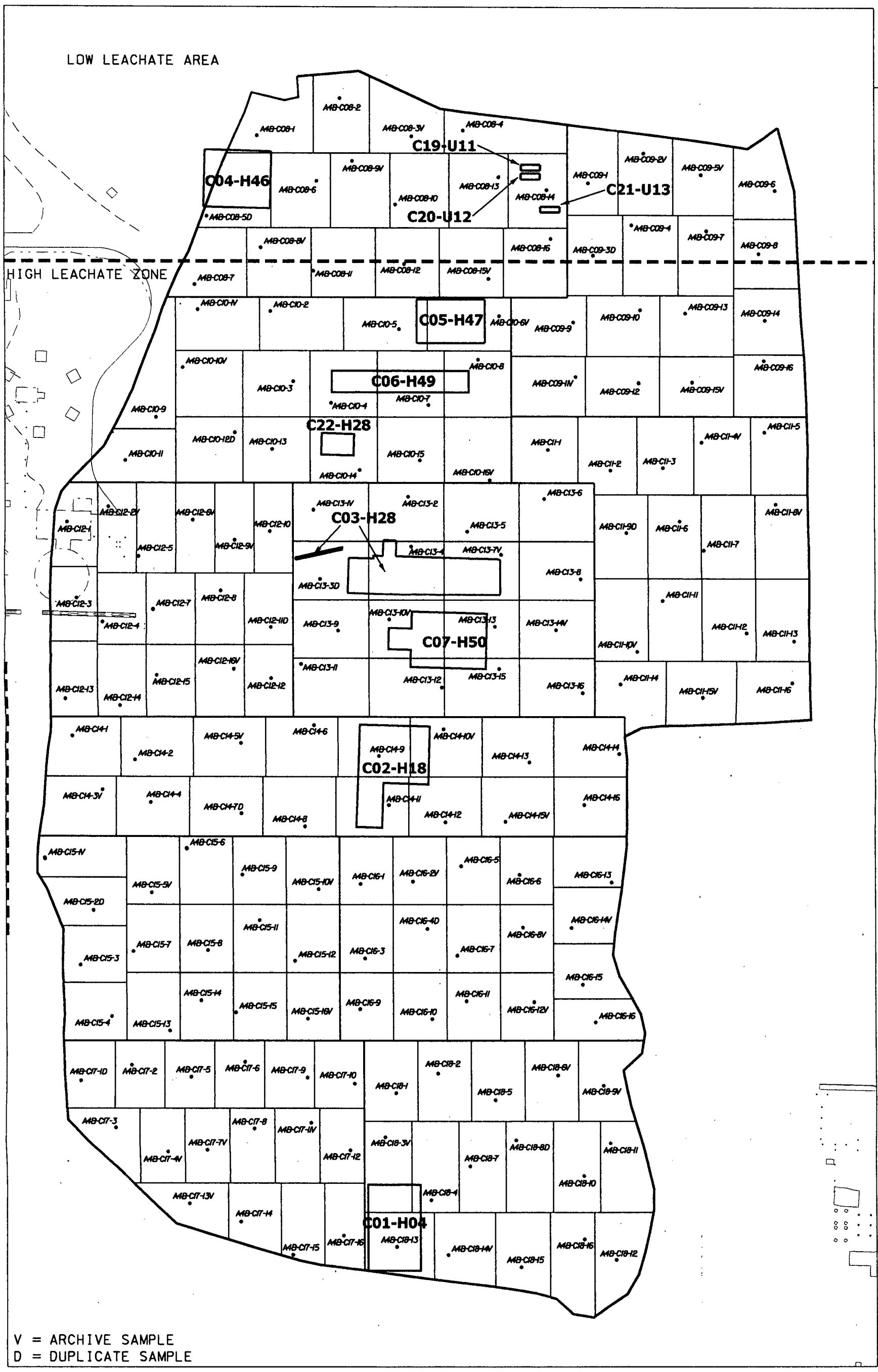


FIGURE 2-1. AREA 4B - PART ONE CERTIFICATION AREA BOUNDARIES



LEGEND:

• .. SAMPLE LOCATION

SCALE

90 45 0 90 FEET

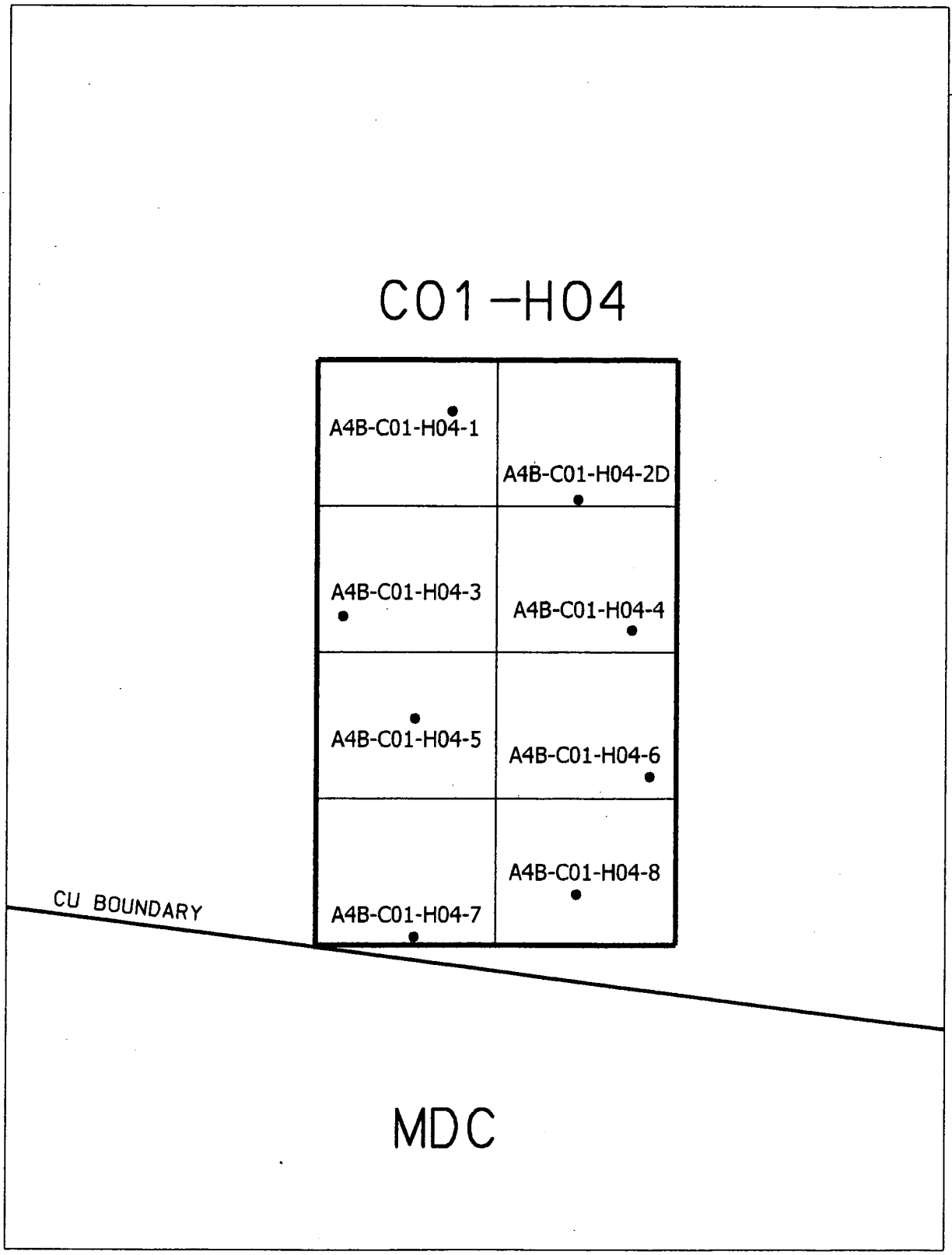
FIGURE 2-2. CERTIFICATION SAMPLING LOCATIONS FOR CU08 THROUGH CU18

STATE PLANAR COORDINATE SYSTEM 1983

17-NOV-2005

v:\2fm12\dgn\4b_007cu.dgn

6094



LEGEND:

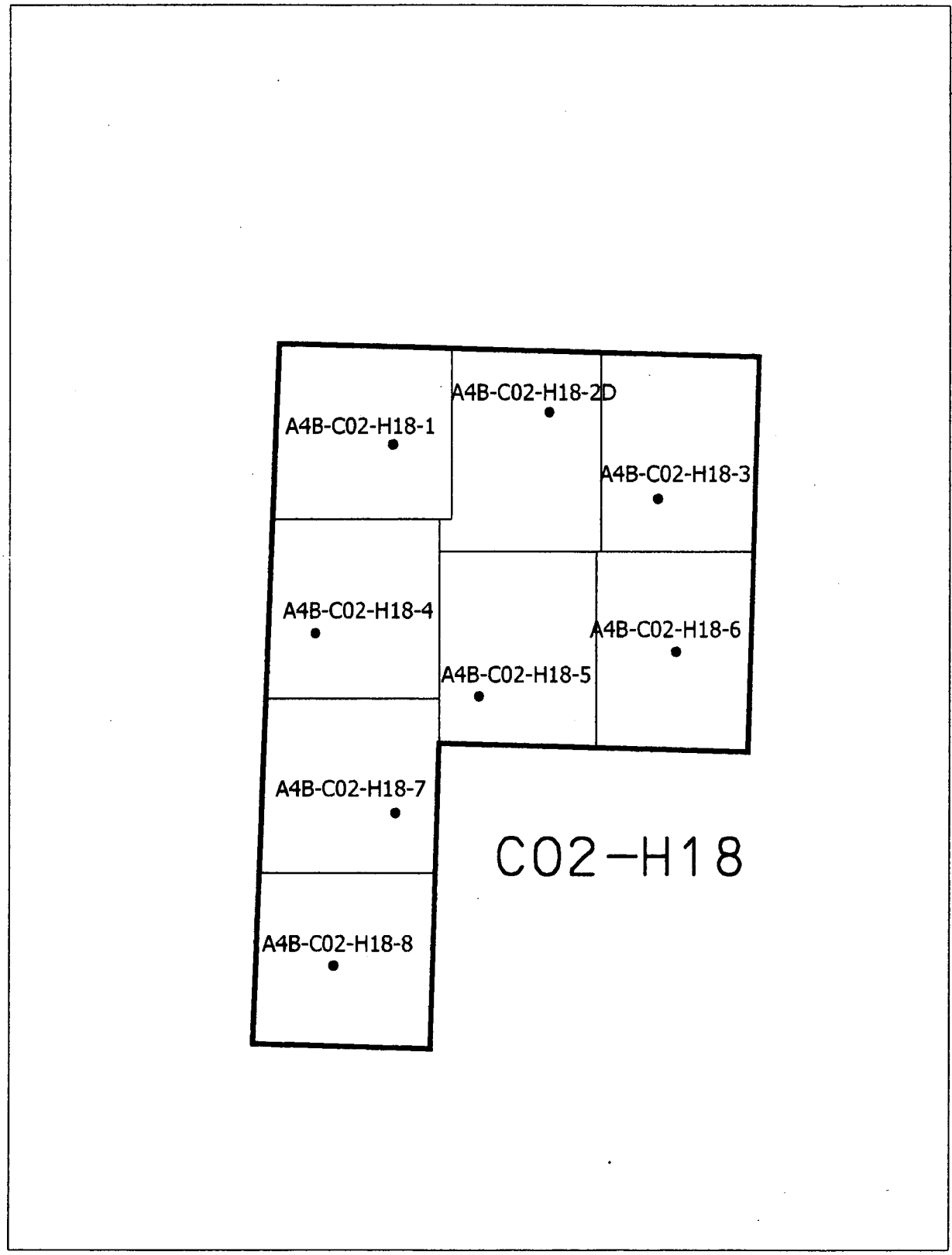
• SAMPLE LOCATION (D = DUPLICATE)

SCALE

20 10 0 20 FEET

FIGURE 2-3. CERTIFICATION SAMPLING LOCATIONS FOR CU01 (HWMU-4)

v:\82fm12\dgn\a4b_hwmu_4.dgn
STATE PLANAR COORDINATE SYSTEM 1983
17-NOV-2005



LEGEND:

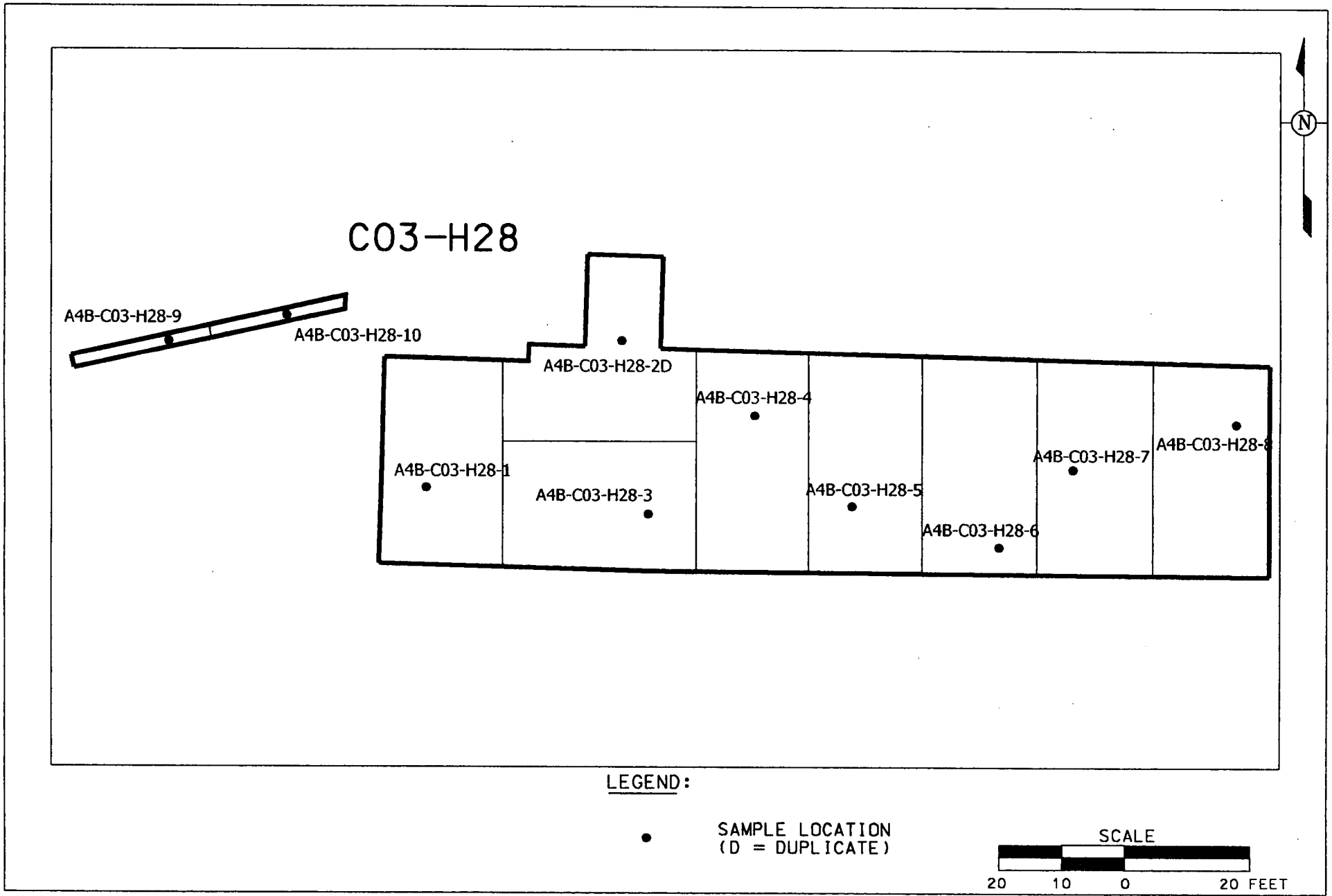
● SAMPLE LOCATION (D = DUPLICATE)

SCALE

20 10 0 20 FEET

FIGURE 2-4. CERTIFICATION SAMPLING LOCATIONS CU02 (HWMU-18)

v:\02fm12\dgn\4b_hwmu_18.dgn
STATE PLANAR COORDINATE SYSTEM 1983
17-NOV-2005

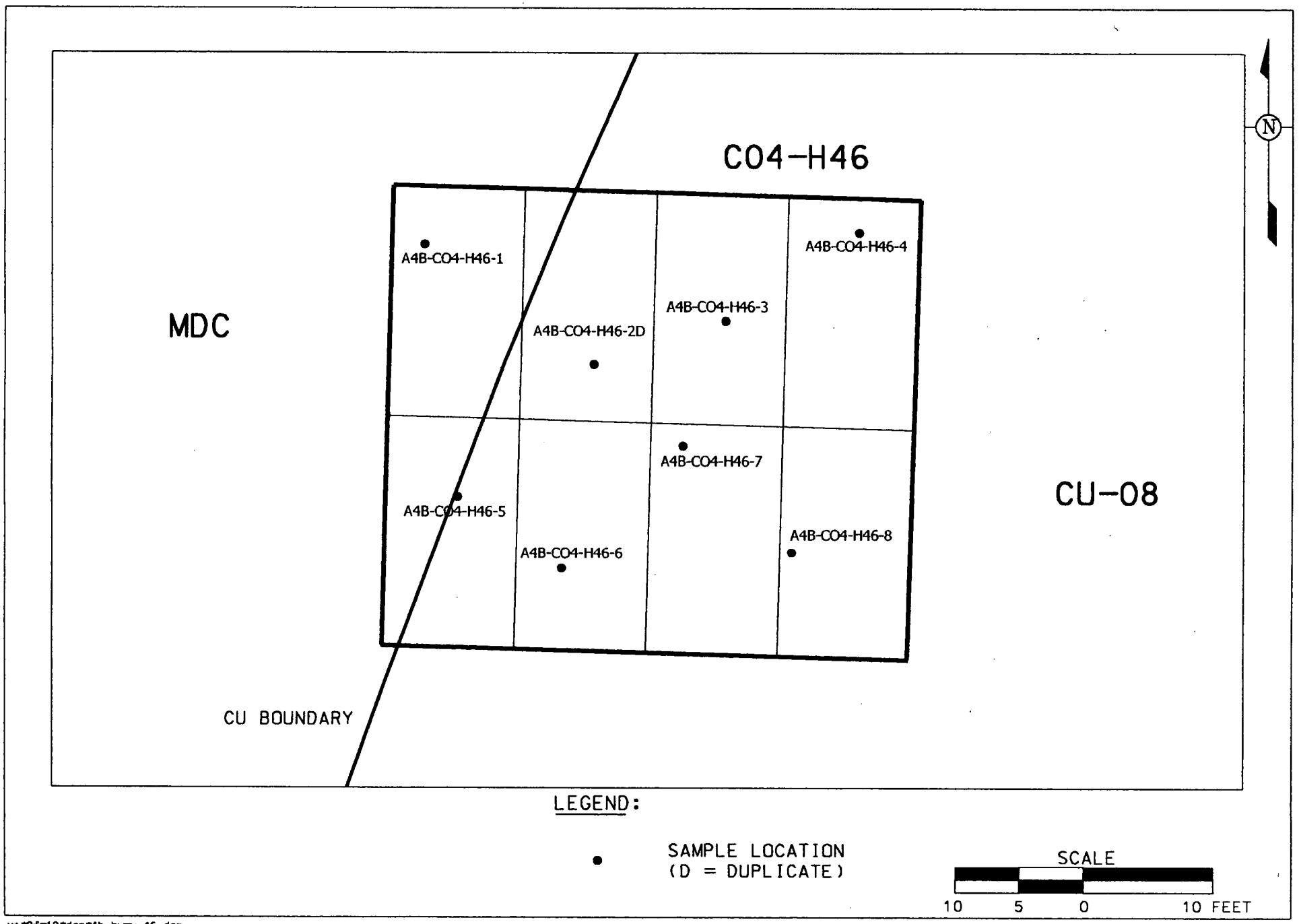


v:\#2fm12\dgn\4b_hwmu_28_c.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-5. CERTIFICATION SAMPLING LOCATIONS FOR CU03 (HWMU-28)

