006409

Department of Energy

Ohio Field Office
Fernald Closure Project
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OCT 6 2006

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DOE-0004-07

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Southwest District Office
401 East Fifth Street
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Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF THE DRAFT CERTIFICATION REPORT FOR STREAM CORRIDORS PADDYS RUN AND PILOT PLANT DRAINAGE DITCH

Enclosed for your review is the draft Certification Report for Stream Corridors Paddys Run and Pilot Plant Drainage Ditch.

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

Sincerely,

Johnny Reising

Johnny W. Reising
Director

Enclosure: As Stated

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CERTIFICATION REPORT FOR STREAM CORRIDORS PADDYS RUN AND PILOT PLANT DRAINAGE DITCH

FERNALD CLOSURE PROJECT
FERNALD, OHIO

OCTOBER 2006

U.S. DEPARTMENT OF ENERGY

20820-RP-0003
REVISION A
DRAFT

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LIST OF ACRONYMS AND ABBREVIATIONS

ASCOC	area-specific constituent of concern
ASL	Analytical Support Level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CRDL	contract required detection limit
CU	certification unit
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FCP	Fernald Closure Project
FRL	final remediation level
HAMDC	highest allowable minimum detectable concentration
HWMU	Hazardous Waste Management Unit
MDC	main drainage corridor
MDC	minimum detectable concentration
MDL	minimum detectable level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
OEPA	Ohio Environmental Protection Agency
OSDF	On-site disposal facility
OU	Operable Unit
pCi/g	picoCuries per gram
pCi/L	picoCuries per Liter
PPDD	Pilot Plant Drainage Ditch
PR	Paddys Run
PSP	Project Specific Plan
RAWP	Remedial Action Work Plan
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
TPU	total propagated uncertainty
UCL	Upper Confidence Limit
UST	underground storage tank
V/FCN	Variance/Field Change Notice
WAO	Waste Acceptance Organization
WAC	waste acceptance criteria

EXECUTIVE SUMMARY

This Certification Report presents the information and data used by the U.S. Department of Energy (DOE) to determine that soils in the Stream Corridors Paddys Run/Pilot Plant Drainage Ditch (PR/PPDD) meet established final remediation levels (FRLs). The scope of this certification effort is limited to the area immediately surrounding/adjacent to these areas, as shown in Figure 1-1. Remediation of this area was completed in June 2006.

This Certification Report includes details of the certification sampling, analysis, and validation that took place in PR/PPDD. Figure 1-1 depicts the layout of this area.

Consistent with the Sitewide Excavation Plan (SEP, DOE 1998), these areas underwent predesign, excavation, and precertification activities, including the use of real-time instrumentation as well as physical sampling and analysis. During precertification activities, three additional "debris fields" were identified. The southern most of these was in the southern oxbow area and represented an additional contaminated debris excavation as discussed in the Certification Design Letter (CDL) and Certification Project Specific Plan (PSP) for the Stream Corridors Paddys Run and Pilot Plant Drainage Ditch (DOE 2006).

All PR/PPDD certification units (CUs) were sampled and, where necessary, a statistical analysis was conducted on the data to ensure the certification criteria were met. As discussed in the CDL/PSP the certification criteria are that the 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).

Upon completion of final certification statistics, all of the PR/PPDD CUs pass the certification criteria. 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 OEPA 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 2002).

DOE has restricted access to certified areas in order to maintain their integrity prior to final land use development. Fernald Closure Project 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 the Stream Corridors Paddys Run/Pilot Plant Drainage Ditch (PR/PPDD) meet established final remediation levels (FRLs). Figure 1-1 depicts the boundaries, location, and layout of the PR/PPDD.

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 Fernald Closure Project (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. However, the Stream Corridors were not specifically addressed in the SEP. Because the SEP does not identify ASCOCs for the Stream Corridors as it does for other remediation areas, and due to the fact that the Stream Corridors have received storm water runoff from the entire FCP, the full list of ASCOCs was retained for predesign. After all necessary remediation was completed within each area/phase, the soil was certified as having attained all clean up goals (i.e., FRLs).

1.3 SCOPE AND AREA DESCRIPTION

The scope of this Certification Report includes details of certification sampling, analysis and validation that took place in the PR/PPDD. Figure 1-1 depicts the layout of PR/PPDD that is to be certified under this Certification Report.

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.