17-NOV-2005

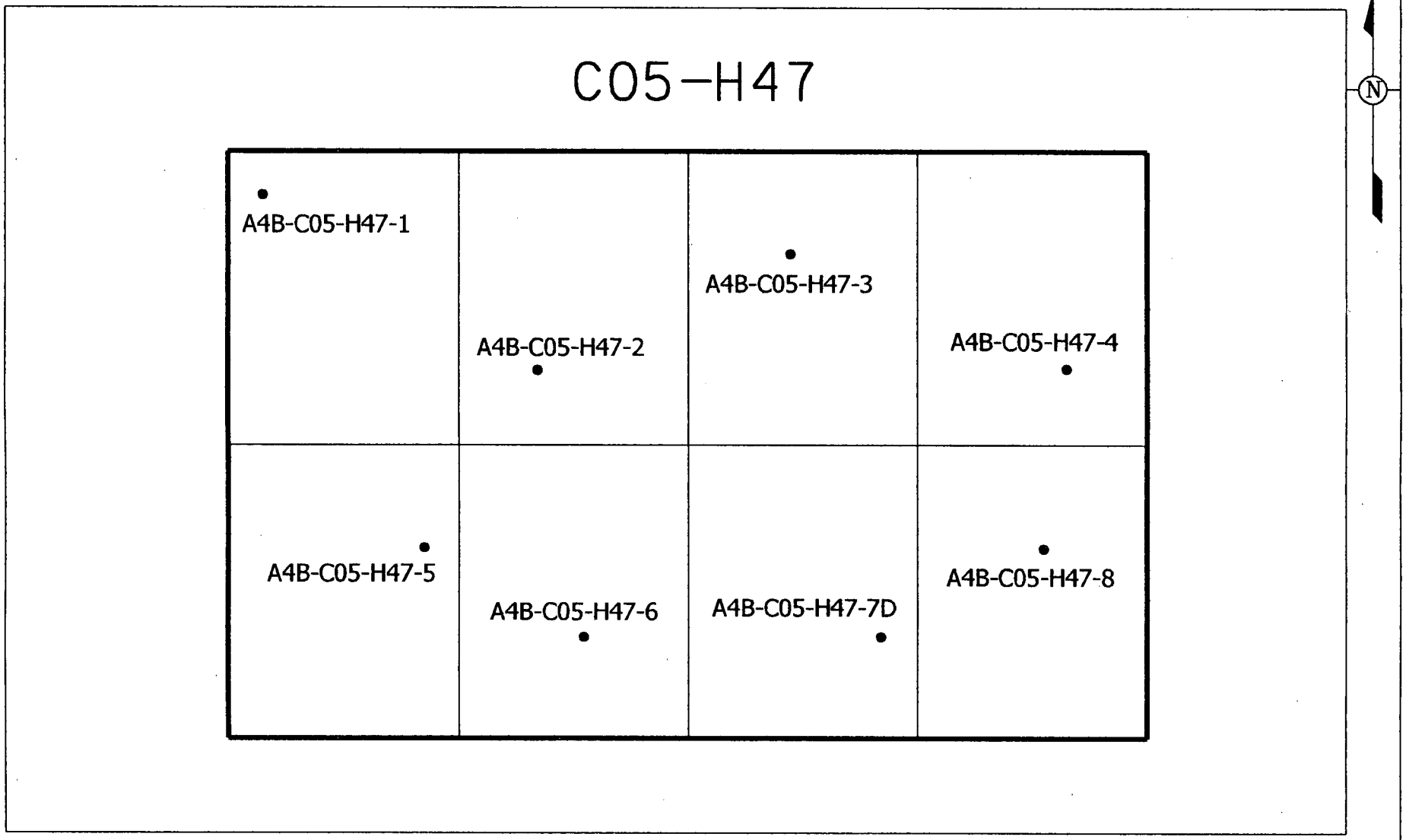
6094



v:\2fm12\dgn\4b_hwmu_46.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-6. CERTIFICATION SAMPLING LOCATIONS FOR CU04 (HWMU-46)

17-NOV-2005



LEGEND:

• SAMPLE LOCATION
(D = DUPLICATE)

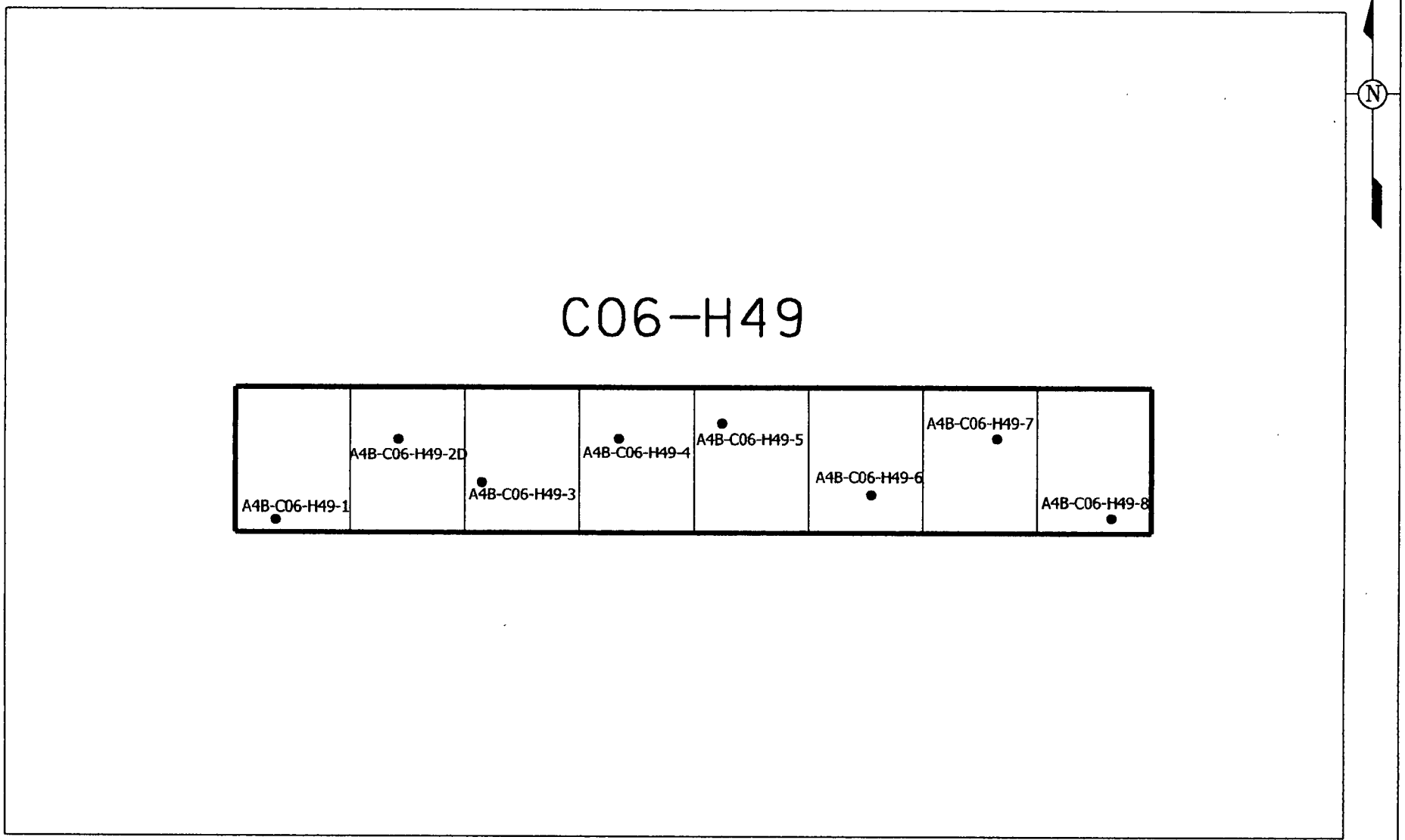
SCALE
10 5 0 10 FEET

v:\#2fm12\dgn\4b_hwmu_47.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-7. CERTIFICATION SAMPLING LOCATIONS FOR CU05 (HWMU-47)

17-NOV-2005

6094



LEGEND:

● SAMPLE LOCATION (D = DUPLICATE)

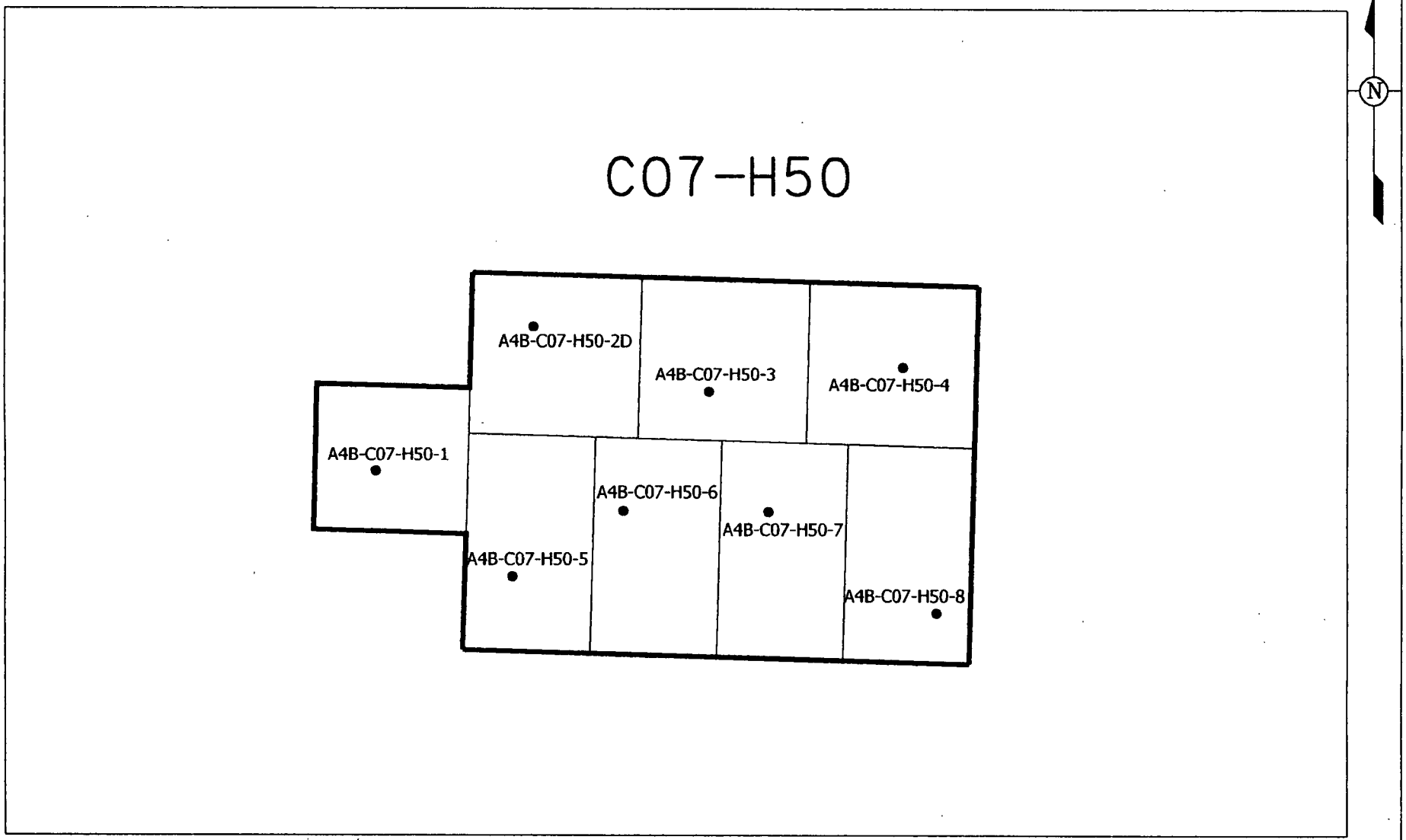
SCALE

20 10 0 20 FEET

v:\2fm12\dgn\4b_hwmu_49.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-8. CERTIFICATION SAMPLING LOCATIONS FOR CU06 (HWMU-49)

17-NOV-2005



LEGEND:

• SAMPLE LOCATION (D = DUPLICATE)

SCALE

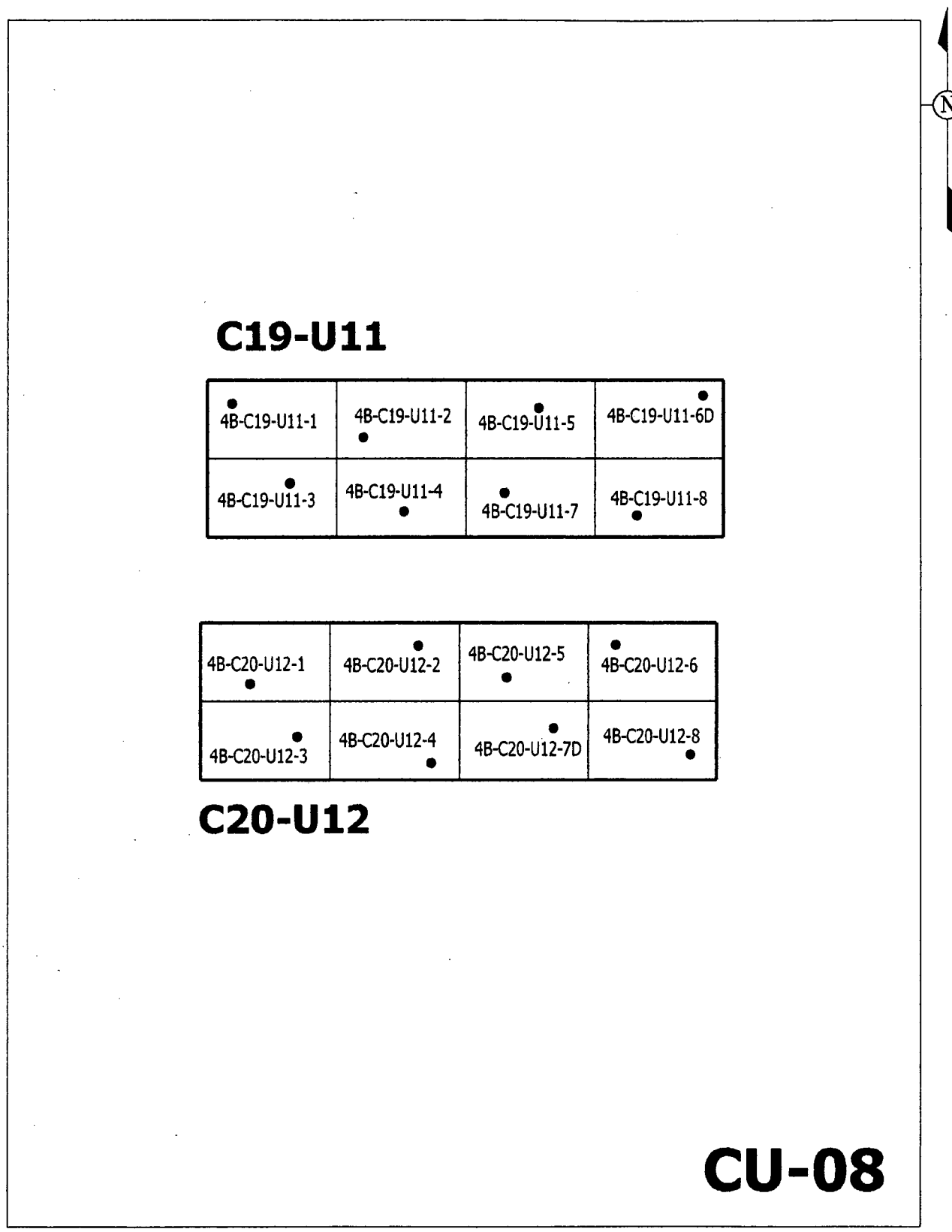
20 10 0 20 FEET

v:\#2fm12\dgn\4b_hwmu_50.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-9. CERTIFICATION SAMPLING LOCATIONS FOR CU07 (HWMU-50)

17-NOV-2005

6094



LEGEND:

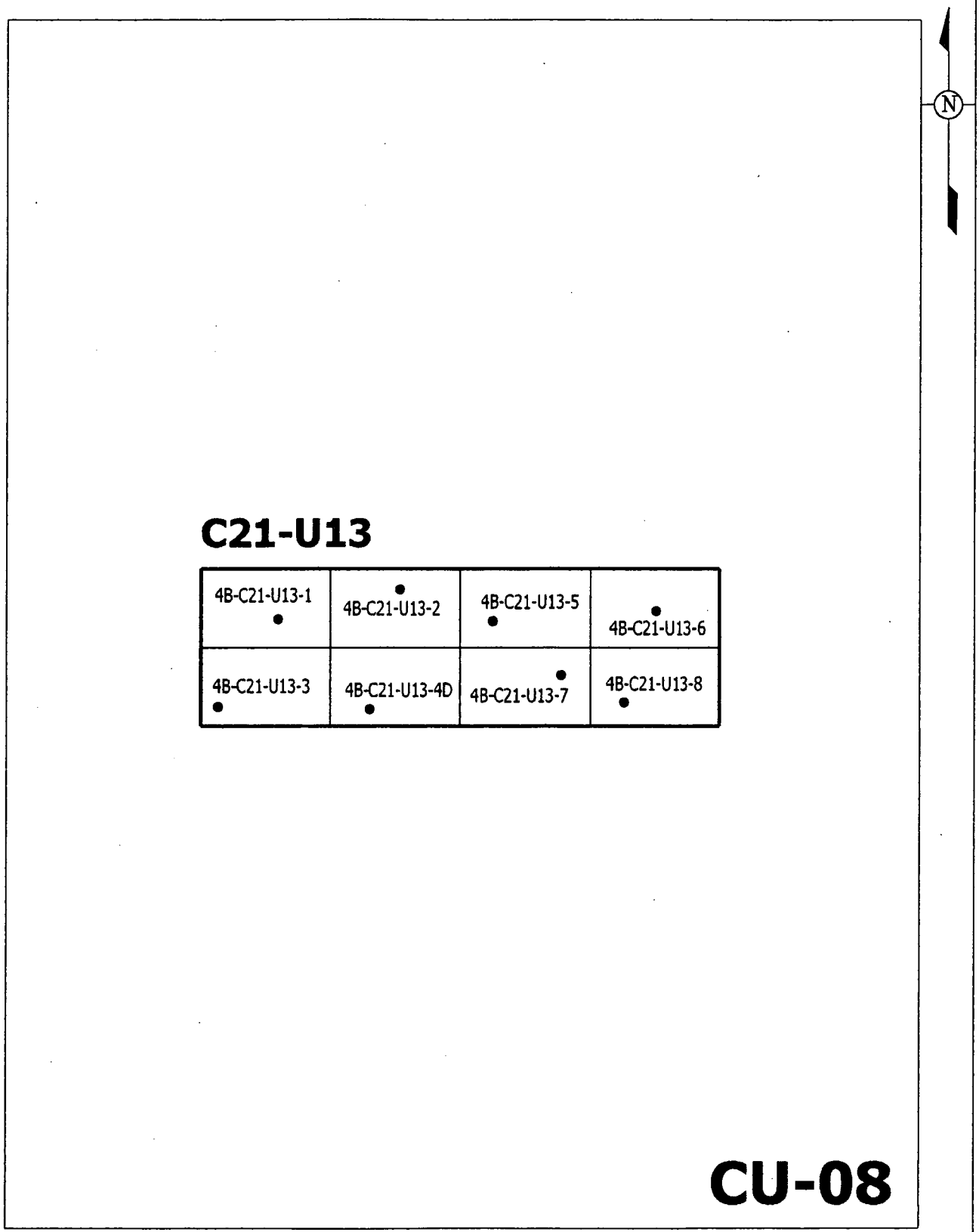
● SAMPLE LOCATION (D = DUPLICATE)

SCALE

5 2.5 0 5 FEET

FIGURE 2-10. CERTIFICATION SAMPLING LOCATIONS FOR CU19 (UST 11) AND CU20 (UST 12)

v:\82fm12\dgn\4b_ust_001.dgn
STATE PLANAR COORDINATE SYSTEM 1983
17-NOV-2005



LEGEND:

● SAMPLE LOCATION (D = DUPLICATE)

SCALE

5 2.5 0 5 FEET

STATE PLANAR COORDINATE SYSTEM 1983

17-NOV-2005

FIGURE 2-11. CERTIFICATION SAMPLING LOCATIONS FOR CU21 (UST 13)

3.0 OVERVIEW OF FIELD ACTIVITIES

In accordance with the SEP, prior to conducting precertification and certification activities, all soil demonstrated to contain contamination above the associated FRLs or other applicable action levels were evaluated for remedial actions.

In addition to the Predesign Investigations, the OU3 and OU5 RI Reports (DOE 1995c and 1995a) and Feasibility Study Reports (FS, DOE 1995d and 1995e) were used for remedial design of Area 4B. Final grade excavation monitoring/sampling and real-time scanning/sampling data have been collected pursuant to the RI/FS and remedial activities.

Before initiating the certification process, all historical soil data within the Area 4B - Part One certification area was pulled from the Sitewide Environmental Database (SED). Based on the results of sampling and scanning activities summarized below, it was determined that no further remedial actions were necessary to remove above-FRL or above-WAC soil.

3.1 AREA PREPARATION AND PRECERTIFICATION

All historical data for Area 4B - Part One is presented in the Implementation Plan for Area 3B/4B/5 (DOE 2004a). This includes data collected during the RI/FS and during two separate predesign investigations: PSP for Delineating Known Exceedances of the OSDF WAC in Areas 3B/4B/5 (DOE 2002b) and PSP for Area 4B Potentially Characteristic Area and West of the Pilot Plant Predesign Investigation (DOE 2001). Data were also collected during the remediation/excavation activities for excavation control and following the remediation/excavation activities for precertification per the PSP for the Excavation Control of Areas 3B, 4B, and 5 (Supplement to 20300-PSP-0011) (DOE 2004b).

Seven designed above-WAC areas were located within the certification area boundary. Three of the above-WAC areas were located within Plant 2, two within Plant 8, and two within the Lab Building. The above-WAC constituents for Northwest and Southwest Plant 2 were technetium-99 and uranium, and Northeast Plant 2 was above-WAC for uranium. North Plant 8 was above-WAC for technetium-99 and uranium, and Central Plant 8 was above-WAC for technetium-99. The Lab Building Loading Dock was above-WAC for technetium-99 and uranium, and the Lab Building North Courtyard was above-WAC for uranium.

All of the above-WAC material was removed during the remediation/excavation activities in Area 4B - Part One. During remediation/excavation activities in Area 4B - Part One the above-WAC areas in Plant 2 and Plant 8 were expanded laterally and vertically due to the presence of visible product material. Additional excavation was performed until all of the product material was removed. Once all of the

above-WAC material was removed from these areas, the excavation proceeded to remove the remaining above-FRL material.

The final above-WAC soil volume removed from Area 4B - Part One was 82,535 (bank) cubic yards (yd^3). The final above-FRL soil and concrete volume removed from Area 4B - Part One was 588,143 (bank) yd^3.

Three USTs (11, 12, and 13) were located within the boundaries of Area 4B - Part One near the former Plant 1 Truck Dock. Seven HWMUs (4, 18, 28, 46, 47, 49, and 50) were located throughout Area 4B. These three USTs and seven HWMUs are being closed under this certification process.

Following the excavation activities in Area 4B, precertification activities were conducted according to the guidelines established in Section 3.3.3 of the SEP to evaluate residual radiological contamination patterns as specified in the PSP for Excavation Control of Areas 3B, 4B, 5 (Supplement to 20300-PSP-0011). Prior to conducting a precertification real-time scan, Area 4B - Part One was scanned with a magnetometer to determine if residual debris remained following excavation activities. Minor occurrences of metallic objects were located and were either excavated or hand picked from the area.

All areas in Area 4B - Part One passed the requirements of precertification, and it was determined that certification of the soil in Area 4B - Part One could be completed.

3.2 CHANGES TO SCOPE OF WORK

The scope of work for Area 4B - Part One Certification Sampling required six changes, which were documented with six V/FCNs (see Appendix D) and discussed in the following paragraphs.

Variance 20810-PSP-0008-1 documents that analytical releases 1000033560 and 1000033562 will be treated as one analytical batch for volatile organic compound analysis.

Variance 20810-PSP-0008-2 documents the collection of eight grab soil samples for technetium-99 from an excavated above-WAC area in CU 6 (sub-CU A4B-C06-H49-1).

Variance 20810-PSP-0008-3 documents the collection of grab soil samples for total uranium [Target Analyte List (TAL) M] from above-FRL excavated areas in CU 2 (sub-CU A4B-C02-H18-6) and CU 6 (sub-CUs A4B-C06-H49-3 and A4B-C06-H49-7). Above-FRL sample results were detected in these three sub-CUs the areas were excavated to remove the elevated uranium soil. The newly collected samples replaced the previously collected uranium samples and were used in the statistical analysis of these two CUs.

Variance 20810-PSP-0008-4 documents the collection of grab soil samples from of six additional sampling locations in CU C22-H28 (HWMU 28) for TALs A, B, C, E, and H. The CU design for HWMU 28 was altered based on discussions with OEPA; therefore, additional sample locations were necessary.

Variance 20810-PSP-0008-5 documents the collection of 18 additional grab soil samples for technetium-99 from an excavated above-WAC are in CU 6 (sub-CU A4B-C06-H49-1) and two grab soils samples from an erosion area running south through the above-WAC area.

Variance 20810-PSP-0008-6 documents the collection of 20 additional grab soil samples for technetium-99 from two excavations extending from the original above-WAC area in CU 6 (sub-CU A4B-C06-H49-1) identified in variances 20810-PSP-0008-02 and 20810-PSP-0008-05.

4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES, AND DATA REDUCTION

4.1 ANALYTICAL METHODOLOGIES

All samples collected were sent off-site for analysis. The laboratories complied with Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plant (SCQ) requirements (DOE 2003). The SCQ is the source for analytical methodologies (Appendix G), data verification and validation, and analytical quality assurance/quality control requirements.

Laboratory analysis of certification samples was conducted using approved analytical methods, as discussed in Appendix H of the SEP. The minimum detection level (MDL) was set at 10 percent of the FRL and analyses were conducted to Analytical Support Level (ASL) D or E, where the MDL of 10 percent of the FRL is above the SCQ ASL detection level, but the analyses meet all other SCQ ASL D criteria. ASL D data packages were provided for all of the analytical data. All data were validated. Once data were validated as required, results were entered into the FCP SED. Final certification results are provided in Appendix B, and a summary of the analytical methods follows:

4.1.1 Chemical Methods

Metals

Samples submitted for arsenic analysis were analyzed by inductively coupled plasma-mass spectrometry (ICP-MS).

Samples submitted for barium, beryllium, chromium, lead, and selenium were analyzed by inductively coupled plasma-atomic emission spectroscopy (ICP-AES).

Samples submitted for mercury analysis were analyzed by cold vapor atomic absorption.

Polychlorinated Biphenyl (PCBs)

Samples submitted for PCB analyses were analyzed by gas chromatography.

Semi-Volatile Organic Compounds (SVOCs)

Samples submitted for SVOC analyses were analyzed by gas chromatography/mass spectrometry.

Volatile Organic Compounds (VOCs)

Samples submitted for VOC analyses were analyzed by gas chromatography/mass spectrometry.

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 relative error ratio 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 unaium-238 using gamma spectroscopy, 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.

Radium-226

Samples were analyzed by gamma spectrometry, and radium-226 was quantified by measuring gamma rays emitted by members of its decay chain. This method does not require chemical separation, but the samples must be allowed a 20-day progeny in-growth period before counting. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all of the Area 4B - 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 off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all Area 4B - Part One certification results.

Isotopic Thorium

Isotopic thorium (thorium-228 and thorium-232) was also quantified by measuring gamma rays emitted by members of its decay chain by gamma spectrometry. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all Area 4B - Part One certification results.

Technetium-99

Technetium-99 was quantified by using a liquid scintillation counter.

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 following Section 11.2 and Appendix D of the SCQ.

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 non-conformances 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 validation qualifier 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 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
- 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 Level D. This validation included the same review process as for Level B, but included a systematic review of the raw data and recalculations.

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 limits 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 these data

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration. This qualifier indicates the presumptive presence of the analyte, but the result can only be considered estimated. This qualifier is not used in typical inorganic analyses, but could be used to qualify organic or radiochemistry data due to spectral interpretation problems.

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.

4.3 DATA REDUCTION

Each sample used to support the Area 4B - Part One certification decision was entered in the 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.

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

1. All of the data for each CU were queried from SED. All of 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 higher of the two duplicate results was used in the statistical calculations.

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

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) - The TPU is an estimate of the overall uncertainty associated with a measured or calculated result that has been derived from an evaluation of all factors that can influence a result, including both systematic and random sources of uncertainty. For both *in situ* and laboratory-based radioactivity measurements, factors such as the random nature of the radioactive decay process (i.e., counting uncertainty), the mass or volume of the "sample" being analyzed, the variation in radiation detection efficiency with the energy of the emitted radiation and the density and chemical composition of the sample, uncertainty in nuclear decay parameters used to convert counts to activity, and attenuation of the radiation must be considered to properly asses the overall uncertainty of the measured result.

- 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, the validation result becomes the minimum detectable concentration value.

- Validation TPU - The TPU based on the validation process (applicable to radiological parameters only). The data Validation Section evaluates the reported TPU as described in the SCQ in Section 11.2 and Appendix D to assess the impact on the data quality and will qualify the data as estimated if the uncertainty is excessive.

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

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

5.0 CERTIFICATION EVALUATION AND CONCLUSIONS

Certification success or failure was based on sample data from each CU against criteria discussed in Section 2.2.4. Subsequent to any evaluation of preliminary data, full statistical analysis and evaluation was performed on all validated data. Final certification data are presented in Appendix B.

5.1 CERTIFICATION RESULTS AND EVALUATION

Below is a summary of the analytical results and statistical analyses of the data for each CU in Area 4B - Part One. The majority of Area 4B - Part One is in a high leachability zone. All CUs were considered to be in the zone, which results in using lower total uranium FRL of 20 mg/kg.

A4B-C01-H04

CU A4B-C01-H04 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C02-H18

A4B-C02-H18 failed one of the certification requirements (*a posteriori Sample* size was greater than the number of samples collected) for the primary ASCOC total uranium. Although the hot spot criterion was met with all uranium results in this CU (i.e., less than two-times the FRL), the entire sub-CU with the above-FRL total uranium result [A4B-C02-H18-6 (26.5 mg/kg)] for this CU was excavated and re-sampled as a conservative approach to reduce the residual uranium levels.

The failing preliminary certification statistics are presented in Appendix A. Following a real-time scan of the area (Table 5-1, Figure 5-1), another sample was collected from a random sampling location within the sub-CU under V/FCN 20810-PSP-0008-03. The new sample result was below the total uranium FRL with a result of 6.11 mg/kg (A4B-C02-H18-6A). Following excavation and re-sampling, A4B-C02 passed all certification requirements. All final certification data are presented in Appendix B.

A4B-C03-H28

CU A4B-C03-H28 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C04-H46

CU A4B-C04-H46 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C05-H47

CU A4B-C05-H47 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C06-H49

A4B-C06-H49 failed one of the certification requirements (*a posteriori Sample* size was greater than the number of samples collected) for the primary ASCOC total uranium. Although the hotspot criterion was met with all uranium results in this CU (i.e., less than two-times the FRL), the entire sub-CUs with the above-FRL total uranium results [A4B-C06-H49-3 (21.1 mg/kg) and A4B-C06-H49-7 (30.8 mg/kg)] for this CU were excavated and re-sampled as a conservative approach to reduce the residual uranium levels.

The failing preliminary certification statistics are presented in Appendix A. Following a real-time scan of the area (Table 5-1, Figure 5-1), another sample was collected from a random sampling location within each sub-CU under V/FCN 20810-PSP-0008-03. The new sample results were below the total uranium FRL with results of 8.01 mg/kg (A4B-C06-H49-3A) and 10.3 mg/kg (A4B-C06-H49-7A). Following excavation and re-sampling, A4B-C06 passed all certification requirements. All final certification data are presented in Appendix B.

A4B-C07-H50

CU A4B-C07-H50 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C08

CU A4B-C08 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C09

CU A4B-C09 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C10

CU A4B-C10 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C11

CU A4B-C11 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C12

CU A4B-C12 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C13

CU A4B-C13 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C14

CU A4B-C14 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C15

CU A4B-C15 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C16

CU A4B-C16 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C17

CU A4B-C17 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C18

CU A4B-C18 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C19-U11

CU A4B-C19-U11 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C20-U12

CU A4B-C20-U12 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C21-U13

CU A4B-C21-U13 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

A4B-C22-H28

CU A4B-C22-H28 passed all of the certification criteria as discussed in Section 2.2.4. Final certification data are presented in Appendix B.

HWMU CLOSURES (HWMUs 4, 18, 28, 46, 47, 49, AND 50)

As discussed in Section 4.1.2 of the CDL, there are seven HWMUs (4, 18, 28, 46, 47, 49, and 50) in Area 4B that are being closed under the scope of this certification effort.

Based on SEP protocol described in Section 2.2.5, a unique CU should be established with a minimum of eight sample locations collected and analyzed for the HWMU COCs with the exception of HWMU 28. HWMU 28 includes the Incinerator Equipment area located in the northeast quadrant of Building 39A; the pad, trench, and sump to the east of Building 39A; and the trench to the northwest of Building 39A. These areas are considered to be contiguous because they are in close proximity to each other. Ten samples were collected from these areas. Building 39B, which is approximately 90 feet north of Building 39A and is part of HWMU 28, is not in close proximity to the other section of HWMU 28; therefore, a total of eight certification samples were collected to close this portion of HWMU 28. The approach to dividing HWMU 28 into two separate CUs and collecting a total of 18 samples is consistent with OEPA Division of Hazardous Waste Management's (DHWM) request.

As an added measure, the calculations described in the Closure Plan Review Guidance for RCRA Facilities (OEPA 2004) by the OEPA DHWM, were performed. Specifically, Appendix N, Section entitled "Using GCNs to Determine that No Further Action is Necessary at a Unit" was used.

In short, this OEPA guidance describes the application of General Cleanup Numbers (GCNs) to a specific RCRA site. According to this guidance, elimination of a COC from assessment can be done based on two conditions: 1) if the frequency of detection is less than 5 percent, and 2) the 95 percent UCL or maximum concentration of the compound is below the site-specific background for the compound (for inorganic metals only). In each HWMU within 4B, one or more of the HWMU constituents were eliminated based on the two conditions above.

Once the list of COCs to be assessed was defined, the appropriate adjusted GCN used in the calculations was defined using the 20 DAF (dilution attenuation factor) from Table O-1 of the Closure Plan Review Guidance for RCRA Facilities (OEPA 2004), as the source area is less then 30 acres. Appendix C

contains tables for the statistical calculations that were performed to demonstrate HWMU closure. These tables also describe the constituents that were eliminated and which ones were retained for statistical analysis.

The results of these calculations demonstrate that the cancer risk for each applicable HWMU is below the acceptable cancer risk level of 1.00 E-05. Additionally, the non-cancer risk is less than the acceptable non-cancer risk level of 1.00.

Taking both approaches (SEP protocols and OEPA DHWM guidance) into consideration, all HWMUs (4, 18, 28, 46, 47, 49, and 50) pass all relevant criteria and therefore are considered closed.

5.2 AREA 4B - PART ONE CERTIFICATION CONCLUSIONS

Based on the certification analytical results, precertification data, and statistical analysis, DOE has determined that the remedial objectives in the OU5 ROD have been achieved for Area 4B - Part One including all HWMUs and USTs described in this report. No further remedial actions are required. This portion of the FCP will be released for restoration and final land use upon U.S. Environmental Protection Agency (EPA) and OEPA concurrence.

TABLE 5-1
ELEVATED CONSTITUENT REMOVAL VERIFICATION FOR A4B-C02-H18 AND C06-H49 - TOTAL URANIUM (MOISTURE CORRECTED)

Location ID	Measurement Date	Northing	Easting	Elevation	Detector Height (cm)	Ra-226 (pCi/g)	Th-232 (pCi/g)	Total U (ppm)
A4B-CERT-P2-HL-737	07Oct05	480300	1348780	551	31	1.3	0.6	12.6
A4B-CERT-P2-HL-737-D	07Oct05	480300	1348780	551	31	1.3	0.6	0.0
A4B-CERT-P2-HL-738	07Oct05	480301	1348790	554	31	1.3	0.7	11.4
A4B-CERT-P2-HL-739	07Oct05	480312	1348790	554	31	1.5	0.7	0.1
A4B-CERT-P2-HL-740	07Oct05	480311	1348781	554	31	1.2	0.6	0.1
A4B-CERT-P2-HL-741	07Oct05	480308	1348786	557	31	1.4	0.7	0.1
A4B-CERT-P2-HL-744	10Oct05	480674	1348810	555	31	1.2	0.5	25.9
A4B-CERT-P2-HL-745	10Oct05	480668	1348810	554	31	1.2	0.6	15.2
A4B-CERT-P2-HL-745-D	10Oct05	480668	1348810	554	31	1.2	0.6	14.3
A4B-CERT-P2-HL-746	10Oct05	480661	1348810	555	31	1.4	0.6	0.1
A4B-CERT-P2-HL-747	10Oct05	480662	1348747	552	31	1.1	0.5	0.1
A4B-CERT-P2-HL-748	10Oct05	480667	1348747	551	31	1.2	0.6	13.1
A4B-CERT-P2-HL-749	10Oct05	480674	1348747	550	31	1.1	0.5	13.4

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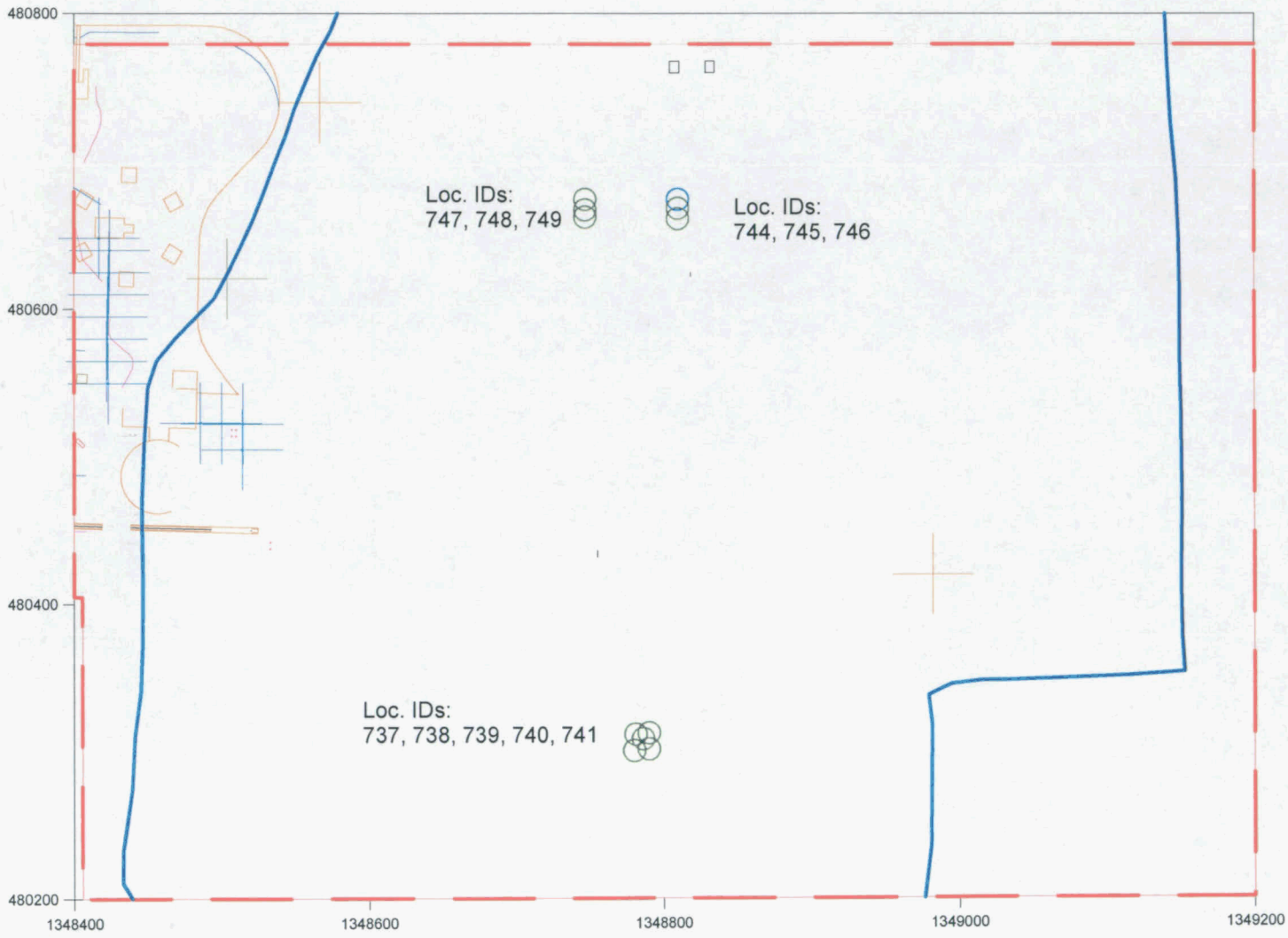
Figure 5-1
Elevated Constituent Removal Verification for A4B-C02-H18 and C06-H49 Total Uranium (moisture corrected)

Total Uranium

Data Group: 30687_10-10-2005, 30687_10-07-2005
Measurement Date: 10/07/2005 - 10/10/2005



Total U
HPGe @ 31cm

- 0 to 20
- 20 to 40
- 40 to 60

Certification boundary

High leachate boundary

RTIMP DWG ID: A4B_CERT_TU_31cm.srf
Project ID: Gen Char for Site Soil Remed 20300-PSP-0011
Prepared: M. Frank 11-17-2005
Support Data: A4B_CERT_P2_30687_SUMMARY.xls

6.0 PROTECTION OF CERTIFIED AREAS

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

The procedure is summarized as follows:

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

After DOE, EPA and 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

Ohio Environmental Protection Agency, 2004, "Closure Plan Review Guidance for RCRA Facilities," Ohio EPA Division of Hazardous Waste Management, Dayton, Ohio.

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

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

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U.S. Department of Energy, 2002a, "Natural Resource Restoration Plan," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2002b, "Project Specific Plan for Delineating Known Exceedances of the On-Site Disposal Facility Waste Acceptance Criteria in Areas 3B/4B/5," Revision 1, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

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U.S. Department of Energy, 2004a, "Implementation Plan for Areas 3B/4B/5," Final, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2004b, "Project Specific Plan for the Excavation Control of Areas 3B, 4B, and 5 (Supplement to 20300-PSP-0011)," Revision 1, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 2005, "Certification Design Letter and Certification Project Specific Plan for Area 4B - Part One," Revision 1, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

APPENDIX A

FAILING PRELIMINARY CERTIFICATION STATISTICS

APPENDIX A
FAILING PRELIMINARY CERTIFICATION STATISTICS

A4B-C02	Uranium, Total
A4B-C02-H18-1^RMP	3.33 -
A4B-C02-H18-2^RMP	4.92 -
A4B-C02-H18-2^RMP-D	4.54 -
A4B-C02-H18-3^RMP	4.35 -
A4B-C02-H18-4^RMP	4.26 -
A4B-C02-H18-5^RMP	3.17 -
A4B-C02-H18-6^RMP	26.5 -
A4B-C02-H18-7^RMP	6.31 -
A4B-C02-H18-8^RMP	4.11 -
Limit	20.0
Units	ug/g
Conf. Level	95%
Max. Result	26.5
Max. >= Limit	Yes
W-statistic Prob. #	< 0.01% (LN)
Test Procedure	Median (Sign)
Sample Size	8
Nondetects	0
% Nondetects	0.0%
Est. Mean*	4.31
UCL	6.31
Prob. > Limit	- -
Pass / Fail	Pass
a posteriori Sample Size calculation	9 Fail

A4B-C06	Uranium, Total
A4B-C06-H49-1^RMP	16.0 -
A4B-C06-H49-2^RMP	19.9 -
A4B-C06-H49-2^RMP-D	19.6 -
A4B-C06-H49-3^RMP	21.1 -
A4B-C06-H49-4^RMP	14.0 -
A4B-C06-H49-5^RMP	16.0 -
A4B-C06-H49-6^RMP	12.3 -
A4B-C06-H49-7^RMP	30.8 -
A4B-C06-H49-8^RMP	6.08 -
Limit	20.0
Units	ug/g
Conf. Level	95%
Max. Result	30.8
Max. >= Limit	Yes
W-statistic Prob. #	75.7% (N)
Test Procedure	Normal
Sample Size	8
Nondetects	0
% Nondetects	0.0%
Est. Mean*	17.0
UCL	21.9
Prob. > Limit	- -
Pass / Fail	Fail
a posteriori Sample Size calculation	39 Fail

NOTE:

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

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

#: This is the highest reported 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 (N) and the log-transformed data (LN) to test for lognormality.

APPENDIX B

CERTIFICATION SAMPLES, ANALYTICAL RESULTS AND FINAL STATISTICS TABLES

APPENDIX B
STATISTICAL ABBREVIATIONS AND SYMBOLS

The procedure used to determine if the data are to be assumed to be either normally distributed or lognormally distributed is outlined in Section G.2.3 of Appendix G to the SEP. The second paragraph under "Step 3: Perform the Shapiro-Wilk Test to evaluate if the data are normally or lognormally distributed" states that "If the Shapiro-Wilk Test indicates both normal and lognormal distributions fit the data, the distribution with the highest p-value will be used in the Student's t-Test (Section G.2.2.2) to make the certification decision." Therefore, the distribution testing procedure is not a matter of transforming the data and then testing for lognormality only when the normality assumption fails as the comment seems to imply. The method is to test both normality and lognormality and select the distribution that "best" fits the data as defined by the test yielding the higher p-value above a minimum acceptable value. The minimum acceptable p-value for acceptance of a distribution was set at 0.05.