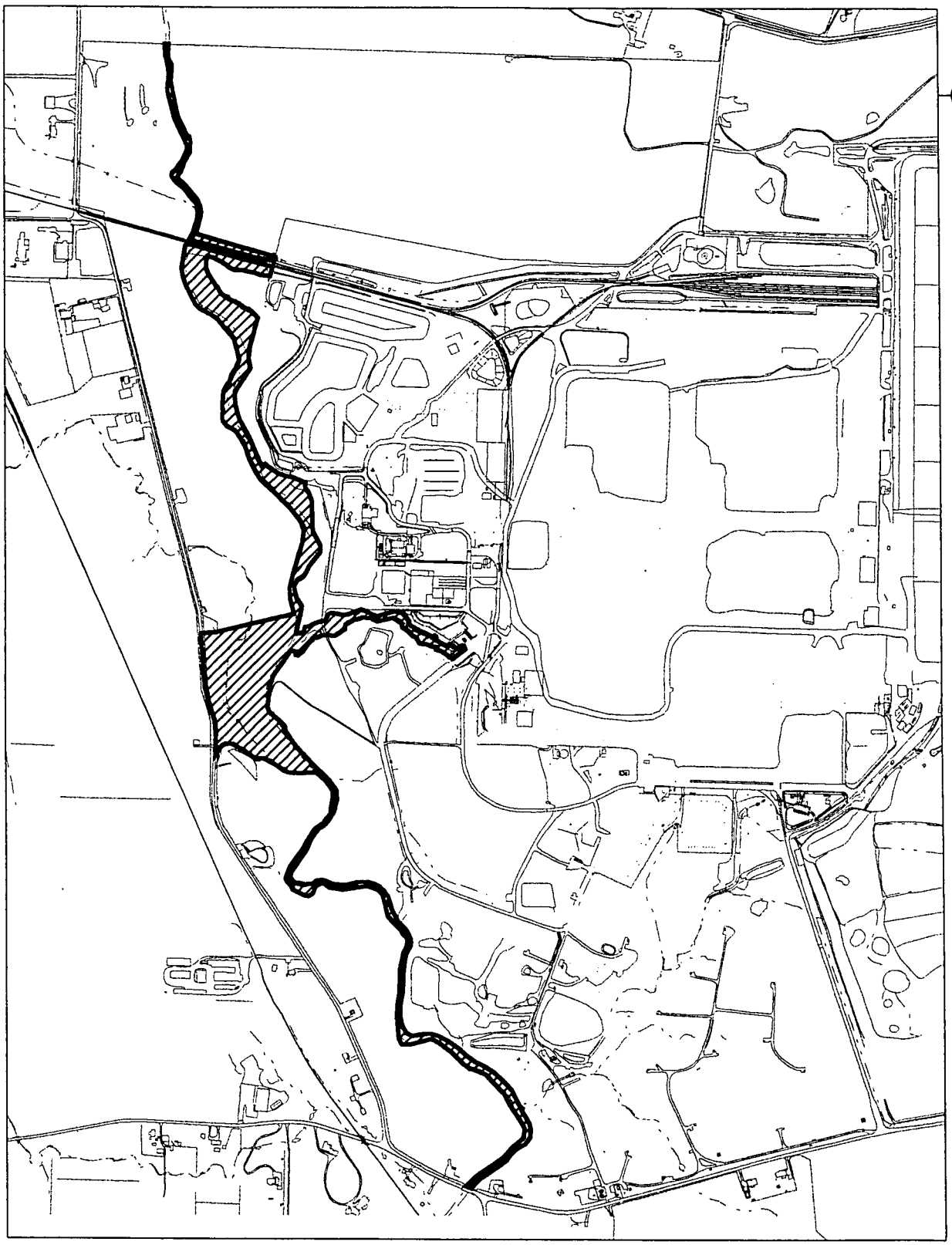
1.5 REPORT FORMAT

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	Certification Samples, Analytical Results and Final Statistics Tables
Appendix B	Variances/Field Change Notices (V/FCNs) for the Certification Design Letter (CDL) and Certification Project Specific Plan (PSP) for the Stream Corridors Paddys Run and Pilot Plant Drainage Ditch (DOE 2006)

1.6 FCP MASTER CERTIFICATION MAP

In order to track certification areas at the FCP, DOE updates a controlled map (Figure 1-2) showing the status of the soil remediation areas and phased areas with all Certification Reports. This map has been updated to include certification of PR/PPDD.



LEGEND:

PADDYS RUN CERTIFICATION BOUNDARY

SCALE

1000 500 0 1000 FEET

FIGURE 1-1. PADDYS RUN AND PILOT PLANT DRAINAGE DITCH AREA LOCATION MAP

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STATE PLANAR COORDINATE SYSTEM 1983

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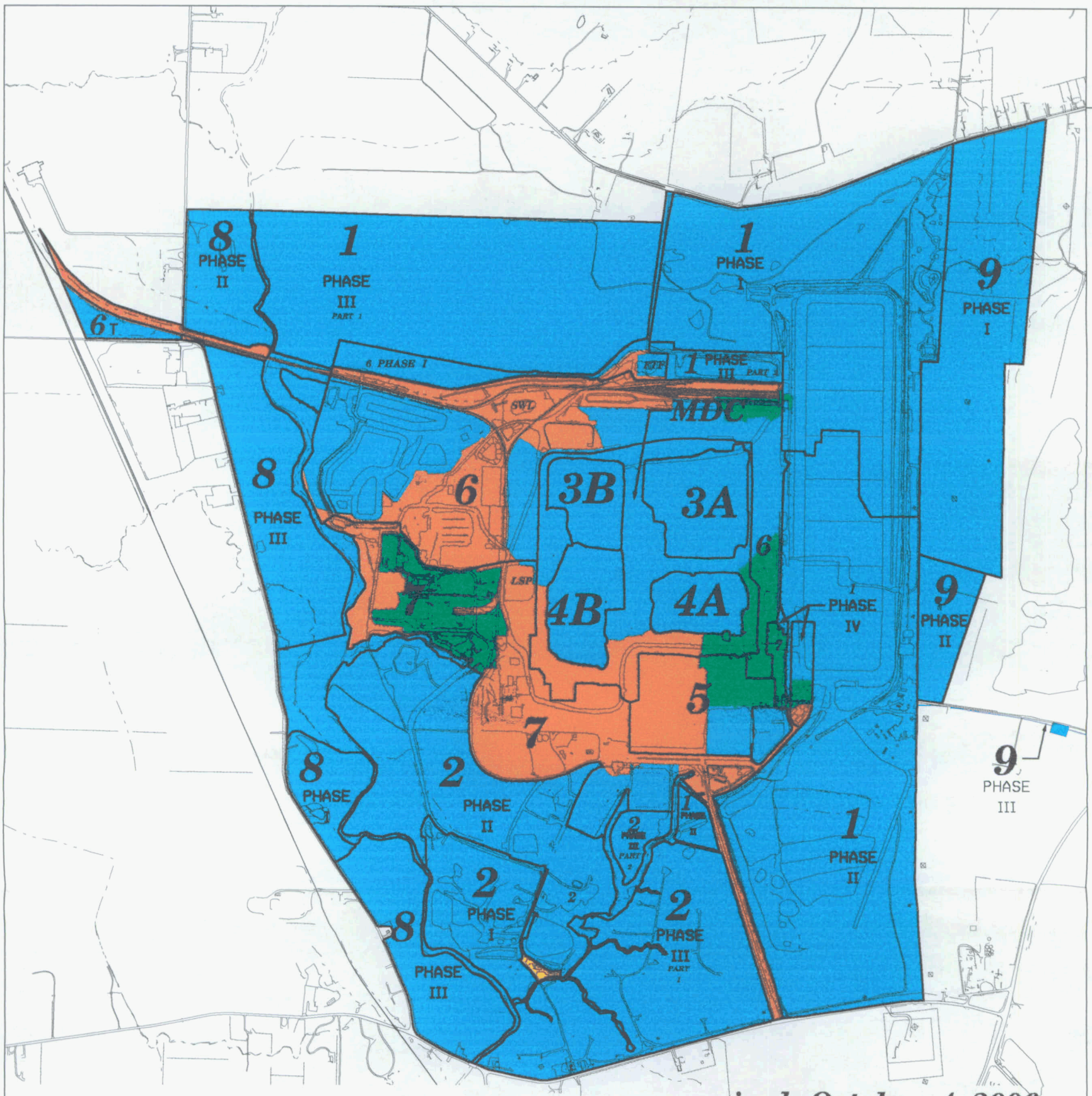

revised October 4, 2006

AREAS	TOTAL ACRES	APPROVED CERT. ACRES	CERT. ACRES IN PROGRESS	REMEDIATION ACRES IN PROGRESS	PREDESIGN ACRES IN PROGRESS	REMAINING ACRES
AREA 1	395.1	394.0	0	1.0	0	0
AREA 2	173.9	173.9	0	0	0	0
AREA 3A/4A	29.3	29.3	0	0	0	0
AREA 3B/4B	25.4	25.4	0	0	0	0
AREA 5	26.9	7.6	13.8	5.6	0	0
AREA 6	148.9	77.3	60.9	10.8	0	0
AREA 7	77.0	9.6	65.0	2.4	0	0
AREA 8	98.9	98.9	0	0	0	0
MDC	39.8	24.2	11.7	3.9	0	0
PR/SSOD/PPDD	33.3	33.3	0	0.0	0	0
TOTAL ON SITE	1048.6	873.5	151.5	23.6	0	0
AREA 9	85.6	85.6	0	0	0	0
TOTAL OFF SITE	85.6	85.6	0	0	0	0

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

SCALE

1100 550 0 1100 FEET

FIGURE 1-2. FCP CONTROLLED CERTIFICATION MAP

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STATE PLANAR COORDINATE SYSTEM 1983

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2.0 CERTIFICATION APPROACH

2.1 CERTIFICATION STRATEGY

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

2.1.1 Area-Specific Constituents of Concern

Because the SEP does not identify ASCOCs for the Stream Corridors as it does for other remediation areas and due to the fact that the Stream Corridors have received storm water runoff from the entire FCP, the full list of ASCOCs for the site was initially retained.

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 Hazardous Waste Management Unit (HWMU) or underground storage tank (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 2-7 of the SEP. Using the above process, the ASCOCs were refined to those listed in Table 2-2. Additionally, Table 2-2 lists the justification for retaining or not retaining the secondary ASCOCs and the ecological COCs for each CU in PR/PPDD. The final list of ASCOCs are presented in Table 2-3.

2.1.3 ASCOC Selection Process

Each COC listed in Table 2-1 was evaluated for their relevance to PR/PPDD. Table 2-2 presents the reasoning for either retaining or eliminating the ASCOCs.

2.2 CERTIFICATION APPROACH

The certification design for PR/PPDD Area followed the general approach outlined in Section 3.4 of the SEP. The design for PR/PPDD is depicted on Figure 2-1 and the sample locations are depicted in Figures 2-2 through 2-12. The five primary ASCOCs (total uranium, radium-226, radium-228, thorium-228, and thorium-232) were retained in each CU.

Several factors were taken into consideration when determining the boundaries for each CU within the PR/PPDD. Some of these include: historical land use, proximity to other areas of the site, contours of the area to be certified and COC data. Additionally, because the area contained impacted material, it was comprised of Group 1 CUs to allow for more concentrated sampling and to ensure excavation activities had no effect on the soil.

2.2.1 Stream Corridors Paddys Run/Pilot Plant Drainage Ditch Certification Unit Design

The original CU design is depicted in Figure 2-1. Initially, 21 Group 1 CUs were designed to represent the PR/PPDD. Four more Group 1 CUs (Figures 2-11 and 2-12) were added to the original design in order to evaluate potential differences between streambed and flood plain sample locations. The sample points from the initially designed CUs were used for the four additional CUs. Several additional sample locations were added to the new CUs to bring the total number of sample locations to 16.

2.2.2 Sample Selection Process

For the 25 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.

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 collected in any CU.

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. The four samples designated as "archive" were not collected because they were not needed for additional statistical 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 first 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
ASCOCs FOR PADDYS RUN/PPDD

Primary COCs	Secondary COCs
Radium-226	1,1-Dichloroethene
Radium-228	Antimony
Thorium-228	Aroclor-1254
Thorium-232	Aroclor-1260
Total Uranium	Arsenic
	Benzo(a)anthracene
	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Benzo(g,h,i)perlene
	Benzo(k)fluoranthene
	Beryllium
	Bromodichloromethane
	Cadmium
	Cesium-137
	Chrysene
	Dibenzo(a,h)anthracene
	Dieldrin
	Fluoranthene
	Fluoride
	Indeno(1,2,3-cd)pyrene
	Lead
	Lead-210
	Manganese
	Molybdenum
	Neptunium-237
	Phenantrene
	Plutonium-238
	Pyrene
	Silver
	Strontium-90
	Technetium-99
	Tetrachloroethene
	Thorium-230
	Trichloroethene