Abbreviations:

W-Statistic Probability - Shapiro-Wilk probability of the "better" fit - either normal or lognormal (note: a value less than 0.05 indicates that neither normality nor lognormality could be accepted, but the highest p-value is still shown.)

t-Test (N) - indicates that the normal distribution is best fit to data with a p-value greater than or equal to 0.05.

t-Test (LN) - indicates that the lognormal distribution is best fit to data with a p-value greater than or equal to 0.05.

Sign Test - the Sign test was used because one of the following situations occurred:

1. there were greater than 50 percent non-detects,
2. between 15 and 50 percent non-detects and data not symmetrically distributed,
3. less than 15 percent non-detects, but fails Shapiro-Wilk test for both normality and lognormality and data not symmetrically distributed.

Wilcoxon SR - the Wilcoxon Signed Rank procedure was used because of one of the following situations:

1. between 15 and 50 percent non-detects and data symmetrically distributed,
2. less than 15 percent non-detects, but fails Shapiro-Wilk test for both normality and lognormality and data symmetrically distributed.

Note: Data was considered to be "symmetrically distributed" if the Standardized Skewness had an Absolute Value of less than or equal to 2.00 (i.e., between -2.00 and 2.00).

Number of NDs - number of non-detects.

@ - maximum result was below the FRL indicating that no statistical result needed to be reported.

APPENDIX B
A4B-CU1

	Primary COCs					Secondary COCs					
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254	Benzene	Tetrachloroethene	Toluene
A4B-C01-H04-1	0.956 J	0.696 -	0.718 J	0.696 -	2.60 UJ	0.838 U	0.325 U	0.0037 U	0.0009 U	0.0012 -	0.0009 U
A4B-C01-H04-2	0.976 J	0.784 -	0.794 J	0.784 -	3.04 UJ	0.809 U	0.388 -	0.0052 J	0.0008 U	0.0008 U	0.0006 J
A4B-C01-H04-2-D	1.06 J	0.869 -	0.876 J	0.869 -	3.86 -	0.831 U	0.459 -	0.0037 U	0.0010 U	0.0010 U	0.0005 J
A4B-C01-H04-3	0.978 J	0.582 -	0.583 J	0.582 -	3.40 -	0.789 U	0.265 U	0.0038 U	0.0010 U	0.0010 U	0.0010 U
A4B-C01-H04-4	0.936 J	0.622 -	0.626 J	0.622 -	4.42 -	0.815 U	0.304 U	0.0037 U	0.0009 U	0.0009 U	0.0009 U
A4B-C01-H04-5	0.936 J	0.580 -	0.609 J	0.580 -	4.72 -	0.805 U	0.321 U	0.0036 U	0.0010 U	0.0420 -	0.0005 J
A4B-C01-H04-6	0.760 J	0.581 -	0.582 J	0.581 -	3.73 -	0.818 U	0.255 U	0.0036 U	0.0009 U	0.0014 -	0.0008 J
A4B-C01-H04-7	0.815 J	0.557 -	0.580 J	0.557 -	4.08 -	0.794 U	0.352 -	0.0036 U	0.0011 U	0.0170 -	0.0011 J
A4B-C01-H04-8	0.851 J	0.689 -	0.722 J	0.689 -	3.61 -	0.794 U	0.341 U	0.0026 NJ	0.0009 U	0.0170 -	0.0005 J
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130	850000	3600	100000000
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg	ug/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%
Max. Result	1.06	0.869	0.876	0.869	4.72	0.838 U	0.459	0.0052	0.0011 U	0.042	0.0011
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	1	8	6	6	8	3	3
% Nondetects	0%	0%	0%	0%	13%	100%	75%	75%	100%	38%	38%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

FOOTNOTES FOR APPENDIX B:

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

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

#: This is the highest reported 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 (N) and the log-

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APPENDIX B
A4B-CU2

	Primary COCs					Secondary COCs					
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Lead	2-Butanone	Aroclor-1254	Xylenes, Total
A4B-C02-H18-1	0.828 -	0.672 J	0.669 J	0.672 J	3.33 -	0.707 U	0.374 J	8.43 U	0.0046 U	0.0140 NJ	0.0010 J
A4B-C02-H18-2	0.909 -	0.773 J	0.751 J	0.773 J	4.92 -	0.730 U	0.329 J	6.71 U	0.0056 U	0.0037 UJ	0.00037 J
A4B-C02-H18-2-D	0.837 -	0.637 J	0.627 J	0.637 J	4.54 -	0.722 U	0.372 J	9.61 U	0.0047 U	0.0100 NJ	0.00030 J
A4B-C02-H18-3	0.818 -	0.611 J	0.611 J	0.611 J	4.35 -	0.717 U	0.375 J	7.19 U	0.0048 U	0.0025 NJ	0.00095 U
A4B-C02-H18-4	1.02 -	0.739 J	0.725 J	0.739 J	4.26 -	0.706 U	0.421 J	10.7 U	0.0047 U	0.0037 UJ	0.00046 J
A4B-C02-H18-5	0.879 -	0.626 J	0.621 J	0.626 J	3.17 -	0.715 U	0.403 J	9.46 U	0.0046 U	0.0038 UJ	0.00020 J
A4B-C02-H18-6	0.772 -	0.507 J	0.513 J	0.507 J		1.19 -	0.305 J	8.90 U	0.0044 U	0.0130 NJ	0.00020 J
A4B-C02-H18-6A					6.11 -						
A4B-C02-H18-7	0.947 -	0.778 J	0.823 J	0.778 J	6.31 -	0.726 U	0.487 J	10.1 U	0.0039 U	0.0011 NJ	0.00079 U
A4B-C02-H18-8	0.949 -	0.631 J	0.627 J	0.631 J	4.11 -	0.718 U	0.431 J	7.63 U	0.0043 U	0.0071 NJ	0.00085 U
Limit	1.7	1.8	1.7	1.5	20	30	1.5	400	23.5	130	920000000
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%
Max. Result	1.02	0.778	0.823	0.778	6.31	1.19	0.487	10.7 U	0.0056 U	0.0140	0.0010
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	0	7	0	8	8	2	3
% Nondetects	0%	0%	0%	0%	0%	88%	0%	100%	100%	25%	38%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU3

	Primary COCs					Secondary COCs				
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Lead	1,1,1-Trichloroethane	Aroclor-1254
A4B-C03-H28-1	0.853 -	0.638 -	0.650 -	0.638 -	16.4 J	0.864 U	0.556 -	7.93 J	0.0009 U	0.0038 UJ
A4B-C03-H28-2	0.628 -	0.626 J	0.680 J	0.626 J	12.5 J	0.679 U	0.239 J	12.5 U	0.0010 UJ	0.0038 UJ
A4B-C03-H28-2-D	0.646 -	0.500 J	0.517 J	0.500 J	18.1 J	0.685 U	0.188 J	8.43 U	0.0010 U	0.0038 UJ
A4B-C03-H28-3	0.650 -	0.422 -	0.412 -	0.422 -	12.4 J	0.822 U	0.261 U	6.76 J	0.0009 U	0.0037 UJ
A4B-C03-H28-4	0.835 -	0.728 J	0.805 J	0.728 J	8.37 J	1.26 -	0.413 J	7.65 U	0.0010 U	0.0038 UJ
A4B-C03-H28-5	0.722 -	0.538 J	0.559 J	0.538 J	6.18 J	0.737 -	0.336 J	5.79 U	0.0011 U	0.0040 UJ
A4B-C03-H28-6	0.894 -	0.589 J	0.586 J	0.589 J	4.66 J	0.937 -	0.323 J	9.60 U	0.0010 U	0.0015 NJ
A4B-C03-H28-7	0.821 -	0.587 J	0.584 J	0.587 J	6.30 J	0.831 -	0.393 J	7.47 U	0.0009 U	0.0039 UJ
A4B-C03-H28-8	0.930 -	0.724 J	0.726 J	0.724 J	4.57 J	0.734 U	0.358 J	8.95 U	0.0011 U	0.0038 UJ
A4B-C03-H28-9	0.868 -	0.546 -	0.504 -	0.546 -	8.96 J	0.844 U	0.474 U	6.26 J	0.0011 U	0.0040 UJ
A4B-C03-H28-10	0.871 -	0.693 -	0.700 -	0.693 -	5.61 J	0.836 U	0.513 -	5.60 J	0.0010 U	0.0040 UJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	400	4300	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%
Max. Result	0.93	0.728	0.805	0.728	18.1	1.26	0.556	7.93	0.0011 U	0.0015
Max. >= Limit	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	10	10	10	10	10	10	10	10	10	10
Nondetects	0	0	0	0	0	6	2	6	10	9
% Nondetects	0%	0%	0%	0%	0%	60%	20%	60%	100%	90%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU4

	Primary COCs					Secondary COCs						
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Barium	Beryllium	Chromium	Lead	Mercury	Aroclor-1254
A4B-C04-H46-1	0.830 -	0.513 -	0.513 -	0.513 -	4.81 J	0.791 U	24.7 J	0.215 -	8.50 J	8.45 J	0.0052 U	0.0042 NJ
A4B-C04-H46-2	0.990 -	0.833 -	0.849 -	0.833 -	4.01 J	0.810 U	68.0 J	0.486 -	13.9 J	15.2 J	0.0071 U	0.0040 UJ
A4B-C04-H46-2-D	0.994 -	0.820 -	0.862 -	0.820 -	6.82 J	0.817 U	71.0 J	0.591 -	17.4 J	13.4 J	0.0175 U	0.0010 NJ
A4B-C04-H46-3	1.05 -	0.729 -	0.724 -	0.729 -	2.03 UJ	0.818 U	58.9 J	0.594 -	17.0 J	13.3 J	0.0136 U	0.0038 UJ
A4B-C04-H46-4	1.09 -	0.761 -	0.767 -	0.761 -	4.42 J	0.826 U	102 J	0.719 -	19.4 J	12.5 J	0.0323 U	0.0039 UJ
A4B-C04-H46-5	0.866 -	0.721 -	0.759 -	0.721 -	8.17 J	0.810 U	54.3 J	0.505 -	14.5 J	10.2 J	0.0103 U	0.0011 NJ
A4B-C04-H46-6	0.945 -	0.622 -	0.624 -	0.622 -	4.70 J	0.817 U	48.3 J	0.362 -	11.1 J	12.3 J	0.0049 U	0.0013 NJ
A4B-C04-H46-7	0.927 -	0.645 -	0.646 -	0.645 -	4.62 J	0.839 U	53.9 J	0.449 -	13.8 J	15.5 J	0.0052 U	0.0037 UJ
A4B-C04-H46-8	0.927 -	0.757 -	0.775 -	0.757 -	1.77 U	0.846 U	23.6 J	0.184 -	8.23 J	5.51 U	0.0049 U	0.0040 UJ
Limit	1.7	1.8	1.7	1.5	20	30	68000	1.5	300	400	7.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%	90%
Max. Result	1.09	0.833	0.862	0.833	8.17	0.846 U	102	0.719	19.4	15.5	0.0323 U	0.0042
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	2	8	0	0	0	1	8	4
% Nondetects	0%	0%	0%	0%	25%	100%	0%	0%	0%	13%	100%	50%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU5

	Primary COCs					Secondary COCs						
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Barium	Beryllium	Chromium	Lead	Mercury	Aroclor-1254
A4B-C05-H47-1	0.751 -	0.563 -	0.553 -	0.563 -	3.04 -	0.733 U	41.8 J	0.341 U	9.47 J	6.42 J	0.0130 J	0.0008 NJ
A4B-C05-H47-2	0.844 -	0.592 -	0.587 -	0.592 -	4.36 -	0.753 U	49.0 J	0.370 U	14.8 J	8.02 J	0.0127 J	0.0010 NJ
A4B-C05-H47-3	0.920 -	0.721 -	0.724 -	0.721 -	3.49 -	0.763 U	53.2 J	0.586 U	17.3 J	10.4 J	0.0149 J	0.0007 NJ
A4B-C05-H47-4	0.899 -	0.733 -	0.740 -	0.733 -	3.50 -	0.752 U	52.3 J	0.536 U	13.8 J	7.32 J	0.0168 J	0.0011 NJ
A4B-C05-H47-5	0.883 -	0.668 -	0.689 -	0.668 -	3.43 -	0.743 U	42.4 J	0.330 U	9.38 J	6.13 J	0.0167 J	0.0020 NJ
A4B-C05-H47-6	0.620 -	0.389 -	0.391 -	0.389 -	4.12 -	0.736 U	42.5 J	0.102 U	4.61 J	4.97 U	0.0098 J	0.0034 U
A4B-C05-H47-7	0.658 -	0.500 -	0.508 -	0.500 -	2.36 J	0.726 U	36.7 J	0.213 U	6.02 J	6.63 J	0.0112 J	0.0110 NJ
A4B-C05-H47-7-D	0.683 -	0.643 -	0.635 -	0.643 -	3.97 -	2.44 J	28.6 J	0.189 U	6.01 J	7.19 J	0.0092 J	0.0037 UJ
A4B-C05-H47-8	0.903 -	0.690 -	0.702 -	0.690 -	5.81 -	0.744 U	42.7 J	0.429 U	11.3 J	5.39 U	0.0163 J	0.0011 NJ
Limit	1.7	1.8	1.7	1.5	20	30	68000	1.5	300	400	7.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%	90%
Max. Result	0.92	0.733	0.74	0.733	5.81	2.44	53.2	0.586 U	17.3	10.4	0.0168	0.011
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	0	8	0	8	0	6	0	1
% Nondetects	0%	0%	0%	0%	0%	100%	0%	100%	0%	75%	0%	13%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU6

	Primary COCs					Secondary COCs						
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Barium	Beryllium	Chromium	Lead	Mercury	Aroclor-1254
A4B-C06-H49-1	0.759 -	0.378 -	0.369 -	0.378 -	16.0 -		13.0 J	0.130 U	4.49 J	5.47 U	0.0048 U	0.0041 UJ
A4B-C06-H49-2	0.948 -	0.590 -	0.586 -	0.590 -	19.9 -	0.739 U	40.2 J	0.236 U	8.10 J	5.26 U	0.0059 J	0.0110 NJ
A4B-C06-H49-2-D	0.875 -	0.643 -	0.659 -	0.643 -	19.6 -	0.740 U	33.0 J	0.136 U	4.56 J	5.66 U	0.0050 U	0.00070 NJ
A4B-C06-H49-3	0.737 -	0.392 -	0.393 -	0.392 -		0.732 U	48.2 J	0.147 U	5.43 J	5.28 U	0.0057 J	0.0014 NJ
A4B-C06-H49-3A					8.01 -							
A4B-C06-H49-4	0.984 -	0.726 -	0.739 -	0.726 -	14.0 -	0.759 U	36.5 J	0.249 U	19.6 J	7.93 J	0.0130 J	0.0018 NJ
A4B-C06-H49-5	0.868 -	0.470 -	0.438 -	0.470 -	16.0 -	0.792 J	32.4 J	0.259 U	14.1 J	6.80 J	0.0055 U	0.0024 NJ
A4B-C06-H49-6	0.954 -	0.685 -	0.681 -	0.685 -	12.3 -	0.735 U	39.9 J	0.350 U	11.0 J	6.07 J	0.0127 J	0.0013 NJ
A4B-C06-H49-7	0.672 -	0.520 -	0.543 -	0.520 -		3.44 J	15.8 J	0.186 U	6.56 J	5.08 U	0.0073 J	0.0035 UJ
A4B-C06-H49-7A					10.3 -							
A4B-C06-H49-8	0.795 -	0.710 -	0.737 -	0.710 -	6.08 -	0.744 U	53.3 J	0.361 U	10.5 J	6.64 J	0.0137 J	0.00070 NJ
A4B-C06-H49-20						24.9 J						
Limit	1.7	1.8	1.7	1.5	20	30	68000	1.5	300	400	7.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	ug/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%	90%
Max. Result	0.984	0.726	0.739	0.726	19.9	24.9	53.3	0.361 U	19.6	7.93	0.0137	0.0110
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	0	5	0	8	0	4	2	2
% Nondetects	0%	0%	0%	0%	0%	63%	0%	100%	0%	50%	25%	25%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU7

	Primary COCs					Secondary COCs						
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Barium	Beryllium	Chromium	Lead	Mercury	Aroclor-1254
A4B-C07-H50-1	0.960 J	0.895 -	0.897 -	0.895 -	7.64 -	0.723 U	48.9 J	0.401 J	11.6 J	10.2 J	0.0129 J	0.0037 U
A4B-C07-H50-2	0.828 J	0.583 -	0.590 -	0.583 -	11.5 -	0.715 U	50.4 J	0.357 J	10.9 J	9.06 J	0.0114 J	0.0036 U
A4B-C07-H50-2-D	0.941 J	0.631 -	0.640 -	0.631 -	10.2 -	0.723 U	47.2 J	0.342 J	9.88 J	8.98 J	0.0127 J	0.0037 U
A4B-C07-H50-3	0.814 J	0.583 -	0.579 -	0.583 -	14.9 -	0.682 U	43.6 J	0.243 J	9.84 J	6.66 J	0.0070 J	0.0035 U
A4B-C07-H50-4	0.843 J	0.647 -	0.612 -	0.647 -	8.53 -	0.712 U	50.1 J	0.312 J	9.33 J	7.23 J	0.0070 J	0.0036 U
A4B-C07-H50-5	0.912 J	0.633 -	0.624 -	0.633 -	4.73 -	0.715 U	69.9 J	0.360 J	12.5 J	8.26 J	0.0139 J	0.0036 U
A4B-C07-H50-6	0.881 J	0.638 -	0.646 -	0.638 -	7.52 -	0.735 U	46.2 J	0.423 J	11.9 J	10.7 J	0.0139 J	0.0008 J
A4B-C07-H50-7	0.895 J	0.659 -	0.687 -	0.659 -	13.5 -	0.711 U	42.1 J	0.261 J	7.84 J	7.37 J	0.0102 J	0.0036 U
A4B-C07-H50-8	0.788 J	0.486 -	0.502 -	0.486 -	6.22 -	0.693 U	32.5 J	0.240 J	8.27 J	7.59 J	0.0113 J	0.0034 U
Limit	1.7	1.8	1.7	1.5	20	30	68000	1.5	300	400	7.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%	90%
Max. Result	0.96	0.895	0.897	0.895	14.9	0.735 U	69.9	0.423	12.5	10.7	0.0139	0.0008
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	0	8	0	0	0	0	0	7
% Nondetects	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	88%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU8

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C08-1	0.976 -	0.713 -	0.696 -	0.713 -	10.9 -	0.758 U	0.319 U	0.0037 NJ
A4B-C08-2	1.60 -	1.29 -	1.29 -	1.29 -	20.8 -	0.804 U	0.872 U	0.0017 NJ
A4B-C08-4	1.68 -	1.38 -	1.40 -	1.38 -	16.5 -	0.850 U	1.04 U	0.0039 UJ
A4B-C08-5	1.17 -	0.756 -	0.771 -	0.756 -	15.7 -	0.752 U	0.389 U	0.0015 NJ
A4B-C08-5-D	1.16 -	0.847 -	0.871 -	0.847 -	17.4 -	0.751 U	0.684 U	0.0015 NJ
A4B-C08-6	1.11 -	0.940 -	0.930 -	0.940 -	5.17 -	0.763 U	0.482 U	0.0037 UJ
A4B-C08-7	1.07 -	0.795 -	0.790 -	0.795 -	11.6 -	0.757 U	0.653 U	0.0037 UJ
A4B-C08-10	0.862 -	0.603 -	0.630 -	0.603 -	12.4 -	0.740 U	0.242 U	0.0021 NJ
A4B-C08-11	0.838 -	0.626 -	0.642 -	0.626 -	15.9 -	0.738 U	0.267 U	0.0021 NJ
A4B-C08-12	1.24 -	0.951 -	0.981 -	0.951 -	15.0 -	0.762 U	0.629 U	0.0020 NJ
A4B-C08-13	1.08 -	0.778 -	0.766 -	0.778 -	2.29 UJ	0.766 U	0.721 U	0.0041 UJ
A4B-C08-14	0.935 -	0.730 -	0.751 -	0.730 -	5.29 -	0.750 U	0.504 U	0.0021 NJ
A4B-C08-16	0.973 -	0.725 -	0.716 -	0.725 -	5.04 -	0.757 U	0.500 U	0.0034 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.68	1.38	1.4	1.38	20.8	0.850 U	1.04 U	0.0037
Max. >= Limit	No	No	No	No	Yes	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	54.3% (N)	- -	- -	- -
Test Procedure	- -	- -	- -	- -	Normal	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	1	12	12	4
% Nondetects	0%	0%	0%	0%	8%	100%	100%	33%
Est. Mean*	- -	- -	- -	- -	11.4	- -	- -	- -
UCL	- -	- -	- -	- -	14.6	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	pass	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	5	- -	- -	- -
Size calculation	- -	- -	- -	- -	Pass	- -	- -	- -