TABLE 2-2
ASCOC LIST FOR PADDYS RUN/PPDD

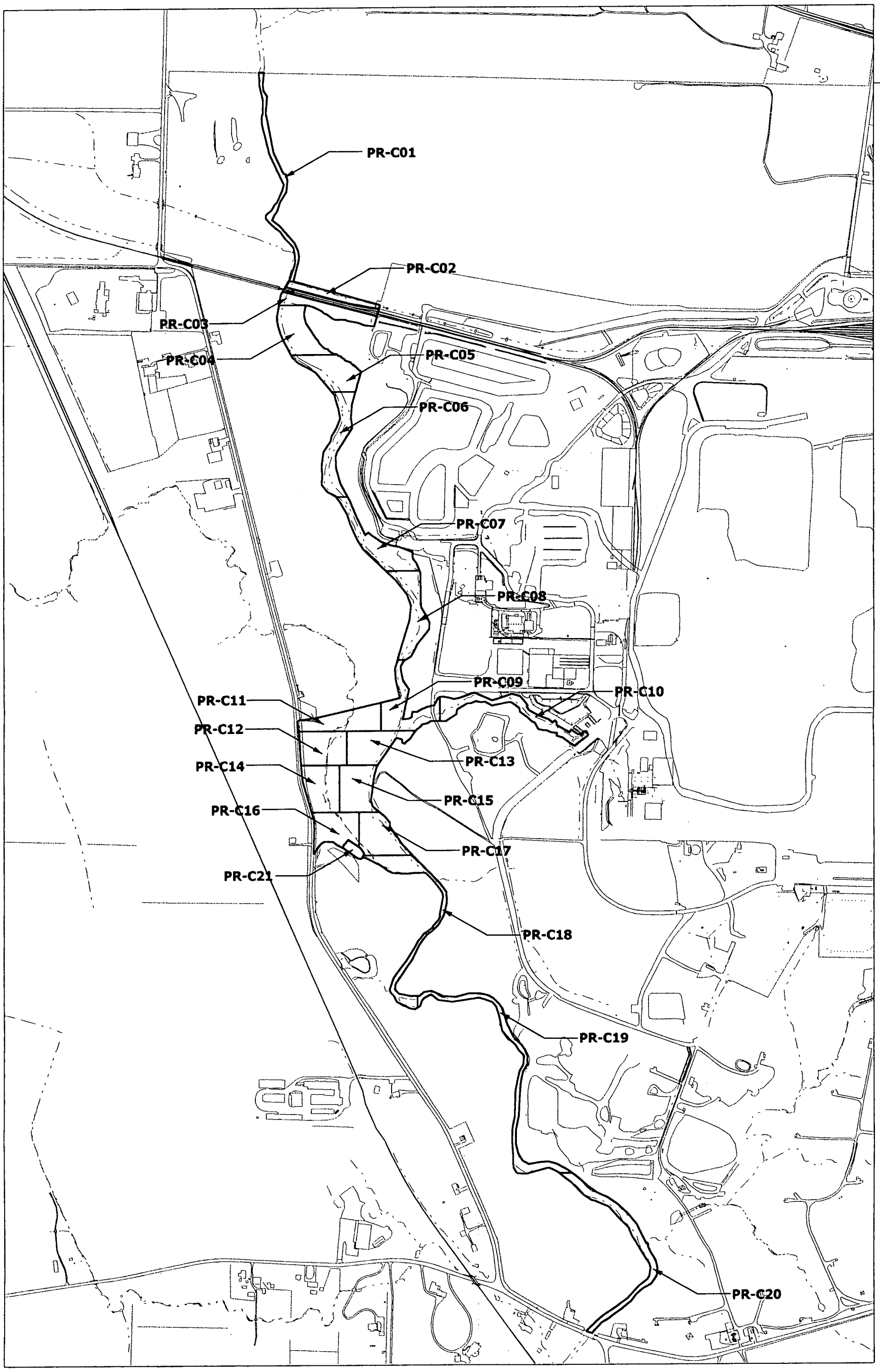
Stream Corridors ASCOCs	Retained As ASCOC?	Justification	CUs
PRIMARY ASCOCs			
Radium-226	Yes	Retained as primary ASCOC	All
Radium-228	Yes	Retained as primary ASCOC	All
Thorium-228	Yes	Retained as primary ASCOC	All
Thorium-232	Yes	Retained as primary ASCOC	All
Total Uranium	Yes	Retained as primary ASCOC	All
SECONDARY ASCOCs			
1,1-Dichloroethene	No	No results at or greater than FRL during Predesign	None
Antimony	No	No results at or greater than FRL during Predesign	None
Aroclor-1254	No	No results at or greater than FRL during Predesign	None
Aroclor-1260	No	No results at or greater than FRL during Predesign	None
Arsenic	No	No results above background during Predesign*	None
Benzo(a)anthracene	No	No results at or greater than FRL during Predesign	None
Benzo(a)pyrene	No	No results at or greater than FRL during Predesign	None
Benzo(b)fluoranthene	No	No results at or greater than FRL during Predesign	None
Benzo(g,h,i)perlene	No	No results at or greater than FRL during Predesign	None
Benzo(k)fluoranthene	No	No results at or greater than FRL during Predesign	None
Beryllium	No	No results at or greater than FRL during Predesign	None
Bromodichloromethane	No	No results at or greater than FRL during Predesign	None
Cadmium	No	No results at or greater than FRL during Predesign	None
Cesium-137	No	No results at or greater than FRL during Predesign	None
Chrysene	No	No results at or greater than FRL during Predesign	None
Dibenzo(a,h)anthracene	No	No results at or greater than FRL during Predesign	None
Dieldrin	No	No results at or greater than FRL during Predesign	None
Fluoranthene	No	No results at or greater than FRL during Predesign	None
Fluoride	No	No results at or greater than FRL during Predesign	None
Indeno(1,2,3-cd)pyrene	No	No results at or greater than FRL during Predesign	None
Lead	No	No results at or greater than FRL during Predesign	None
Lead-210	No	No results at or greater than FRL during Predesign	None
Manganese	No	No results at or greater than FRL during Predesign	None
Molybdenum	No	No results at or greater than FRL during Predesign	None
Neptunium-237	No	No results at or greater than FRL during Predesign	None
Phenantrene	No	No results at or greater than FRL during Predesign	None
Plutonium-238	No	No results at or greater than FRL during Predesign	None
Pyrene	No	No results at or greater than FRL during Predesign	None
Silver	No	No results at or greater than FRL during Predesign	None
Strontium-90	No	No results at or greater than FRL during Predesign	None
Technetium-99	No	No results at or greater than FRL during Predesign	None
Tetrachloroethene	No	No results at or greater than FRL during Predesign	None
Thorium-230	No	No results at or greater than FRL during Predesign	None
Trichloroethene	No	No results at or greater than FRL during Predesign	None