APPENDIX B
A4B-CU9

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C09-1	0.840 -	0.329 -	0.334 -	0.329 -	1.91 U	0.741 U	0.478 J	0.0042 UJ
A4B-C09-3	0.995 -	0.833 -	0.849 -	0.833 -	2.71 UJ	0.744 U	0.615 J	0.0036 UJ
A4B-C09-3-D	0.930 -	0.772 -	0.784 -	0.772 -	2.85 J	0.752 U	0.622 J	0.0036 UJ
A4B-C09-4	1.11 -	0.854 -	0.856 -	0.854 -	2.35 UJ	0.760 U	0.583 J	0.0021 NJ
A4B-C09-6	1.03 -	0.815 -	0.822 -	0.815 -	2.59 UJ	0.748 U	0.378 U	0.0007 NJ
A4B-C09-7	1.01 -	0.836 -	0.875 -	0.836 -	7.59 -	0.748 U	0.588 J	0.0036 UJ
A4B-C09-8	0.917 -	0.728 -	0.727 -	0.728 -	2.37 UJ	0.737 U	0.463 J	0.0007 NJ
A4B-C09-9	0.914 -	0.704 -	0.704 -	0.704 -	2.58 UJ	0.756 U	0.579 J	0.0009 NJ
A4B-C09-10	0.981 -	0.830 -	0.846 -	0.830 -	2.64 UJ	0.752 U	0.638 J	0.0040 NJ
A4B-C09-12	0.833 -	0.672 -	0.673 -	0.672 -	3.24 J	0.748 U	0.517 J	0.0030 NJ
A4B-C09-13	0.971 -	0.779 -	0.783 -	0.779 -	2.49 UJ	0.748 U	0.506 J	0.0035 UJ
A4B-C09-14	0.901 -	0.686 -	0.692 -	0.686 -	5.94 -	0.747 U	0.523 J	0.0068 NJ
A4B-C09-16	0.856 -	0.629 -	0.623 -	0.629 -	4.03 -	0.746 U	0.458 J	0.0014 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.11	0.854	0.875	0.854	7.59	0.760 U	0.638	0.0068
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	7	12	1	4
% Nondetects	0%	0%	0%	0%	58%	100%	8%	33%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU9

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C09-1	0.840 -	0.329 -	0.334 -	0.329 -	1.91 U	0.741 U	0.478 J	0.0042 UJ
A4B-C09-3	0.995 -	0.833 -	0.849 -	0.833 -	2.71 UJ	0.744 U	0.615 J	0.0036 UJ
A4B-C09-3-D	0.930 -	0.772 -	0.784 -	0.772 -	2.85 J	0.752 U	0.622 J	0.0036 UJ
A4B-C09-4	1.11 -	0.854 -	0.856 -	0.854 -	2.35 UJ	0.760 U	0.583 J	0.0021 NJ
A4B-C09-6	1.03 -	0.815 -	0.822 -	0.815 -	2.59 UJ	0.748 U	0.378 U	0.0007 NJ
A4B-C09-7	1.01 -	0.836 -	0.875 -	0.836 -	7.59 -	0.748 U	0.588 J	0.0036 UJ
A4B-C09-8	0.917 -	0.728 -	0.727 -	0.728 -	2.37 UJ	0.737 U	0.463 J	0.0007 NJ
A4B-C09-9	0.914 -	0.704 -	0.704 -	0.704 -	2.58 UJ	0.756 U	0.579 J	0.0009 NJ
A4B-C09-10	0.981 -	0.830 -	0.846 -	0.830 -	2.64 UJ	0.752 U	0.638 J	0.0040 NJ
A4B-C09-12	0.833 -	0.672 -	0.673 -	0.672 -	3.24 J	0.748 U	0.517 J	0.0030 NJ
A4B-C09-13	0.971 -	0.779 -	0.783 -	0.779 -	2.49 UJ	0.748 U	0.506 J	0.0035 UJ
A4B-C09-14	0.901 -	0.686 -	0.692 -	0.686 -	5.94 -	0.747 U	0.523 J	0.0068 NJ
A4B-C09-16	0.856 -	0.629 -	0.623 -	0.629 -	4.03 -	0.746 U	0.458 J	0.0014 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.11	0.854	0.875	0.854	7.59	0.760 U	0.638	0.0068
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	7	12	1	4
% Nondetects	0%	0%	0%	0%	58%	100%	8%	33%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU10

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C10-2	0.743 -	0.450 -	0.455 -	0.450 -	5.56 J	0.789 U	0.177 U	0.0038 UJ
A4B-C10-3	0.798 -	0.335 -	0.347 -	0.335 -	2.38 UJ	0.740 U	0.186 U	0.0038 UJ
A4B-C10-4	0.691 -	0.421 -	0.421 -	0.421 -	8.67 J	1.89 -	0.107 U	0.0038 UJ
A4B-C10-5	0.825 -	0.613 -	0.622 -	0.613 -	2.72 J	0.776 U	0.386 U	0.0034 NJ
A4B-C10-7	0.787 -	0.649 -	0.664 -	0.649 -	3.50 J	0.735 U	0.490 U	0.0037 UJ
A4B-C10-8	0.705 -	0.611 -	0.653 -	0.611 -	4.58 J	0.759 U	0.219 U	0.0014 NJ
A4B-C10-9	1.08 -	0.788 -	0.797 -	0.788 -	13.1 J	0.792 U	0.205 U	0.0037 UJ
A4B-C10-11	0.805 -	0.632 -	0.687 -	0.632 -	5.29 J	0.743 U	0.384 U	0.0037 UJ
A4B-C10-12	0.999 -	0.747 -	0.765 -	0.747 -	12.3 J	0.733 U	0.195 U	0.0039 UJ
A4B-C10-12-D	1.09 -	0.763 -	0.763 -	0.763 -	12.8 J	0.742 U	0.238 U	0.0036 UJ
A4B-C10-13	0.745 -	0.489 -	0.509 -	0.489 -	2.20 UJ	0.745 U	0.207 U	0.0034 UJ
A4B-C10-14	0.603 -	0.325 -	0.302 -	0.325 -	9.10 J	0.738 U	0.0659 U	0.0036 UJ
A4B-C10-15	1.11 -	0.866 -	0.891 -	0.866 -	11.1 J	0.767 U	0.496 U	0.0038 UJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.11	0.866	0.891	0.866	13.1	1.89	0.496 U	0.0034
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	-1	-1	-1	-1	-1	-1	-1	-1
Nondetects	0	0	0	0	0	0	0	0
% Nondetects	0%	0%	0%	0%	0%	0%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU11

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C11-1	0.989 -	0.796 -	0.811 -	0.796 -	4.42 J	0.743 U	0.594 -	0.0036 UJ
A4B-C11-2	1.04 -	0.567 -	0.577 -	0.567 -	11.8 J	0.709 U	0.383 -	0.0034 UJ
A4B-C11-3	1.09 -	0.681 -	0.681 -	0.681 -	12.5 J	0.725 U	0.362 -	0.0034 UJ
A4B-C11-5	1.04 -	0.811 -	0.809 -	0.811 -	16.5 J	0.730 U	0.516 -	0.0035 UJ
A4B-C11-6	0.969 -	0.714 -	0.714 -	0.714 -	14.4 J	0.720 U	0.412 -	0.0033 NJ
A4B-C11-7	0.910 -	0.725 -	0.724 -	0.725 -	2.39 UJ	0.742 U	0.450 -	0.0035 UJ
A4B-C11-9	0.874 -	0.556 -	0.552 -	0.556 -	6.06 J	0.720 U	0.371 -	0.0036 UJ
A4B-C11-9-D	0.854 -	0.540 -	0.542 -	0.540 -	2.14 J	0.720 U	0.379 -	0.0036 UJ
A4B-C11-11	0.851 -	0.550 -	0.549 -	0.550 -	3.65 J	0.726 U	0.440 -	0.0036 UJ
A4B-C11-12	0.863 -	0.800 -	0.869 -	0.800 -	2.83 UJ	0.736 U	0.514 -	0.0035 UJ
A4B-C11-13	0.916 -	0.654 -	0.759 -	0.654 -	6.57 J	1.52 -	0.399 -	0.0012 NJ
A4B-C11-14	0.882 -	0.620 -	0.664 -	0.620 -	4.60 J	0.721 U	0.393 -	0.0035 UJ
A4B-C11-16	0.970 -	0.753 -	0.784 -	0.753 -	4.31 J	0.726 U	0.464 -	0.0035 UJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.09	0.811	0.869	0.811	16.5	1.52	0.594	0.0033
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	2	11	0	10
% Nondetects	0%	0%	0%	0%	17%	92%	0%	83%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU12

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C12-1	1.11 J	0.768 -	0.757 J	0.768 -	9.35 J	0.736 U	0.373 -	0.0008 J
A4B-C12-3	0.898 J	0.760 -	0.787 J	0.760 -	5.03 J	0.737 U	0.478 -	0.0038 U
A4B-C12-4	0.735 J	0.486 -	0.504 J	0.486 -	5.15 J	0.734 U	0.256 -	0.0035 U
A4B-C12-5	1.08 J	0.681 -	0.669 J	0.681 -	4.52 J	0.946 U	0.359 -	0.0039 U
A4B-C12-7	0.987 J	0.793 -	0.801 J	0.793 -	2.14 UJ	0.721 U	0.373 -	0.0038 U
A4B-C12-8	0.807 J	0.630 -	0.666 J	0.630 -	3.66 J	0.723 U	0.224 -	0.0036 U
A4B-C12-10	0.857 J	0.595 -	0.599 J	0.595 -	3.24 J	0.754 U	0.280 -	0.0036 U
A4B-C12-11	0.785 J	0.500 -	0.508 J	0.500 -	7.82 J	0.735 U	0.279 -	0.0035 U
A4B-C12-11-D	0.876 J	0.571 -	0.608 J	0.571 -	7.38 J	0.975 -	0.258 -	0.0037 U
A4B-C12-12	0.845 J	0.604 -	0.607 J	0.604 -	5.93 J	0.743 U	0.346 -	0.0007 J
A4B-C12-13	1.05 J	0.780 -	0.800 J	0.780 -	5.34 J	0.736 U	0.566 -	0.0010 J
A4B-C12-14	0.850 J	0.626 -	0.618 J	0.626 -	1.63 U	0.725 U	0.343 -	0.0036 U
A4B-C12-15	0.863 J	0.640 -	0.666 J	0.640 -	3.07 J	0.722 U	0.399 -	0.0037 U
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.11	0.793	0.801	0.793	9.35	0.975	0.566	0.0010
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	1	11	0	9
% Nondetects	0%	0%	0%	0%	8%	92%	0%	75%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU13

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C13-2	0.778 -	0.597 J	0.593 J	0.597 J	7.78 -	0.748 U	0.481 -	0.0013 NJ
A4B-C13-3	0.859 -	0.647 J	0.642 J	0.647 J	4.52 -	0.747 U	0.429 -	0.0040 UJ
A4B-C13-3-D	0.912 -	0.769 J	0.762 J	0.769 J	5.30 -	0.758 U	0.548 -	0.0040 UJ
A4B-C13-4	0.866 -	0.607 J	0.599 J	0.607 J	6.43 -	0.756 U	0.386 -	0.0035 UJ
A4B-C13-5	0.868 -	0.844 J	0.890 J	0.844 J	5.84 -	0.755 U	0.447 -	0.0034 NJ
A4B-C13-6	0.933 -	0.680 J	0.675 J	0.680 J	4.14 -	0.756 U	0.463 -	0.0011 NJ
A4B-C13-8	0.848 -	0.653 J	0.668 J	0.653 J	5.68 -	0.764 U	0.436 -	0.0011 NJ
A4B-C13-9	0.810 -	0.601 J	0.594 J	0.601 J	4.56 -	0.758 U	0.395 -	0.0036 UJ
A4B-C13-11	0.847 -	0.628 J	0.633 J	0.628 J	4.38 -	0.754 U	0.345 -	0.0017 NJ
A4B-C13-12	0.961 -	0.644 J	0.626 J	0.644 J	3.24 -	0.758 U	0.481 -	0.0009 UJ
A4B-C13-13	0.785 -	0.576 J	0.564 J	0.576 J	6.66 -	0.745 U	0.380 -	0.0009 NJ
A4B-C13-15	0.711 -	0.491 J	0.492 J	0.491 J	12.2 -	0.735 U	0.334 -	0.00055 NJ
A4B-C13-16	0.745 -	0.429 J	0.469 J	0.429 J	10.4 -	0.731 U	0.128 J	0.0034 UJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	0.961	0.844	0.89	0.844	12.2	0.764 U	0.548	0.0034
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	0	12	0	5
% Nondetects	0%	0%	0%	0%	0%	100%	0%	42%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU17

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C17-1	0.639 -	0.417 J	0.441 J	0.417 J	4.39 -	0.766 U	0.195 U	0.0017 U
A4B-C17-1-D	0.711 -	0.521 J	0.547 J	0.521 J	3.70 -	0.722 U	0.214 U	0.0021 U
A4B-C17-2	1.19 -	0.688 J	0.676 J	0.688 J	5.27 -	0.799 U	0.432 U	0.0039 UJ
A4B-C17-3	0.873 -	0.792 J	0.871 J	0.792 J	3.40 -	0.741 U	0.272 U	0.0038 UJ
A4B-C17-5	0.734 -	0.496 J	0.506 J	0.496 J	1.98 J	0.761 U	0.419 -	0.0039 UJ
A4B-C17-6	0.852 -	0.571 J	0.567 J	0.571 J	1.50 U	0.808 U	0.265 U	0.0045 U
A4B-C17-8	1.05 -	0.927 J	0.927 J	0.927 J	4.19 -	0.815 U	0.385 -	0.0039 UJ
A4B-C17-9	0.807 -	0.503 J	0.495 J	0.503 J	4.25 -	0.808 U	0.307 U	0.0040 UJ
A4B-C17-10	1.03 -	0.790 J	0.777 J	0.790 J	10.0 -	0.866 U	0.595 -	0.0015 U
A4B-C17-12	1.25 -	1.01 J	1.10 J	1.01 J	9.94 -	0.779 U	0.650 -	0.0018 U
A4B-C17-14	0.948 -	0.779 J	0.792 J	0.779 J	16.1 -	0.783 U	0.421 -	0.0039 U
A4B-C17-15	0.938 -	0.682 J	0.674 J	0.682 J	1.62 U	0.780 U	0.248 U	0.0024 U
A4B-C17-16	0.846 -	0.604 J	0.603 J	0.604 J	5.25 -	0.773 U	0.338 U	0.0013 U
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.25	1.01	1.1	1.01	16.1	0.866 U	0.650	0.0045 U
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	2	12	7	12
% Nondetects	0%	0%	0%	0%	17%	100%	58%	100%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU16

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C16-1	0.839 J	0.683 J	0.718 J	0.683 J	5.89 -	1.29 U	0.580 -	0.0011 NJ
A4B-C16-3	0.610 J	0.428 J	0.418 J	0.428 J	11.0 -	1.00 U	0.280 -	0.0017 NJ
A4B-C16-4	0.709 J	0.523 J	0.531 J	0.523 J	23.1 -	2.00 -	0.270 -	0.0059 NJ
A4B-C16-4-D	0.904 J	0.635 J	0.662 J	0.635 J	26.4 -	1.96 -	0.290 -	0.0012 NJ
A4B-C16-5	0.655 J	0.549 J	0.559 J	0.549 J	18.3 -	1.09 U	0.290 -	0.0039 UJ
A4B-C16-6	0.888 J	0.804 J	0.814 J	0.804 J	9.78 -	1.74 -	0.430 -	0.0036 NJ
A4B-C16-7	0.691 J	0.535 J	0.544 J	0.535 J	3.06 -	1.10 U	0.290 -	0.0038 UJ
A4B-C16-9	0.850 J	0.736 J	0.734 J	0.736 J	6.58 -	1.09 U	0.450 -	0.0021 NJ
A4B-C16-10	0.891 J	0.645 J	0.624 J	0.645 J	10.5 -	0.988 U	0.530 -	0.0051 J
A4B-C16-11	0.702 J	0.498 J	0.521 J	0.498 J	3.93 J	1.10 U	0.580 -	0.0036 NJ
A4B-C16-13	0.832 J	0.696 J	0.674 J	0.696 J	12.6 -	6.89 -	0.560 -	0.0310 J
A4B-C16-15	0.878 J	0.654 J	0.660 J	0.654 J	4.88 -	1.07 U	0.450 -	0.0016 NJ
A4B-C16-16	0.763 J	0.459 J	0.458 J	0.459 J	9.58 -	1.13 U	0.300 -	0.0015 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	0.904	0.804	0.814	0.804	26.4	6.89	0.580	0.031
Max. >= Limit	No	No	No	No	Yes	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	95.2% (LN)	- -	- -	- -
Test Procedure	- -	- -	- -	- -	Lognormal	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	0	9	0	2
% Nondetects	0%	0%	0%	0%	0%	75%	0%	17%
Est. Mean*	- -	- -	- -	- -	10.4	- -	- -	- -
UCL	- -	- -	- -	- -	16.1	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	pass	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	5	- -	- -	- -
Size calculation	- -	- -	- -	- -	Pass	- -	- -	- -

APPENDIX B
A4B-CU15

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C15-2	1.01 -	0.732 -	0.744 -	0.732 -	3.69 J	1.05 U	0.620 -	0.0017 NJ
A4B-C15-2-D	0.932 -	0.839 -	0.877 -	0.839 -	4.74 J	1.17 U	0.650 -	0.0017 NJ
A4B-C15-3	1.23 -	0.827 -	0.834 -	0.827 -	7.63 -	1.13 U	0.640 -	0.0029 NJ
A4B-C15-4	0.862 -	0.703 -	0.715 -	0.703 -	3.96 J	1.11 U	0.580 -	0.0014 NJ
A4B-C15-6	0.900 -	0.593 -	0.605 -	0.593 -	2.27 J	1.04 U	0.400 -	0.0007 NJ
A4B-C15-7	1.15 -	0.942 -	0.978 -	0.942 -	7.79 -	1.07 U	0.580 -	0.0025 NJ
A4B-C15-8	1.04 -	0.902 -	0.922 -	0.902 -	3.57 J	0.981 U	0.510 -	0.0008 NJ
A4B-C15-9	0.861 -	0.665 -	0.670 -	0.665 -	9.46 -	1.08 U	0.550 -	0.0030 NJ
A4B-C15-11	0.967 -	0.790 -	0.798 -	0.790 -	16.6 -	1.04 U	0.240 -	0.0041 NJ
A4B-C15-12	0.940 -	0.813 -	0.832 -	0.813 -	6.01 -	1.02 U	0.620 -	0.0020 NJ
A4B-C15-13	1.21 -	1.00 -	1.01 -	1.00 -	7.07 -	0.957 U	0.400 -	0.0009 NJ
A4B-C15-14	1.10 -	1.03 -	1.03 -	1.03 -	5.37 -	1.09 U	0.400 -	0.0016 NJ
A4B-C15-15	0.705 -	0.581 -	0.598 -	0.581 -	5.05 -	1.10 U	0.370 -	0.0015 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.23	1.03	1.03	1.03	16.6	1.17 U	0.650	0.0041
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	0	12	0	0
% Nondetects	0%	0%	0%	0%	0%	100%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU14

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C14-1	1.09 J	0.876 -	0.910 -	0.876 -	2.74 UJ	0.707 U	0.590 -	0.0037 UJ
A4B-C14-2	0.780 J	0.590 -	0.585 -	0.590 -	3.61 J	0.676 U	0.300 -	0.0035 UJ
A4B-C14-4	0.899 J	0.676 -	0.684 -	0.676 -	2.50 UJ	0.693 U	0.370 -	0.0034 UJ
A4B-C14-6	0.997 J	0.735 -	0.754 -	0.735 -	2.63 UJ	0.715 U	0.710 -	0.0036 UJ
A4B-C14-7	0.858 J	0.626 -	0.638 -	0.626 -	3.61 J	0.719 U	0.560 -	0.0037 UJ
A4B-C14-7-D	0.971 J	0.702 -	0.726 -	0.702 -	4.62 J	0.703 U	0.630 -	0.0038 UJ
A4B-C14-8	0.949 J	0.716 -	0.726 -	0.716 -	2.54 UJ	0.720 U	0.570 -	0.0035 UJ
A4B-C14-9	0.951 J	0.849 -	0.859 -	0.849 -	7.34 J	0.720 U	0.650 -	0.0036 UJ
A4B-C14-11	1.08 J	0.862 -	0.869 -	0.862 -	7.29 J	0.711 U	0.630 -	0.0035 UJ
A4B-C14-12	0.933 J	0.777 -	0.791 -	0.777 -	5.27 J	0.698 U	0.440 -	0.0034 UJ
A4B-C14-13	0.773 J	0.545 -	0.516 -	0.545 -	3.76 J	0.679 U	0.300 -	0.0009 NJ
A4B-C14-14	1.09 J	0.844 -	0.841 -	0.844 -	17.1 J	1.96 -	0.560 -	0.0078 NJ
A4B-C14-16	1.02 J	0.779 -	0.789 -	0.779 -	13.1 J	2.14 -	0.480 -	0.0048 NJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.09	0.876	0.91	0.876	17.1	2.14	0.710	0.0078
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	4	10	0	9
% Nondetects	0%	0%	0%	0%	33%	83%	0%	75%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU21 PRIMARY COCs

	Primary COCs				
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
A4B-C21-U13-1	1.00 J	0.644 -	0.637 J	0.644 -	4.25 J
A4B-C21-U13-2	0.929 J	0.612 -	0.616 J	0.612 -	4.24 J
A4B-C21-U13-3	1.03 J	0.754 -	0.770 J	0.754 -	3.05 J
A4B-C21-U13-4	0.934 J	0.723 -	0.765 J	0.723 -	6.15 J
A4B-C21-U13-4-D	0.979 J	0.660 -	0.661 J	0.660 -	5.35 J
A4B-C21-U13-5	0.856 J	0.650 -	0.656 J	0.650 -	3.71 J
A4B-C21-U13-6	0.904 J	0.809 -	0.834 J	0.809 -	2.90 J
A4B-C21-U13-7	0.955 J	0.702 -	0.683 J	0.702 -	5.96 J
A4B-C21-U13-8	0.928 J	0.686 -	0.685 J	0.686 -	4.28 J
Limit	1.7	1.8	1.7	1.5	20
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.03	0.809	0.834	0.809	6.15
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8
Nondetects	0	0	0	0	0
% Nondetects	0%	0%	0%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU21 SECONDARY COCs