TABLE 2-3
FINAL ASCOC LIST FOR PADDYS RUN/PPDD CERTIFICATION UNITS

ASCOC	MDC	FRL
Total Uranium	8.2 mg/kg	82 mg/kg
Radium-226	0.17 pCi/g	1.7 pCi/g
Radium-228	0.18 pCi/g	1.8 pCi/g
Thorium-228	0.17 pCi/g	1.7 pCi/g
Thorium-232	0.15 pCi/g	1.5 pCi/g

*Based on the approved Excavation Plan, although Arsenic was present at above-FRL levels in this area, it is consistent with the background levels as identified in the CERCLA/RCRA Background Soil Study (DOE 1993) and it's associated addendum (DOE 2001b). Therefore, Arsenic was not retained as an ASCOC for this certification effort.

MDC - minimum detectable concentration
mg/kg - milligrams per kilogram
pCi/g - picoCuries per gram



LEGEND:

PR CU BOUNDARY

SCALE

600 300 0 600 FEET

FIGURE 2-1. PADDYS RUN/PILOT PLANT DRAINAGE DITCH - CU LOCATION MAP

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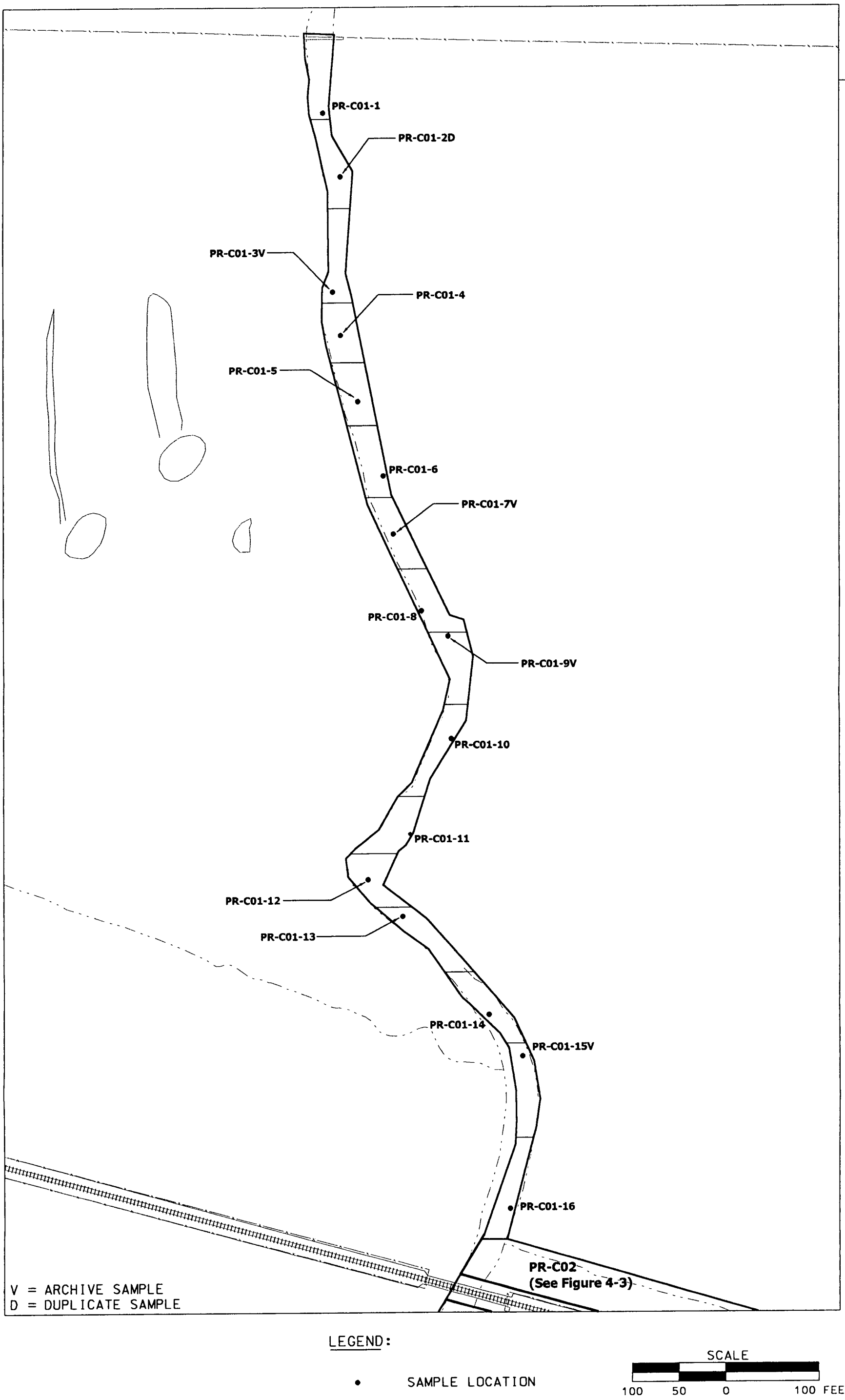

FIGURE 2-2. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN (NORTH) - CU PR-C01

STATE PLANAR COORDINATE SYSTEM 1983

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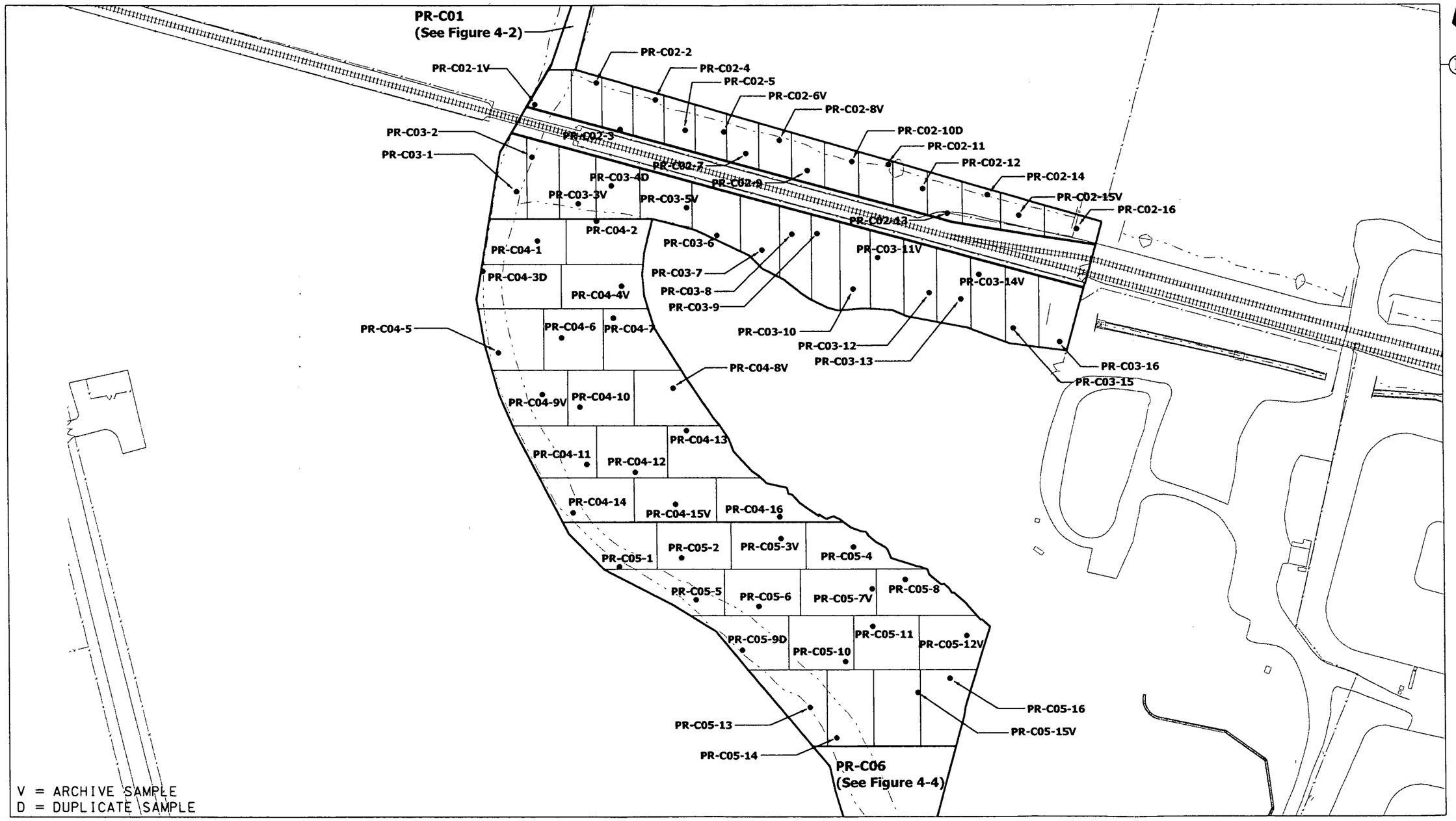

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05-OCT-2006

FIGURE 2-3. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN AREA, ADJACENT TO RAIL LINE - CU's PR-C02 THROUGH PR-C05