	Secondary COCs														
SAMPLE ID	Technetium-99	Arsenic	Barium	Beryllium	Chromium	Lead	Mercury	Selenium	1,1,1-Trichloroethane	4-Methyl-2-pentanone	Aroclor-1254	Benzene	Ethylbenzene	Toluene	Xylenes, Total
A4B-C21-U13-1	0.796 U	8.28 J	82.6 J	0.411 -	11.3 J	10.6 U	0.0138 U	1.34 U	0.0009 U	0.0046 U	0.0029 NJ	0.0009 U	0.0002 J	0.0003 J	0.0017 -
A4B-C21-U13-2	0.787 U	8.35 J	73.4 J	0.463 -	12.6 J	11.0 U	0.0113 U	1.59 U	0.0011 U	0.0054 U	0.0017 NJ	0.0011 U	0.0008 J	0.0005 J	0.0037 -
A4B-C21-U13-3	0.779 U	5.58 J	127 J	0.673 -	17.0 J	12.9 U	0.0219 U	1.64 U	0.0010 U	0.0051 U	0.0008 NJ	0.0010 U	0.0003 J	0.0004 J	0.0014 -
A4B-C21-U13-4	0.775 U	5.61 J	146 J	0.769 -	20.3 J	13.4 U	0.0248 U	1.68 U	0.0010 U	0.0052 U	0.0047 UJ	0.0010 U	0.0003 J	0.0004 J	0.0010 J
A4B-C21-U13-4-D	0.789 U	14.2 J	151 J	0.635 -	16.3 J	15.2 U	0.0199 U	1.40 U	0.0010 U	0.0048 U	0.0009 NJ	0.0010 U	0.0002 J	0.0003 J	0.0011 -
A4B-C21-U13-5	0.785 U	8.16 J	103 J	0.483 -	13.2 J	12.7 U	0.0132 U	1.30 U	0.0010 U	0.0049 U	0.0008 NJ	0.0010 U	0.0002 J	0.0003 J	0.0008 J
A4B-C21-U13-6	0.795 U	5.44 J	60.0 J	0.377 -	10.4 J	9.26 U	0.0136 U	1.61 U	0.0010 U	0.0050 U	0.0010 NJ	0.0010 U	0.0005 J	0.0003 J	0.0023 -
A4B-C21-U13-7	0.786 U	13.5 J	95.2 J	0.605 -	14.2 J	20.4 U	0.0134 U	1.71 U	0.0010 U	0.0052 U	0.0059 NJ	0.0010 U	0.0002 J	0.0010 U	0.0009 J
A4B-C21-U13-8	0.778 U	11.3 J	97.9 J	0.548 -	15.3 J	11.0 U	0.0173 U	1.55 U	0.0009 U	0.0046 U	0.0014 NJ	0.0009 U	0.0003 J	0.0009 U	0.0018 -
Limit	30	12	68000	1.5	300	400	7.5	5400	4300	2500000	130	850000	5100000	100000000	920000000
Units	pCi/g	ug/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	mg/kg	ug/kg
Conf. Level	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	0.796 U	14.2	.151	0.769	20.3	20.4 U	0.0248 U	1.71 U	0.0011 U	0.0054 U	0.0059	0.0011 U	0.0008	0.0005	0.0037
Max. >= Limit	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	38.8% (LN)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	Lognormal	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	8	0	0	0	0	8	8	8	8	8	0	8	0	2	0
% Nondetects	100%	0%	0%	0%	0%	100%	100%	100%	100%	100%	0%	100%	0%	25%	0%
Est. Mean*	- -	9.44	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	11.7	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	pass	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	8	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	Pass	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU22

	Primary COCs					Secondary COCs				
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Lead	1,1,1-Trichloroethane	Aroclor-1254
A4B-C22-H28-1	0.744 -	0.379 J	0.371 J	0.379 J	3.24 J	1.48 -	0.178 J	6.75 U	0.0023 -	0.0039 UJ
A4B-C22-H28-2	0.743 -	0.371 J	0.365 J	0.371 J	3.92 J	0.659 U	0.111 J	4.03 U	0.0018 -	0.0038 UJ
A4B-C22-H28-3	0.783 J	0.469 -	0.499 J	0.469 -	7.30 J	2.80 -	0.193 U	6.14 J	0.0024 -	0.0038 U
A4B-C22-H28-4	0.655 J	0.364 -	0.375 J	0.364 -	6.69 J	1.50 -	0.205 U	7.09 J	0.0010 U	0.0041 U
A4B-C22-H28-4-D	0.691 J	0.403 -	0.404 J	0.403 -	11.0 J	1.55 -	0.198 U	5.81 U	0.0010 U	0.0041 U
A4B-C22-H28-5	0.622 J	0.345 -	0.374 J	0.345 -	1.82 U	1.28 -	0.158 U	5.29 U	0.00050 J	0.0014 J
A4B-C22-H28-6	0.806 J	0.372 -	0.414 J	0.372 -	3.95 J	0.846 U	0.204 U	4.84 U	0.0010 U	0.0037 U
A4B-C22-H28-7	0.805 J	0.294 -	0.302 J	0.294 -	3.45 J	0.918 U	0.202 U	5.64 J	0.0024 -	0.0039 U
A4B-C22-H28-8	0.497 J	0.328 -	0.335 J	0.328 -	13.0 -	3.45 -	0.105 U	6.12 J	0.0018 -	0.0038 U
Limit	1.7	1.8	1.7	1.5	20	30	1.5	400	4300	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%
Max. Result	0.806	0.469	0.499	0.469	13.0	3.45	0.178	7.09	0.0024	0.0014
Max. >= Limit	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	1	3	6	4	2	1
% Nondetects	0%	0%	0%	0%	13%	38%	75%	50%	25%	13%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

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APPENDIX B
A4B-CU20

	Primary COCs					Secondary COCs				
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Lead	Aroclor-1254	Benzene
A4B-C20-U12-1	0.878 -	0.744 -	0.803 -	0.744 -	1.62 U	0.741 U	0.269 J	7.44 U	0.0039 UJ	0.0012 U
A4B-C20-U12-2	0.809 -	0.636 -	0.628 -	0.636 -	5.14 J	0.742 U	0.259 J	7.41 U	0.0038 UJ	0.0011 U
A4B-C20-U12-3	0.765 -	0.558 -	0.548 -	0.558 -	3.57 J	0.742 U	0.251 J	5.88 U	0.0038 UJ	0.0011 U
A4B-C20-U12-4	0.777 -	0.609 -	0.604 -	0.609 -	2.37 UJ	0.737 U	0.250 J	9.78 U	0.0038 UJ	0.0011 U
A4B-C20-U12-5	1.04 -	0.636 -	0.623 -	0.636 -	2.63 UJ	0.743 U	0.445 J	11.3 U	0.0040 UJ	0.0009 U
A4B-C20-U12-6	0.941 -	0.654 -	0.671 -	0.654 -	2.58 UJ	0.751 U	0.222 J	6.11 U	0.0038 UJ	0.0010 U
A4B-C20-U12-7	0.945 -	0.622 -	0.620 -	0.622 -	4.58 J	0.749 U	0.216 J	5.71 U	0.0038 UJ	0.0010 U
A4B-C20-U12-7-D	0.971 -	0.671 -	0.675 -	0.671 -	2.54 UJ	0.744 U	0.388 J	6.90 U	0.0038 UJ	0.0012 U
A4B-C20-U12-8	0.932 -	0.688 -	0.682 -	0.688 -	5.09 J	0.740 U	0.198 J	7.60 U	0.0038 UJ	0.0010 U
Limit	1.7	1.8	1.7	1.5	20	30	1.5	400	130	850000
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%
Max. Result	1.04	0.744	0.803	0.744	5.14	0.751 U	0.445	11.3 U	0.0040 U	0.0012 U
Max. >= Limit	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8	8	8	8	8	8
Nondetects	0	0	0	0	4	8	0	8	0	8
% Nondetects	0%	0%	0%	0%	50%	100%	0%	100%	0%	100%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU19 SECONDARY COCs

	Secondary COCs														
SAMPLE ID	Technetium-99	Arsenic	Barium	Beryllium	Chromium	Lead	Mercury	Selenium	1,1,1-Trichloroethane	4-Methyl-2-pentanone	Aroclor-1254	Benzene	Ethylbenzene	Toluene	Xylenes, Total
A4B-C19-U11-1	0.803 U	5.61 J	82.2 J	0.521 -	15.6 J	10.5 U	0.0111 J	1.54 U	0.0011 U	0.0054 U	0.0019 NJ	0.0011 U	0.0011 U	0.0011 UJ	0.0011 UJ
A4B-C19-U11-2	0.759 U	5.54 J	70.2 J	0.682 -	18.6 J	12.0 U	0.0078 J	1.55 U	0.0010 U	0.0049 U	0.0040 UJ	0.0010 U	0.0010 U	0.0010 UJ	0.0010 UJ
A4B-C19-U11-3	0.783 U	2.85 J	49.0 J	0.476 -	12.4 J	8.95 U	0.0294 J	1.41 U	0.0011 U	0.0054 U	0.0140 NJ	0.0011 U	0.0011 U	0.0011 UJ	0.0011 UJ
A4B-C19-U11-4	0.782 U	2.05 J	39.3 J	0.358 -	10.2 J	6.58 U	0.0146 J	1.39 U	0.0011 U	0.0055 U	0.0020 NJ	0.0011 U	0.0011 U	0.0011 UJ	0.0011 UJ
A4B-C19-U11-5	0.783 U	2.28 J	49.9 J	0.439 -	12.3 J	8.93 U	0.0074 J	1.68 U	0.0010 U	0.0050 U	0.0190 NJ	0.0010 U	0.0010 U	0.0010 UJ	0.0010 UJ
A4B-C19-U11-6	0.776 U	11.7 J	125 J	0.709 -	18.6 J	12.6 U	0.0113 J	1.72 U	0.0009 U	0.0047 U	0.0041 UJ	0.0009 U	0.0009 U	0.0009 UJ	0.0009 UJ
A4B-C19-U11-6-D	0.816 U	2.15 J	164 J	0.671 -	21.0 J	11.5 U	0.0268 J	1.76 U	0.0010 U	0.0052 U	0.0041 UJ	0.0010 U	0.0010 U	0.0010 UJ	0.0013 J
A4B-C19-U11-7	0.789 U	1.11 J	38.0 J	0.439 -	12.6 J	7.59 U	0.0104 J	1.37 U	0.0011 U	0.0054 U	0.0022 NJ	0.0011 U	0.0011 U	0.0011 UJ	0.0011 UJ
A4B-C19-U11-8	0.772 U	1.56 J	50.5 J	0.593 -	16.3 J	12.8 U	0.0093 J	1.68 U	0.0011 U	0.0053 U	0.0470 NJ	0.0011 U	0.0011 U	0.0011 UJ	0.0011 UJ
Limit	30	12	68000	1.5	300	400	7.5	5400	4300	2500000	130	850000	5100000	100000000	920000000
Units	pCi/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	mg/kg	ug/kg
Conf. Level	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	0.816 U	11.7	164	0.709	21.0	12.8 U	0.0294	1.76 U	0.0011 U	0.0055 U	0.047	0.0011 U	0.0011 U	0.0011 U	0.0013
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Nondetects	8	0	0	0	0	8	0	8	8	8	2	8	8	8	7
% Nondetects	100%	0%	0%	0%	0%	100%	0%	100%	100%	100%	25%	100%	100%	100%	88%
Est. Mean*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
a posteriori Sample	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Size calculation	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

APPENDIX B
A4B-CU19 PRIMARY COCs

	Primary COCs				
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
A4B-C19-U11-1	1.09 -	0.806 -	0.809 -	0.806 -	2.84 J
A4B-C19-U11-2	0.985 -	0.740 -	0.730 -	0.740 -	3.87 -
A4B-C19-U11-3	1.14 -	0.888 -	0.916 -	0.888 -	4.36 -
A4B-C19-U11-4	1.11 -	0.799 -	0.784 -	0.799 -	1.96 U
A4B-C19-U11-5	1.17 -	0.945 -	0.976 -	0.945 -	2.44 J
A4B-C19-U11-6	1.15 -	0.849 -	0.849 -	0.849 -	4.91 -
A4B-C19-U11-6-D	1.19 -	0.887 -	0.889 -	0.887 -	5.97 -
A4B-C19-U11-7	1.01 -	0.875 -	0.862 -	0.875 -	2.81 J
A4B-C19-U11-8	1.07 -	0.726 -	0.725 -	0.726 -	4.36 -
Limit	1.7	1.8	1.7	1.5	20
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.19	0.945	0.976	0.945	5.97
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -
Sample Size	8	8	8	8	8
Nondetects	0	0	0	0	1
% Nondetects	0%	0%	0%	0%	13%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

APPENDIX B
A4B-CU18

	Primary COCs					Secondary COCs		
SAMPLE_ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Technetium-99	Beryllium	Aroclor-1254
A4B-C18-1	0.944 -	0.590 -	0.599 -	0.590 -	6.20 -	1.20 U	0.290 -	0.0037 UJ
A4B-C18-2	0.825 -	0.709 -	0.734 -	0.709 -	2.13 J	1.27 U	0.400 -	0.0007 NJ
A4B-C18-4	0.797 -	0.668 -	0.683 -	0.668 -	3.72 J	1.18 U	0.500 -	0.0032 NJ
A4B-C18-5	1.08 -	0.992 -	0.968 -	0.992 -	4.60 -	1.18 U	0.820 -	0.0040 UJ
A4B-C18-7	0.817 -	0.560 -	0.574 -	0.560 -	3.30 -	1.22 U	0.420 -	0.0024 NJ
A4B-C18-8	0.833 -	0.741 -	0.743 -	0.741 -	4.91 -	1.09 U	0.470 -	0.0038 UJ
A4B-C18-8-D	0.794 -	0.719 -	0.711 -	0.719 -	5.39 -	1.01 U	0.520 -	0.0038 UJ
A4B-C18-10	0.782 -	0.620 -	0.621 -	0.620 -	9.77 -	1.09 U	0.420 -	0.0017 NJ
A4B-C18-11	0.845 -	0.631 -	0.639 -	0.631 -	4.13 -	1.12 U	0.310 -	0.0006 NJ
A4B-C18-12	0.652 -	0.515 -	0.491 -	0.515 -	2.30 J	1.14 U	0.380 -	0.0039 UJ
A4B-C18-13	0.765 -	0.494 -	0.484 -	0.494 -	2.94 J	1.15 U	0.250 -	0.0038 UJ
A4B-C18-15	0.933 -	0.787 -	0.763 -	0.787 -	3.79 J	1.17 U	0.910 -	0.0040 UJ
A4B-C18-16	0.696 -	0.452 -	0.529 -	0.452 -	1.83 J	1.15 U	0.330 -	0.0037 UJ
Limit	1.7	1.8	1.7	1.5	20	30	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%
Max. Result	1.0800	0.9920	0.9680	0.9920	9.7700	1.2700 U	0.9100	0.0032
Max. >= Limit	No	No	No	No	No	No	No	No
W-statistic Prob. #	- -	- -	- -	- -	- -	- -	- -	- -
Test Procedure	- -	- -	- -	- -	- -	- -	- -	- -
Sample Size	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	0	12	0	7
% Nondetects	0%	0%	0%	0%	0%	100%	0%	58%
Est. Mean*	- -	- -	- -	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -	- -	- -	- -

a posteriori Sample	- -	- -	- -	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -	- -	- -	- -

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 47	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		1		0.0712	0.888		0.011
Barium*	NC	0.205	4.09		--		--	--		53.2
Beryllium**	NC	0.0008	0.016		--		--	--		--
Chromium*	NC	0.00696	0.139		--		--	--		17.3
Lead*	--	--	--		--		--	--		--
Mercury*	NC	0.0000949	0.0019		--		--	--		0.0168

Carcinogenic

$$\text{RISK} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \quad \text{X} \quad 1.00\text{E-}05 = \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.0110}}{0.888}\right] = \mathbf{0.0124}$$

* Barium, Chromium, and Mercury are eliminated from the COC list because the maximum concentrations are less than the site-specific maximum background values (Ba = 261 mg/kg, Total Cr = 27.3 mg/kg, and Hg = 0.1 mg/kg). Lead does not have a GCN. Note: Total Chromium was determined but the GCNs listed here are for hexavalent chromium (Cr+6).

** Beryllium is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 46	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		1		0.0712	0.888		0.0042
Barium*	NC	0.205	4.09		--		--	--		102
Beryllium*	NC	0.0008	0.016		--		--	--		0.719
Chromium*	NC	0.00696	0.139		--		--	--		19.4
Lead*	--	--	--		--		--	--		--
Mercury**	NC	0.0000949	0.0019		--		--	--		--

Carcinogenic

$$\text{RISK} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \quad \text{X} \quad 1.00\text{E-}05 \quad = \quad \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.0042}}{0.888}\right] = \mathbf{0.0047}$$

* Barium, Beryllium, and Chromium are eliminated from the COC list because the maximum concentrations are less than the site-specific maximum background values (Ba = 261 mg/kg, Be = 3.05 mg/kg, and Total Cr = 27.3 mg/kg). Lead does not have a GCN. Note: Total Chromium was determined but the GCNs listed here are for hexavalent chromium (Cr+6).

** Mercury is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 28 B	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		2		0.0356	0.444		0.0014
Beryllium*	NC	0.0008	0.016		--		--	--		0.178
Lead*	--	--	--		--		--	--		--
1,1,1-Trichloroethane	NC	0.106	2.12		2		0.0530	1.060		0.0024

Carcinogenic

$$\text{RISK} = \left\{ \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \right\} \times 1.00\text{E-05} = \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.001}}{0.44}\right] + \left[\frac{\overset{\text{1,1,1-TCA}}{0.0024}}{1.06}\right] = \mathbf{0.0054}$$

* Beryllium is eliminated from the COC list because the maximum concentration is less than the site-specific maximum background value of 3.05 mg/kg and Lead does not have a GCN.

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 28 A	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		1		0.0712	0.888		0.0015
Beryllium*	NC	0.0008	0.016		--		--	--		0.556
Lead*	--	--	--		--		--	--		--
1,1,1-Trichloroethane**	NC	0.106	2.12		--		--	--		--

Carcinogenic

$$\text{RISK} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \quad \text{X} \quad 1.00\text{E-}05 = \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.0015}}{0.888}\right] = \mathbf{0.0017}$$

* Beryllium is eliminated from the COC list because the maximum concentration is less than the site-specific maximum background value of 3.05 mg/kg and Lead does not have a GCN.

** 1,1,1-Trichloroethane is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)

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APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 18	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		2		0.0356	0.444		0.014
Beryllium*	NC	0.0008	0.016		--		--	--		0.487
Lead*	--	--	--		--		--	--		--
2-Butanone (MEK)**	NC	1.18	23.5		--		--	--		--
Xylenes	NC	0.0811	1.62		2		0.0406	0.810		0.001

Carcinogenic

$$\text{RISK} = \left\{ \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \right\} \times 1.00\text{E-05} = \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.014}}{0.44}\right] + \left[\frac{\overset{\text{Xylenes}}{0.001}}{0.81}\right] = \mathbf{0.0328}$$

* Beryllium is eliminated from the COC list because the maximum concentration is less than the site-specific maximum background value of 3.05 mg/kg and Lead does not have a GCN.

** 2-Butanone is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 04	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg		Number of COCs (NC vs. CA)	Adjusted GCN mg/kg		Maximum Concentration mg/kg
		1 DAF	20 DAF		1 DAF	20 DAF	
Benzene*	CA	0.00172	0.0343	--			
Tetrachloroethene	CA	0.00398	0.0795	1	0.00398	0.0795	0.042
Aroclor-1254	NC	0.0712	0.888	2	0.0356	0.444	0.0052
Beryllium**	NC	0.0008	0.016	--	--	--	0.459
Toluene	NC	0.276	5.51	2	0.1380	2.76	0.0011

Carcinogenic

$$\text{RISK} = \left\{ \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \right\} \times 1.00\text{E-05} = \textit{LIMIT OF 1.00E-5}$$

20 DAF

$$\text{RISK} = \overset{\text{Tetrachloroethene}}{\left[\frac{0.042}{0.0795}\right]} \times 1.00\text{E-05} = \mathbf{5.28E\text{-}06}$$

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \overset{\text{Aroclor-1254}}{\left[\frac{0.0052}{0.444}\right]} + \overset{\text{Toluene}}{\left[\frac{0.0011}{2.76}\right]} = \mathbf{0.0121}$$

* Benzene is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)
** Beryllium is eliminated from the COC list because the maximum concentration is less than the site-specific maximum background value of 3.05 mg/kg.

6094

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State of Ohio Environmental Protection Agency

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www.epa.state.oh.us
Bob Taft, Governor
Bruce Johnson, Lt. Governor
Joseph P. Koncelik, Director

MEMO

TO: J.D. Chiou and Frank Miller, FF

FROM: Donna Bohannon, OFFO

DATE: October 11, 2005

SUBJECT: **Approval - V/FCN 20810-PSP-0008-05** *Certification Design Letter and Certification Project Specific Plan For Area 4B - Part One*

This V/FCN documents the collection of 20 Tc-99 soil samples from the AWAC excavation in Area 4B, measuring 4ft by 9 ft, in CU6. This sampling will determine whether the AWAC material has been removed from the excavation. Since this excavation is within a sub-CU, the samples will be handled as field duplicates and the highest value will be used for statistical analysis as to eliminate over-weighting the CU. Ohio EPA approves of this variance.

Q:\ou5\3B4BA5\Area4B\Area4BPartOneVFCN1.wpd

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VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): **YES**	**V/F: 20810-PSP-0008-06**
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV 1		**Page: 1 of 3**
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		**Date: 10/17/05**

VARIANCE / FIELD CHANGE NOTICE (Include justification):

This Variance/Field Change Notice (V/FCN) documents the collection of 20 additional grab soil samples for technetium-99 from two excavations extending from the original above-WAC area in CU 6 (sub-CU A4B-C06-H49-1) identified in variances 20810-PSP-0008-02 and 20810-PSP-0008-05. Both excavated areas are approximately 4 feet by 4 feet (see Figures 1 and 2).

The side slopes and the floor of the additional excavation are to be sampled. See Figure 1 for approximate sample locations. Since the floor of the area is 40 feet or less in any direction, two samples at representative spacing will be collected in each direction; therefore, four samples will be collected from the floor. Additionally, two physical samples will be collected from each side slope.