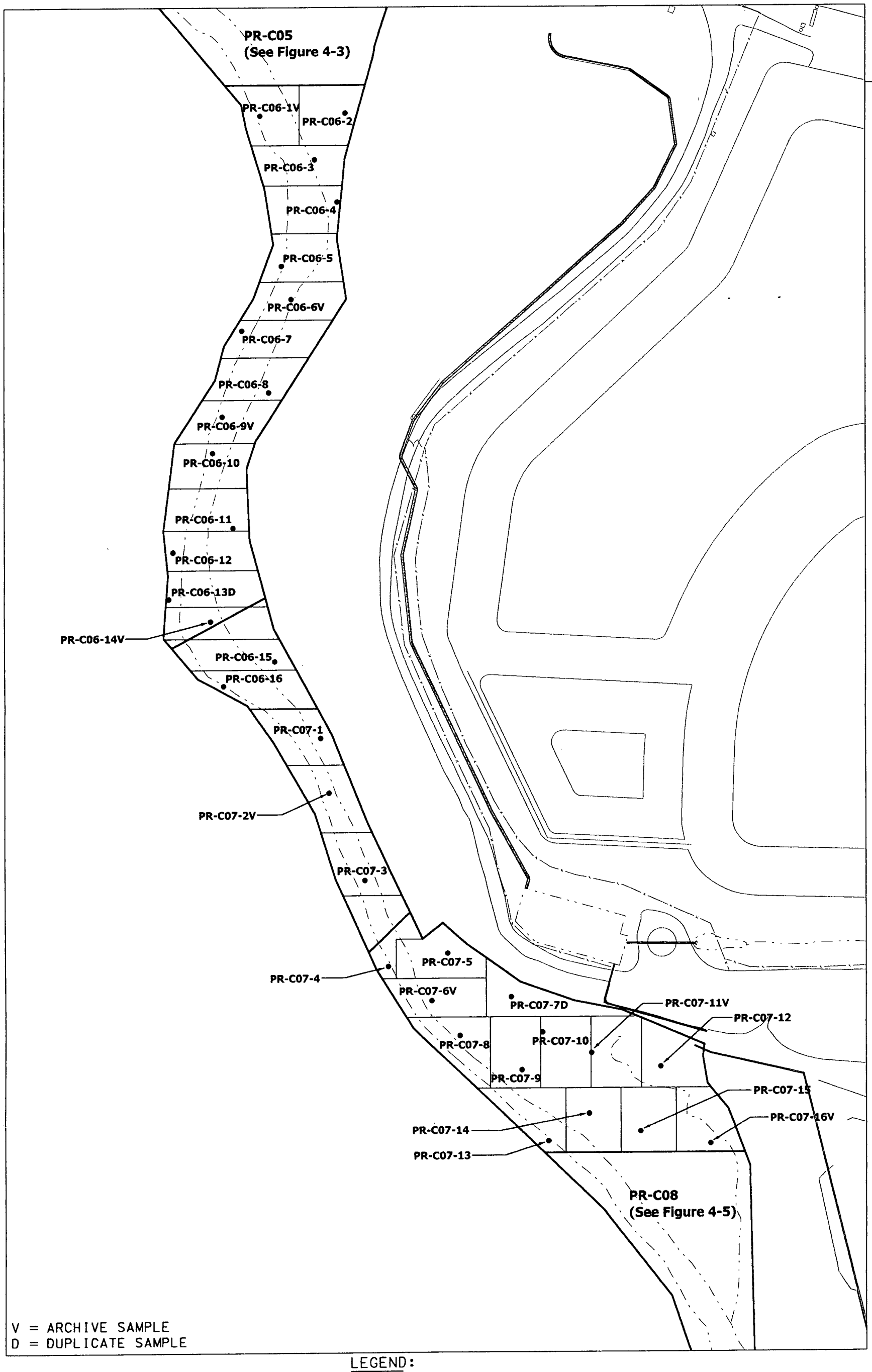


FIGURE 2-4. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN ADJACENT AREA, NORTHERN OXBOW, AND STREAM REROUTED AREA - CU's PR-C06 AND PR-C07