This excavation is from within a sub-CU, as are all of these excavation control samples. Therefore, these samples will be treated as field duplicates for this sub-CU and the highest value will be used for statistical analysis. This will be done to avoid over-weighting this CU.

The Sampling and Analytical Requirements are listed in Attachment 1 and the sample information is listed in Attachment 2. The first Sample ID is identified as A4B-C06-H49-45^R, the second sample ID will be identified as A4B-C06-H49-46^R, etc. Where:

A4B = Area 4B
C06-H49 = CU 6, HWMU 49
45 = forty-fifth sample location
R = radiological analysis

Field sketch required: No
Surveying required: Yes, Surveyors will survey these sample points
Field QC samples required: No
Field data validation: Yes
Analytical data validation: Yes
Data package requirements: Full data package within 7 days.
The highest total uranium result for this area is 30.8 mg/kg from boring A4B-C06-H49-7.

Justification:

Above-WAC technetium-99 results were detected in the floor and northern sidewall of the initial excavation of this area (CU 6 [sub-CU A4B-C06-H49-1]). Sampling is required following excavation of the above-WAC material to confirm that the above-WAC soil has been removed. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 10/17/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R Fiske	10-18-05	X	PROJECT MANAGER: J D Olson for J.D.	11/17/05
X 10/17/05	DATA QUALITY MANAGEMENT		X	CHARACTERIZATION MANAGER: F. Miller	11/17/05
X	ANALYTICAL CUSTOMER SUPPORT: Paul McSurgan	10/18/05		RTIMP Manager	
X	WAC	10-17-05	X	Sampling Manager: T. Buhrlage Tom Buhrlage	10/17/05

VARIANCE/FCN APPROVED [X]YES [ ]NO REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

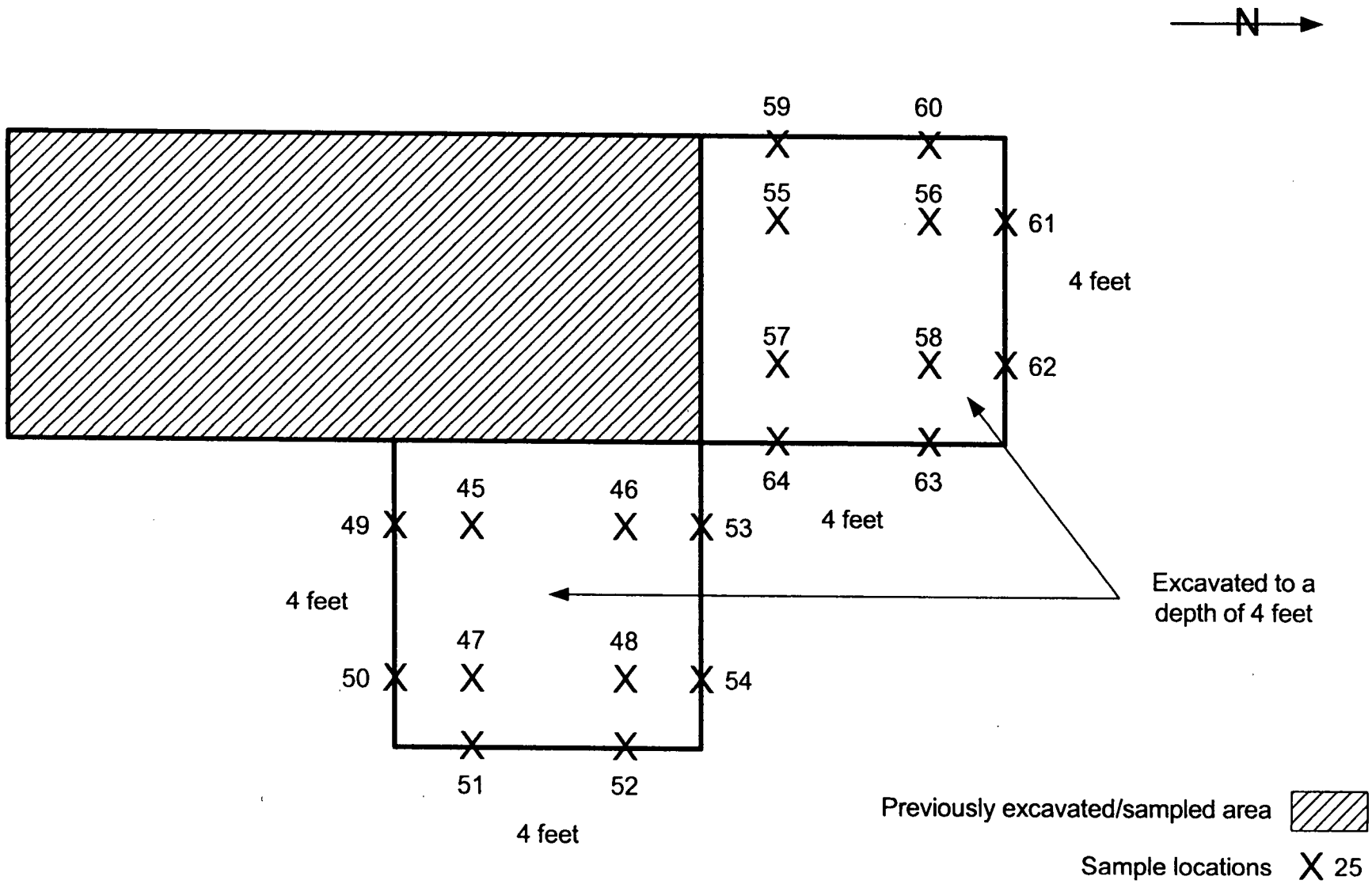
TAL 20810-PSP-0008-L

Component	MDL
Technetium-99	2.9 pCi/g

SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	TAT	ASL	Preservative	Holding Time	Container	Sample Volume/Mass
TAL L	Solid	48 hr	D/E	None	12 months	Appropriate Plastic or Glass	50 g

Figure 1
Variance 20810-PSP-0008-06
Area 4B Tc-99 AWAC area overhead view



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Bob Taft, Governor
Bruce Johnson, Lt. Governor
Joseph P. Koncelik, Director

MEMO

TO: J.D. Chiou and Frank Miller, FF

FROM: Michelle Waller, Ohio EPA, OFFO

DATE: October 18, 2005

SUBJECT: **Approval - V/FCN 20810-PSP-0008-06** *Certification Design Letter and Certification Project Specific Plan For Area 4B - Part One*

This V/FCN documents the collection of 20 Tc-99 soil samples from two AWAC excavation in Area 4B, measuring 4ft by 4ft, in CU6. This sampling will determine whether the AWAC material has been removed from the excavation. Since this excavation is within a sub-CU, the samples will be handled as field duplicates and the highest value will be used for statistical analysis as to eliminate over-weighting the CU. Ohio EPA approves of this variance.

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Bob Taft, Governor
Bruce Johnson, Lt. Governor
Joseph P. Koncelik, Director

September 20, 2005

Mr. William Taylor
US Department of Energy
Ohio Field Office
Fernald Closure Project
175 TriCounty Parkway
Springdale, Ohio 45246

RE: APPROVAL - REVISED RtC & VARIANCES 4B-PART 1 CDL/PSP

Mr. Taylor:

This letter is a correction to the one previously submitted September 16, 2005.

Ohio EPA has received DOE's *Transmittal of Revised Responses to Ohio EPA Comments and Variances on the Certification Design Letter and Certification Project Specific Plan for 4B - Part One* dated September 7, 2005. Ohio EPA approves the changes as well as Variances V/F 20810-PSP-0008-02, V/F 20810-PSP-0008-03, and V/F 20810-PSP-0008-04.

If there are any questions, please contact me.

Sincerely,

Thomas A. Schneider
Fernald Project Manager
Office of Federal Facilities Oversight

cc: Jim Saric, U.S. EPA
Mark Shupe, HSI GeoTrans
Michelle Cullerton, Tetra Tech Inc.
Tom Ontko, DHWM

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VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): YES	V/F: 20810-PSP-0008-05
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV A1		Page: 1 of 4
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		Date: 10/10/05

VARIANCE / FIELD CHANGE NOTICE (Include justification):

This Variance/Field Change Notice (V/FCN) documents the collection of 18 additional grab soil samples for technetium-99 from an excavated above-WAC area in CU 6(sub-CU A4B-C06-H49-1) and two grab soil samples from an erosion area running south through the AWAC area. A total of 20 samples will be collected. The excavated area is approximately 4 feet by 9 feet (see Figures 1 and 2).

All side slopes and the floor are to be sampled in the excavated area and two samples at representative spacing shall be taken from the erosion area. See Figures 1 and 2 for approximate sample locations. Since the floor of the area is 40 feet or less in any direction, two samples at representative spacing will be collected in each direction; therefore, four samples will be collected from the floor. Additionally, two physical samples will be collected from each side slope.

This excavation is from within a sub-CU, as are all of these excavation control samples. Therefore, these samples will be treated as field duplicates for this sub-CU and the highest value will be used for statistical analysis. This will be done to avoid over-weighting this CU.

The Sampling and Analytical Requirements are listed in Attachment 1 and the sample information is listed in Attachment 2. The first Sample ID is identified as A4B-C06-H49-25^R, the second sample ID will be identified as A4B-C06-H49-26^R, etc. Where:

A4B = Area 4B
C06-H49 = CU 6, HWMU 49
25 = twenty-fifth sample location
R = radiological analysis

Field sketch required: Yes
Surveying required: Yes, Surveyors will survey these sample points
Field QC samples required: No
Field data validation: Yes
Analytical data validation: Yes
Data package requirements: Full data package within 7 days.
The highest total uranium result for this area is 30.8 mg/kg from boring A4B-C06-H49-7.

Justification:

Above-WAC technetium-99 results were detected in the floor and northern sidewall of the initial excavation of this area (CU 6 [sub-CU A4B-C06-H49-1]). Sampling is required following excavation of the above-WAC material to confirm that the above-WAC soil has been removed. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 10/10/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Fiske	10/12/05	X	PROJECT MANAGER: J.D. Chuou for J.D.	10/10/05
X-6/2 10/13/05	DATA QUALITY MANAGEMENT		X	CHARACTERIZATION MANAGER: F. Miller	10/10/05
X	ANALYTICAL CUSTOMER SUPPORT: Amy Meeger	10/17/05		RTMP Manager:	
	WAO		X	Sampling Manager: T. Buhrlage for T.B.	10/11/05

VARIANCE/FCN APPROVED [X]YES [ ]NO REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

TAL 20810-PSP-0008-L

Component	MDL
Technetium-99	2.9 pCi/g

SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	TAT	ASL	Preservative	Holding Time	Container	Sample Volume/Mass
TAL L	Solid	48 hr	D/E	None	12 months	Appropriate Plastic or Glass	50 g

Figure 1
Variance 20810-PSP-0008-05
Area 4B Tc-99 AWAC area cross-section
(looking west)

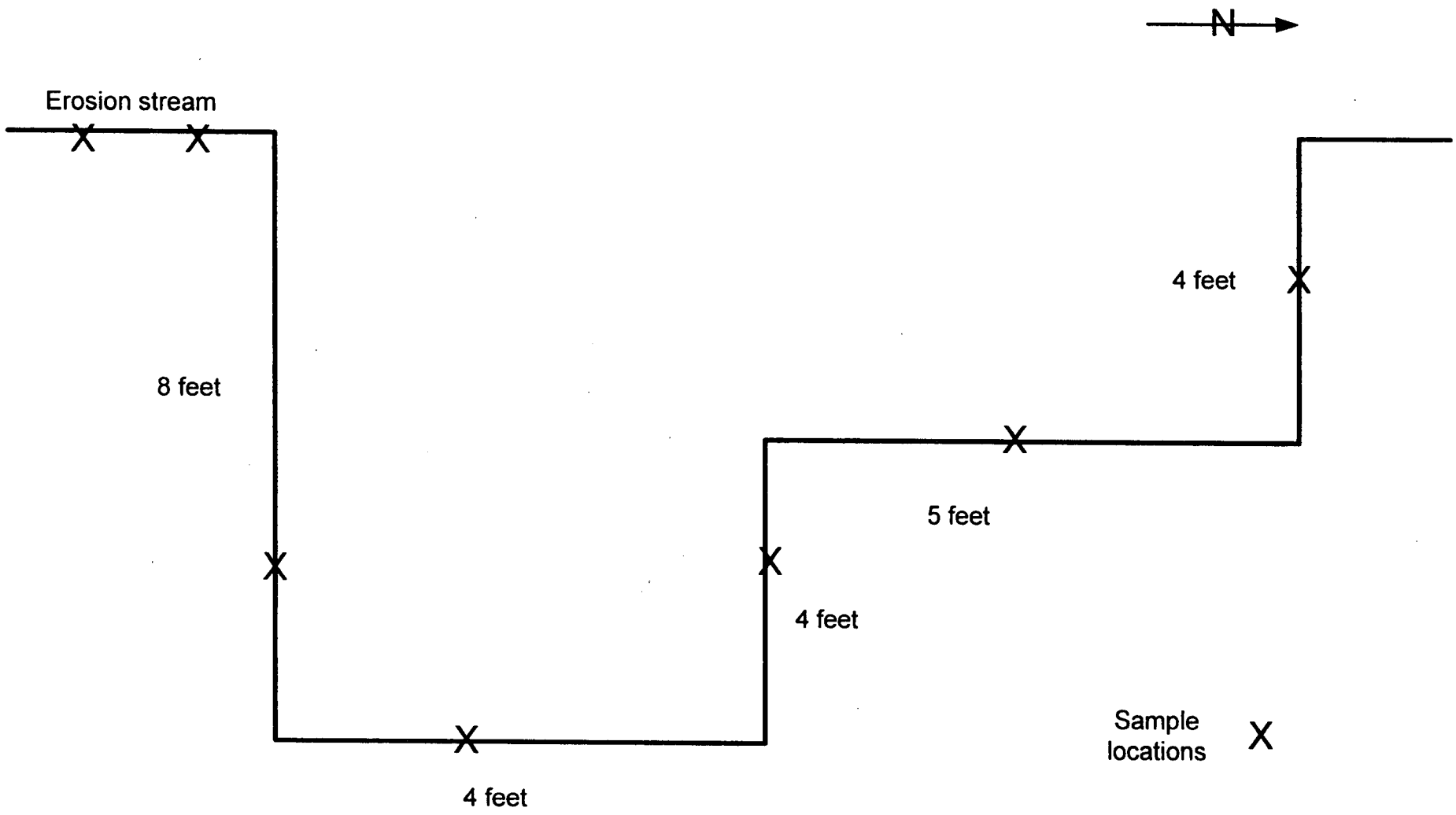

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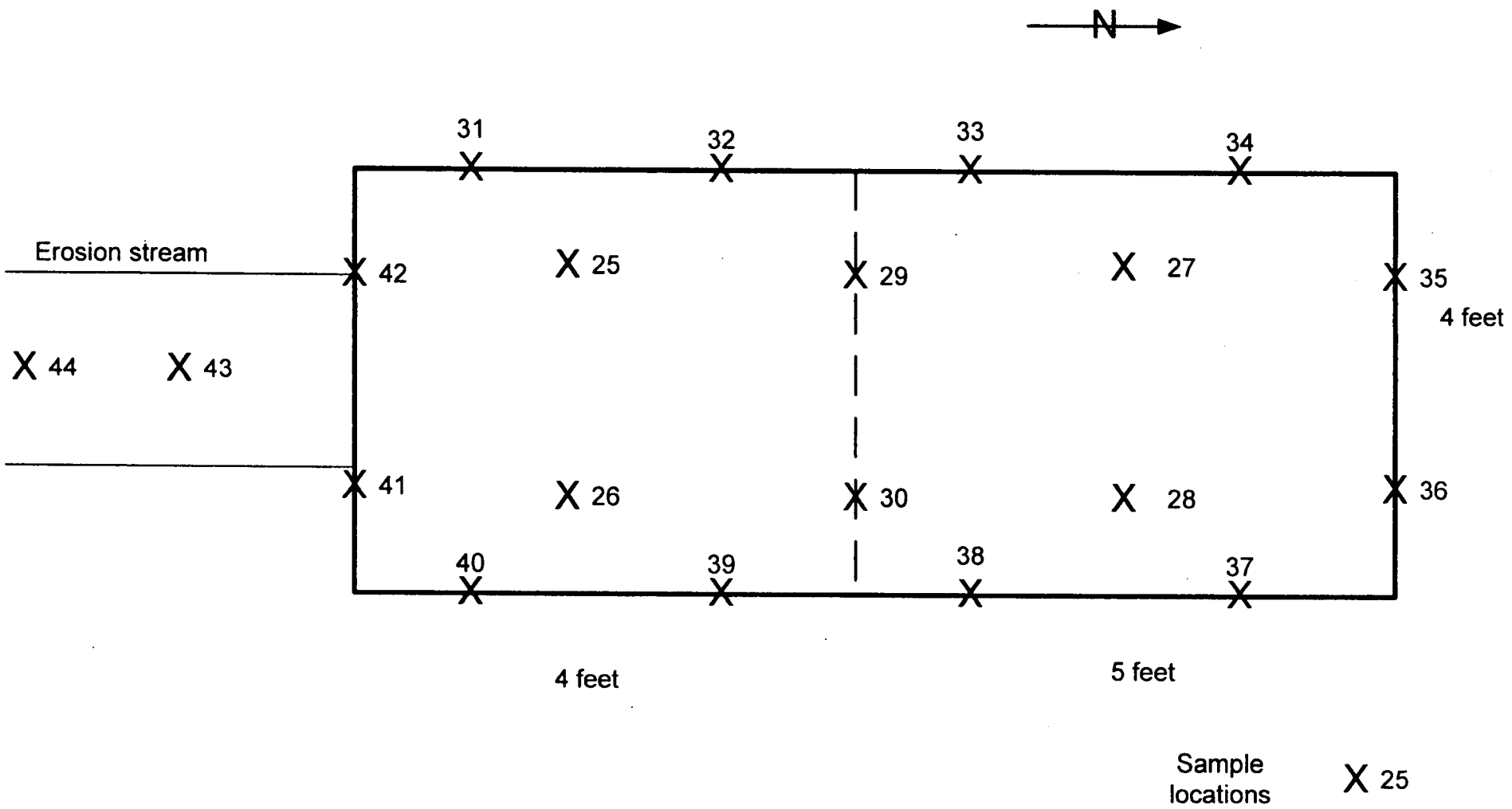
Figure 2
Variance 20810-PSP-0008-05
Area 4B Tc-99 AWAC area overhead view



VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): YES	V/F: 20810-PSP-0008-04
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV A		Page: 1 of 3
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		Date: 9/2/05

VARIANCE / FIELD CHANGE NOTICE (Include justification):
This Variance/Field Change Notice (V/FCN) documents the collection of grab soil samples from of six additional sampling locations in CU C22-H28 for TALs A, B, C, E, and H. See Figure 1 (attached) for sampling locations. See Attachment 1 for sampling requirements.

Field sketch required: No
Surveying required: Yes, Surveyors will survey these sample points prior to sampling.
Field QC samples required: Yes, trip blank
Field data validation: Yes
Analytical data validation: VSL D
Data package requirements: ASL D/E

The highest total uranium result for this area is 3.92 mg/kg from boring A4B-C03-H28-12.

Justification:
The CU design for HWMU 28 was altered based on discussions with Ohio EPA; therefore, additional sample locations are necessary. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 9/2/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Triske	9-2-05	X	PROJECT MANAGER: J.D. Chiou	9/2/05
X	DATA QUALITY MANAGEMENT	9/6/05	X	CHARACTERIZATION MANAGER: F. Miller	9/2/05
X	ANALYTICAL CUSTOMER SUPPORT: Paul McGuigan	9/13/05		RTIMP Manager	
	WAO		X	Sampling Manager: T. Buhrlage	9/13/05

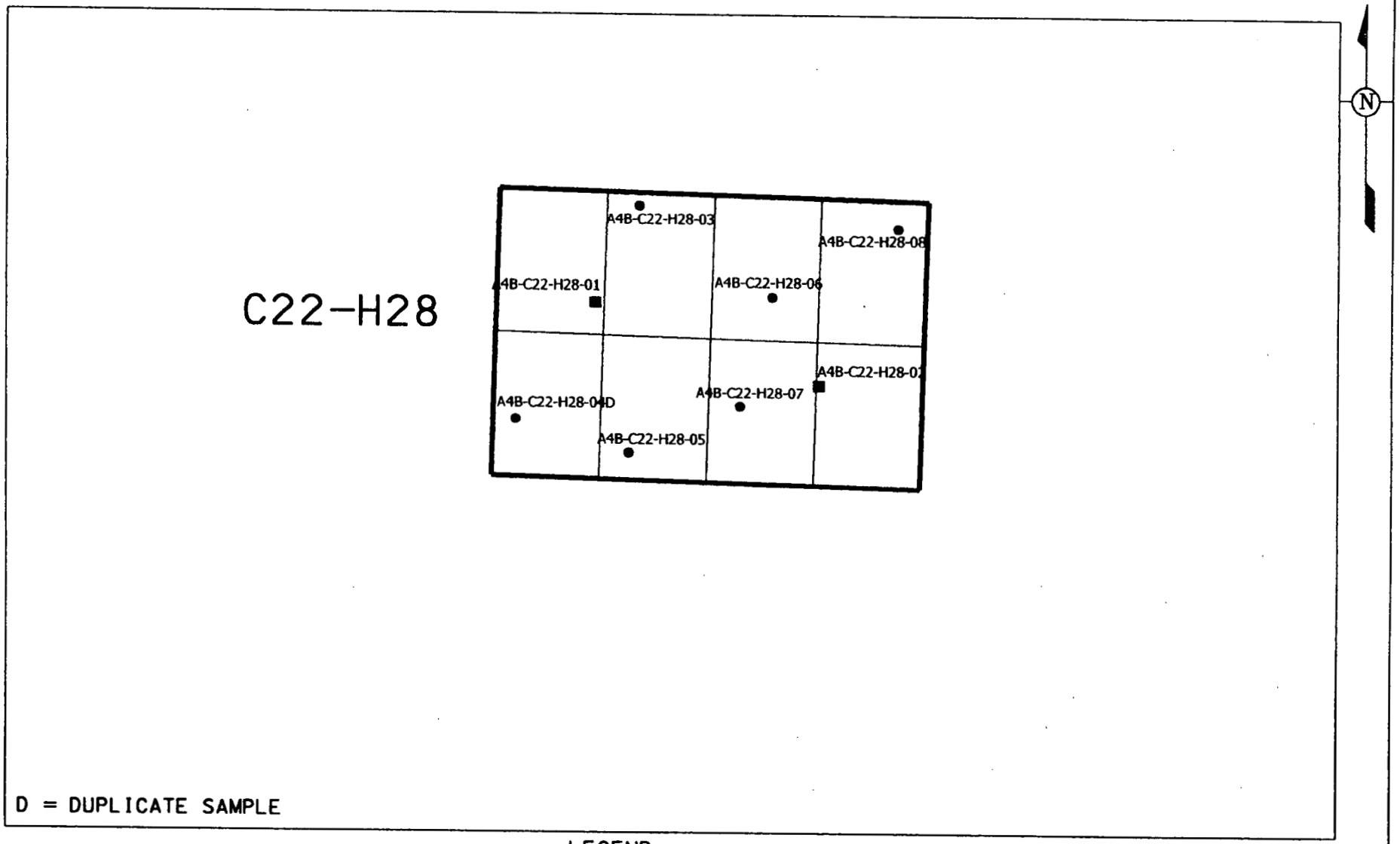
VARIANCE/FCN APPROVED [X]YES [ ]NO REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

Attachment 1

AREA 4B CU 22 ADDITIONAL CERTIFICATION SAMPLE LOCATIONS AND IDENTIFIERS						
CU	**Location**	**Depth**	**Sample ID**	**TAL**	**North-83**	**East-83**
22	22-H28-3	0"-6"	A4B-C22-H28-3^RMP	ABCE	480618.76	1348707.46
			A4B-C22-H28-3^L	H		
	22-H28-4D	0"-6"	A4B-C22-H28-4^RMP	ABCE	480603.88	1348698.92
			A4B-C22-H28-4^RMP-D			
			A4B-C22-H28-4^L	H		
			A4B-C22-H28-4^L-D			
	22-H28-5	0"-6"	A4B-C22-H28-5^RMP	ABCE	480601.57	1348706.80
			A4B-C22-H28-5^L	H		
	22-H28-6	0"-6"	A4B-C22-H28-6^RMP	ABCE	480612.43	1348716.76
			A4B-C22-H28-6^L	H		
	22-H28-7	0"-6"	A4B-C22-H28-7^RMP	ABCE	480604.83	1348714.54
			A4B-C22-H28-7^L	H		
	22-H28-8	0"-6"	A4B-C22-H28-8^RMP	ABCE	480617.20	1348725.54
			A4B-C22-H28-8^L	H		



LEGEND:

■ PREVIOUSLY SAMPLED

● SAMPLE LOCATION

SCALE

10 5 0 10 FEET

DRAFT

v:\02fm12\dgn\4b_hwmu_28.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 4-5B. CERTIFICATION SAMPLING LOCATIONS FOR CU22 (HWMU-28)

02-SEP-2005

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401 East Fifth Street
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Bob Taft, Governor
Bruce Johnson, Lt. Governor
Joseph P. Koncelik, Director

60924

September 20, 2005

Mr. William Taylor
US Department of Energy
Ohio Field Office
Fernald Closure Project
175 TriCounty Parkway
Springdale, Ohio 45246

RE: APPROVAL - REVISED RtC & VARIANCES 4B-PART 1 CDL/PSP

Mr. Taylor:

This letter is a correction to the one previously submitted September 16, 2005.

Ohio EPA has received DOE's *Transmittal of Revised Responses to Ohio EPA Comments and Variances on the Certification Design Letter and Certification Project Specific Plan for 4B - Part One* dated September 7, 2005. Ohio EPA approves the changes as well as Variances V/F 20810-PSP-0008-02, V/F 20810-PSP-0008-03, and V/F 20810-PSP-0008-04.

If there are any questions, please contact me.

Sincerely,

Thomas A. Schneider
Fernald Project Manager
Office of Federal Facilities Oversight

cc: Jim Saric, U.S. EPA
Mark Shupe, HSI GeoTrans
Michelle Cullerton, Tetra Tech Inc.
Tom Ontko, DHWM

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VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): YES	V/F: 20810-PSP-0008-03
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV A		Page: 1 of 2
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		Date: 9/2/05

VARIANCE / FIELD CHANGE NOTICE (Include justification):
This Variance/Field Change Notice (V/FCN) documents the collection of grab soil samples for total uranium (TAL M) from above-FRL excavated areas in CU 2 (sub-CU A4B-C02-H18-6) and CU 6 (sub-CUs A4B-C06-H49-3 and A4B-C06-H49-7). These three areas are each approximately 20 feet by 20 feet.

One sample will be randomly located and collected from the floor of each of the sub-CUs that were excavated. The Sampling and Analytical Requirements are listed in Attachment 1. Listed below are the sample IDs for each sub-CU.

sub-CU	Sample ID
A4B-C02-H18-6	A4B-C02-H18-6a^R
A4B-C06-H49-3	A4B-C06-H49-3a^R
A4B-C06-H49-7	A4B-C06-H49-7a^R

Field sketch required: Yes
Surveying required: Yes, Surveyors will survey these sample points
Field QC samples required: No
Field data validation: Yes
Analytical data validation: Yes, VSL B
Data package requirements: COAs within 24 hrs. Full ASL D/E data package within 7 days.

The highest total uranium result for this area is 30.8 mg/kg from boring A4B-C06-H49-7.

Justification:
Above-FRL sample results were detected in these three sub-CUs the areas were excavated to remove the elevated uranium soil. These newly collected samples will replace the previously collected uranium samples and will be used in the statistical analysis of these two CUs. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 9/2/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Friske	9-6-05	X	PROJECT MANAGER: J.D. Chiou	9/2/05
X	DATA QUALITY MANAGEMENT	9/6/05	X	CHARACTERIZATION MANAGER: F. Miller	9/2/05
X	ANALYTICAL CUSTOMER SUPPORT: Paul McKinney	9/13/05		RTIMP Manager	
	WAO		X	Sampling Manager: T. Bubenhofer	9/13/05

VARIANCE/FCN APPROVED [X]YES [ ]NO REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

TAL 20810-PSP-0008-M

Component	MDL
Total uranium	2.0 mg/kg

SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	TAT	ASL	Preservative	Holding Time	Container	Sample Volume/Mass
TAL M	Solid	24 hr	D/E	None	12 months	Appropriate Plastic or Glass	300 g

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Bob Taft, Governor
Bruce Johnson, Lt. Governor
Joseph P. Koncelik, Director

September 20, 2005

Mr. William Taylor
US Department of Energy
Ohio Field Office
Fernald Closure Project
175 TriCounty Parkway
Springdale, Ohio 45246

RE: APPROVAL - REVISED RtC & VARIANCES 4B-PART 1 CDL/PSP

Mr. Taylor:

This letter is a correction to the one previously submitted September 16, 2005.

Ohio EPA has received DOE's *Transmittal of Revised Responses to Ohio EPA Comments and Variances on the Certification Design Letter and Certification Project Specific Plan for 4B - Part One* dated September 7, 2005. Ohio EPA approves the changes as well as Variances V/F 20810-PSP-0008-02, V/F 20810-PSP-0008-03, and V/F 20810-PSP-0008-04.

If there are any questions, please contact me.

Sincerely,

Thomas A. Schneider
Fernald Project Manager
Office of Federal Facilities Oversight

cc: Jim Saric, U.S. EPA
Mark Shupe, HSI GeoTrans
Michelle Cullerton, Tetra Tech Inc.
Tom Ontko, DHWM

VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): YES	V/F: 20810-PSP-0008-02
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV A		Page: 1 of 3
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		Date: 8/29/05

VARIANCE / FIELD CHANGE NOTICE (Include justification):
This Variance/Field Change Notice (V/FCN) documents the collection of eight grab soil samples for technetium-99 from an excavated above-WAC area in CU 6(sub-CU A4B-C06-H49-1). This area is approximately 4 feet by 4 feet (see Figure 1).

All side slopes and the floor are to be sampled. Since the floor of the area is 40 feet or less in any direction, two samples at representative spacing will be collected in each direction; therefore, four samples will be collected from the floor. Additionally, one physical sample will be collected from each side slope.

- A4B-C06-H49-17 will be collected on the north side slope.
- A4B-C06-H49-18 will be collected on the east side slope.
- A4B-C06-H49-19 will be collected on the south side slope.
- A4B-C06-H49-20 will be collected on the west side slope.

Borings A4B-C06-H49-21, 22, 23, and 24 will be sampled in the floor.

This excavation is from within a sub-CU, as are all of these excavation control samples. Therefore, these samples will be treated as field duplicates for this sub-CU and the highest value will be used for statistical analysis. This will be done to avoid over-weighting this CU.

The Sampling and Analytical Requirements are listed in Attachment 1 and the sample information is listed in Attachment 2. The first Sample ID is identified as A4B-C06-H49-17^R, the second sample ID will be identified as A4B-C06-H49-18^R, etc. Where:

A4B = Area 4B
C06-H49 = CU 6, HWMU 49
17 = seventeenth sample location
R = radiological analysis

Field sketch required: Yes
Surveying required: Yes, Surveyors will survey these sample points
Field QC samples required: No
Field data validation: Yes
Analytical data validation: Yes
Data package requirements: Full data package within 7 days.
The highest total uranium result for this area is 30.8 mg/kg from boring A4B-C06-H49-7.

Justification:
Above-WAC technetium-99 results were detected in CU 6 (sub-CU A4B-C06-H49-1). Even though preliminary statistics demonstrate that this CU passes certification, this above-WAC location has been excavated as a conservative approach. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 8/29/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Friske	8/30/05	X	PROJECT MANAGER: J.D. Chiou	8/29/05
X 8/1/05	DATA QUALITY MANAGEMENT	9/6/05	X	CHARACTERIZATION MANAGER: F. Miller	8/29/05
X	ANALYTICAL CUSTOMER SUPPORT:	8/29/05		RTIMP Manager	
X	WAO	9/6/05		Sampling Manager: T. Buhrlage	

VARIANCE/FCN APPROVED [X]YES [ ]NO

REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

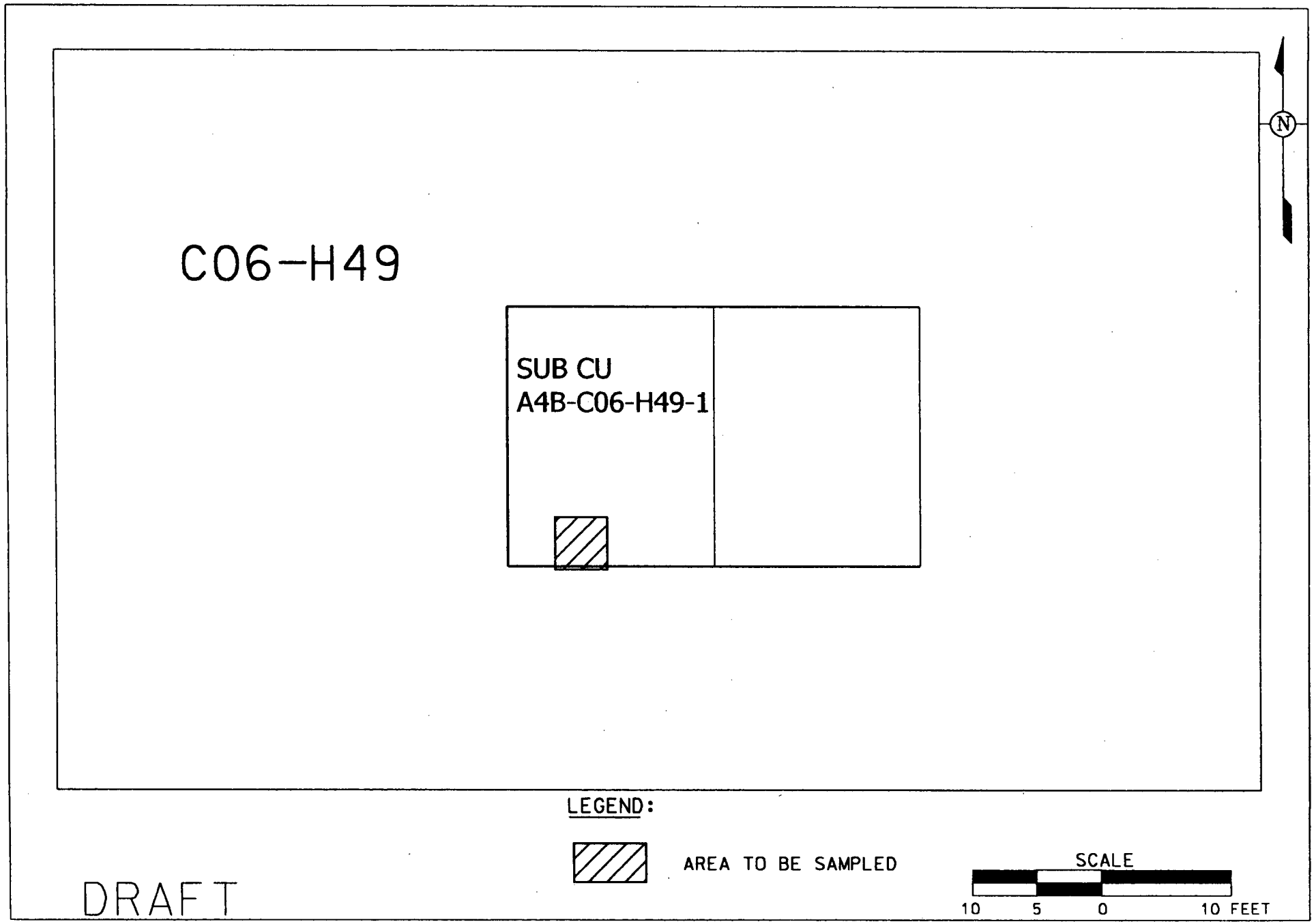
PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

TAL 20810-PSP-0008-L

Component	MDL
Technetium-99	2.9 pCi/g

SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	TAT	ASL	Preservative	Holding Time	Container	Sample Volume/Mass
TAL L	Solid	48 hr	D/E	None	12 months	Appropriate Plastic or Glass	50 g



v:\2fm12\dgn\4b_hwmu_49b.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 1. CERTIFICATION UNIT 6 (HWMU-49)

02-SEP-2005

6094

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 49	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg		Number of COCs (NC vs. CA)	Adjusted GCN mg/kg		Maximum Concentration mg/kg
		1 DAF	20 DAF		1 DAF	20 DAF	
Aroclor-1254	NC	0.0712	0.888	1	0.0712	0.888	0.011
Barium*	NC	0.205	4.09	--	--	--	53.3
Beryllium**	NC	0.0008	0.016	--	--	--	--
Chromium*	NC	0.00696	0.139	--	--	--	19.6
Lead*	--	--	--	--	--	--	--
Mercury*	NC	0.0000949	0.0019	--	--	--	0.0137

Carcinogenic

$$\text{RISK} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \quad \text{X} \quad 1.00\text{E-}05 = \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] = \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.0110}}{0.888}\right] = \mathbf{0.0124}$$

* Barium, Chromium, and Mercury are eliminated from the COC list because the maximum concentrations are less than the site-specific maximum background values (Ba = 261 mg/kg, Total Cr = 27.3 mg/kg, and Hg = 0.1 mg/kg). Lead does not have a GCN. Note: Total Chromium was determine but the GCNs listed here are for hexavalent chromium (Cr+6).

** Beryllium is eliminated based on the frequency of detection, which is less than 5%. (There was no detected concentration of this constituent.)

APPLICATON OF GENERAL CLEANUP NUMBERS

From Ohio Environmental Protection Agency
Division of Hazardous Waste Management
June 2004

HWMU 50	Carcinogenic (CA) Non-Carcinogenic (NC)	GCN from Table O-1 mg/kg			Number of COCs (NC vs. CA)		Adjusted GCN mg/kg			Maximum Concentration mg/kg
		1 DAF	20 DAF				1 DAF	20 DAF		
Aroclor-1254	NC	0.0712	0.888		1		0.0712	0.888		0.0008
Barium*	NC	0.205	4.09		--		--	--		69.9
Beryllium*	NC	0.0008	0.016		--		--	--		0.423
Chromium*	NC	0.00696	0.139		--		--	--		12.5
Lead*	--	--	--		--		--	--		--
Mercury*	NC	0.0000949	0.0019		--		--	--		0.0139

Carcinogenic

$$\text{RISK} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc B}}{\text{adj GCN B}}\right] + \ldots \quad \text{X} \quad 1.00\text{E-}05 \quad = \quad \textit{LIMIT OF 1.00E-5}$$

No Carcinogenic Constituents

Non-Carcinogenic

$$\text{Hazard Index (1)} = \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] + \left[\frac{\text{Conc A}}{\text{adj GCN A}}\right] \quad = \quad \textit{LIMIT OF 1.00}$$

20 DAF

$$\text{Hazard Index (1)} = \left[\frac{\overset{\text{Aroclor-1254}}{0.0008}}{0.888}\right] \quad = \quad \mathbf{0.0009}$$

* Barium, Beryllium, Chromium, and Mercury are eliminated from the COC list because the maximum concentrations are less than the site-specific maximum background values (Ba = 261 mg/kg, Be = 3.05 mg/kg, Total Cr = 27.3 mg/kg, and Hg = 0.1 mg/kg). Lead does not have a GCN. Note: Total Chromium was determined but the GCNs listed here are for hexavalent chromium (Cr+6).

APPENDIX D

VARIANCE/FIELD CHANGE NOTICES FOR THE AREA 4B - PART ONE CERTIFICATION SAMPLING PSP

VARIANCE/FIELD CHANGE NOTICE LOG FOR CERTIFICATION DESIGN LETTER AND CERTIFICATION PROJECT SPECIFIC PLAN FOR AREAS 4B - PART ONE

Variance No.	Variance Date	Variance Description	Significant? (Y or N)	Date Signed	Date Distributed	EPA/OEPA Approval
Revision A						
20810-PSP-0008-1	8/8/05	Documents that analytical releases 1000033560 and 1000033562 will be treated as one analytical batch for volatile organic compound analysis.	N	8/9/05	9/6/05	N/A
20810-PSP-0008-2	8/29/05	Documents the collection of eight grab soil samples for technetium-99 from an excavated above-WAC area in CU 6 (sub-CU A4B-C06-H49-1).	Y	9/2/05	9/6/05	9/20/05
20810-PSP-0008-3	9/2/05	Documents the collection of grab soil samples for total uranium (TAL M) from above-FRL excavated areas in CU 2 (sub-CU A4B-C02-H18-6) and CU 6 (sub-CUs A4B-C06-H49-3 and A4B-C06-H49-7).	Y	9/2/05	9/6/05	9/20/05
20810-PSP-0008-4	9/2/05	Documents the collection of grab soil samples from of six additional sampling locations in CU C22-H28 for TALs A, B, C, E, and H.	Y	9/2/05	9/6/05	9/20/05
Revision 1						
20810-PSP-0008-5	10/10/05	Documents the collection of 18 additional grab soil samples for technetium-99 from an excavated above-WAC are in CU 6 (sub-CU A4B-C06-H49-1) and two grab soils samples from an erosion area running south through the above-WAC area.	Y	10/17/05	10/18/05	10/11/05
20810-PSP-0008-6	10/17/05	Documents the collection of 20 additional grab soil samples for technetium-99 from two excavations extending from the original above-WAC area in CU 6 (sub-CU A4B-C06-H49-1) identified in variances 20810-PSP-0008-02 and 20810-PSP-0008-05.	Y	10/18/05	10/18/05	10/18/05

6094

6094

VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): NO	V/F: 20810-PSP-0008-01
WBS NO.: PROJECT/DOCUMENT/ECDC #20810-PSP-0008 REV ~~0~~ 8 9/6/05		Page: 1 of 1
PROJECT TITLE: Certification Design Letter And Certification Project Specific Plan For Area 4B - Part One		Date: 8/08/05

VARIANCE / FIELD CHANGE NOTICE (Include justification):

This V/FCN documents that analytical releases 1000033560 and 1000033562 will be treated as one analytical batch for the volatile organic compound analysis. The samples from these two releases were collected at approximately the same day and time. The batching of these two releases allows the laboratory quality control samples from release 1000033560 to be associated with release 1000033562.

Justification:

The four samples from release 1000033562 were the remaining samples from CU 3 (HWMU 28), which were unable to be collected at the same time as the other samples collected in CU 3 because of standing water. The samplers did not collect sufficient volume for the laboratory to perform the required laboratory quality control (QC) analysis on the samples collected from the remainder of the CU 3 samples. Therefore, it is necessary to batch releases 1000033560 and 1000033562 together and use the laboratory QC from release 1000033560. Per Section 4.3 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Greg Lupton Date: 8/08/05

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Fluke	8/9/05	X	PROJECT MANAGER/AD. CHIEF: for J.O.	8/5/05
X	DATA QUALITY MANAGEMENT	8/8/05	X	CHARACTERIZATION MANAGER: F. Miller	8/8/05
X	ANALYTICAL CUSTOMER SUPPORT: Heather Medley	8/9/05		RTIMP Manager	
	WAO			Sampling Manager: T. Buhrlage	8/8/05

VARIANCE/FCN APPROVED [X]YES [ ]NO

REVISION REQUIRED: [ ]YES [x]NO

DISTRIBUTION

PROJECT MANAGER:	DOCUMENT CONTROL: Jeannie Rosser	OTHER:
QUALITY ASSURANCE:	CHARACTERIZATION MANAGER: Frank Miller	OTHER:
FIELD MANAGER:	OTHER:	OTHER:

APPENDIX C

HWMUs 04, 18, 28, 46, 47, 49, AND 50 RCRA CALCULATIONS