v:\2fm12\dgn\paddy_056.dgn
STATE PLANAR COORDINATE SYSTEM 1983
05-OCT-2006

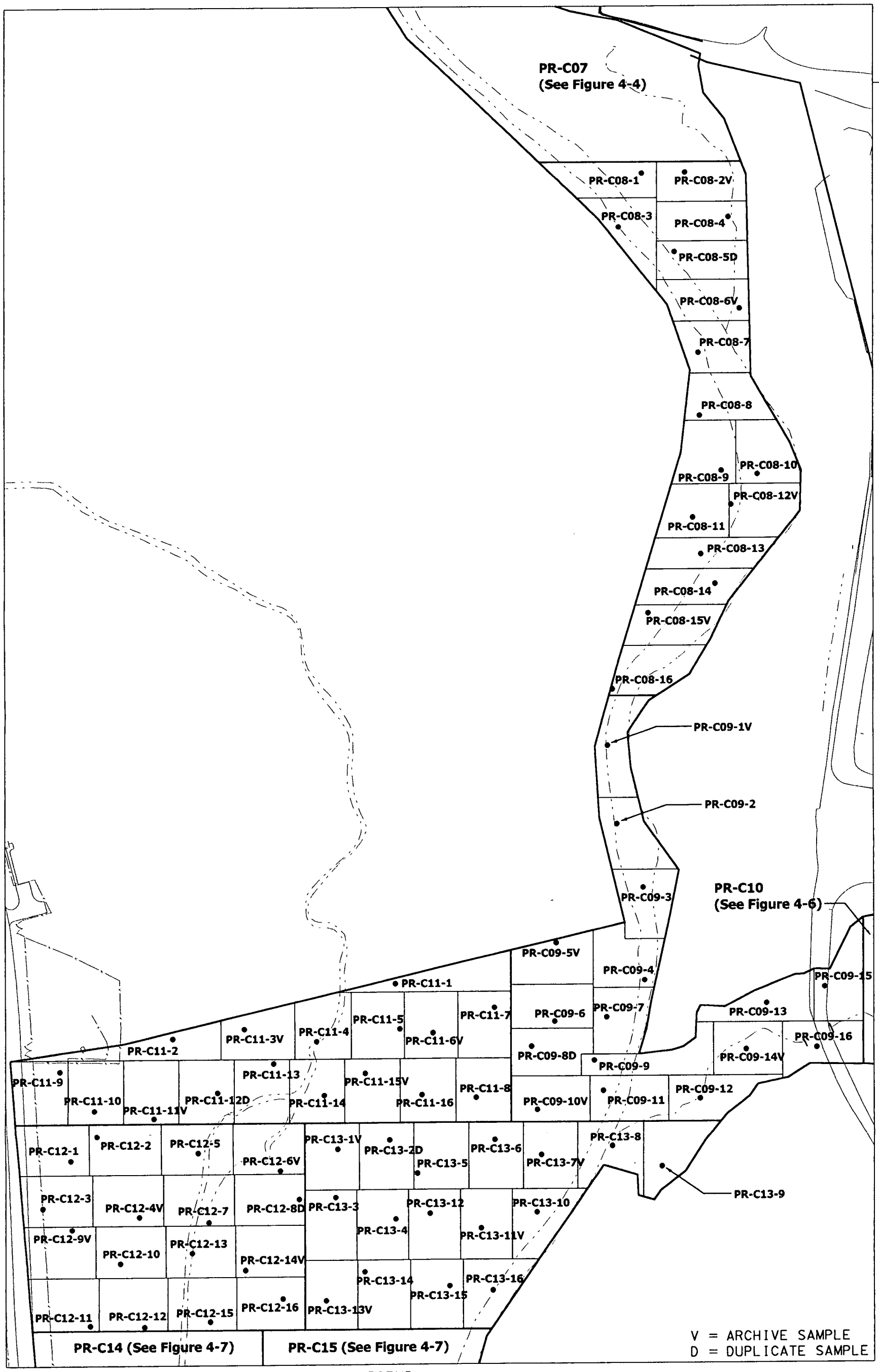
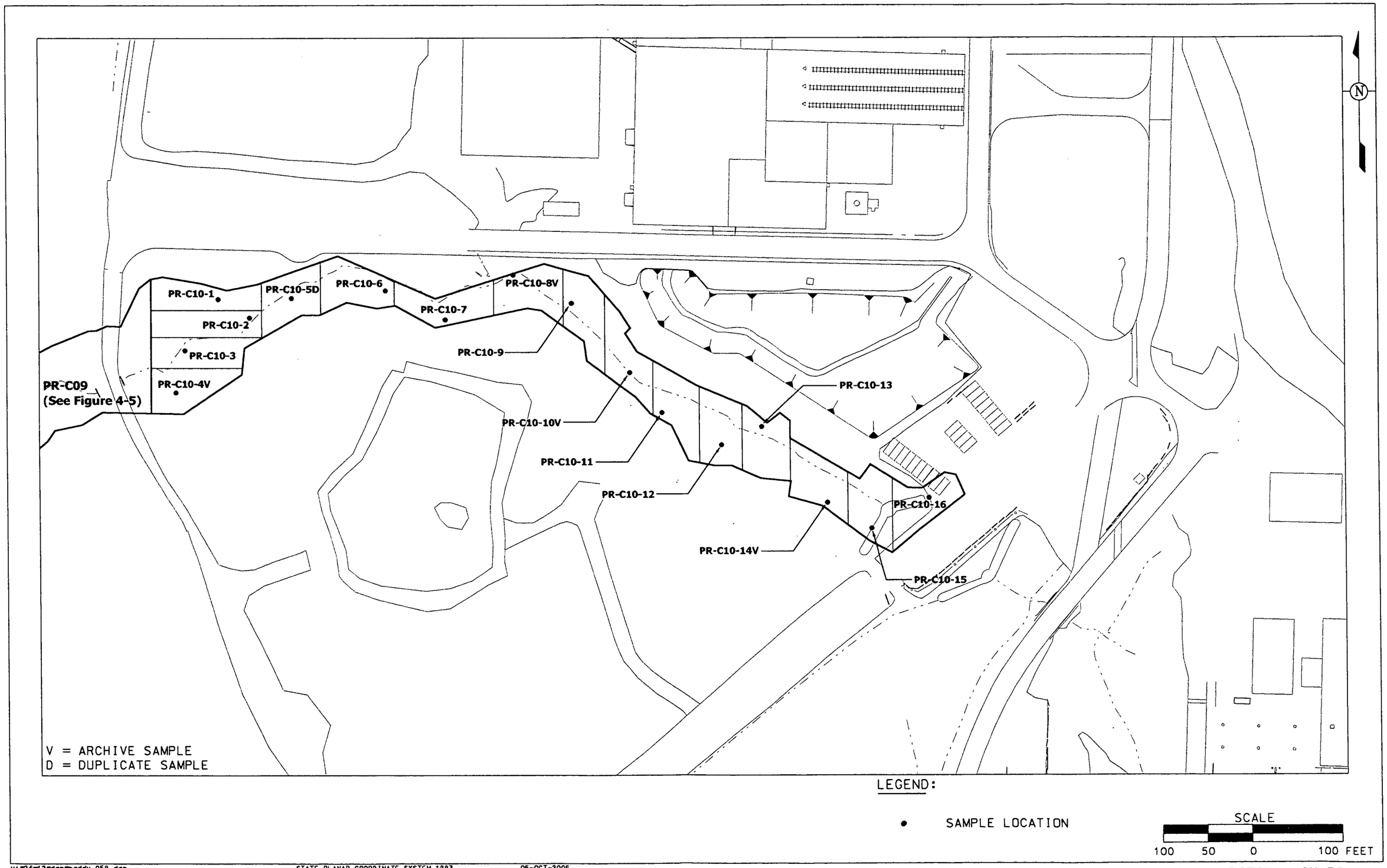


FIGURE 2-5. SUB CU AND SAMPLE LOCATIONS FOR AREA ADJACENT TO SILOS AND PILOT PLANT DRAINAGE DITCH - CU's PR-C08, PR-C09, PR-C11, PR-C12, AND PR-C13

STATE PLANAR COORDINATE SYSTEM 1983

05-OCT-2006

v:\2fml2\dgn\poddy_057.dgn



V:\2fm12\dgn\paddy_058.dgn STATE PLANAR COORDINATE SYSTEM 1983 05-OCT-2006

FIGURE 2-6. SUB CU AND SAMPLE LOCATIONS MAP FOR PILOT PLANT DRAINAGE DITCH – CU PR-C10

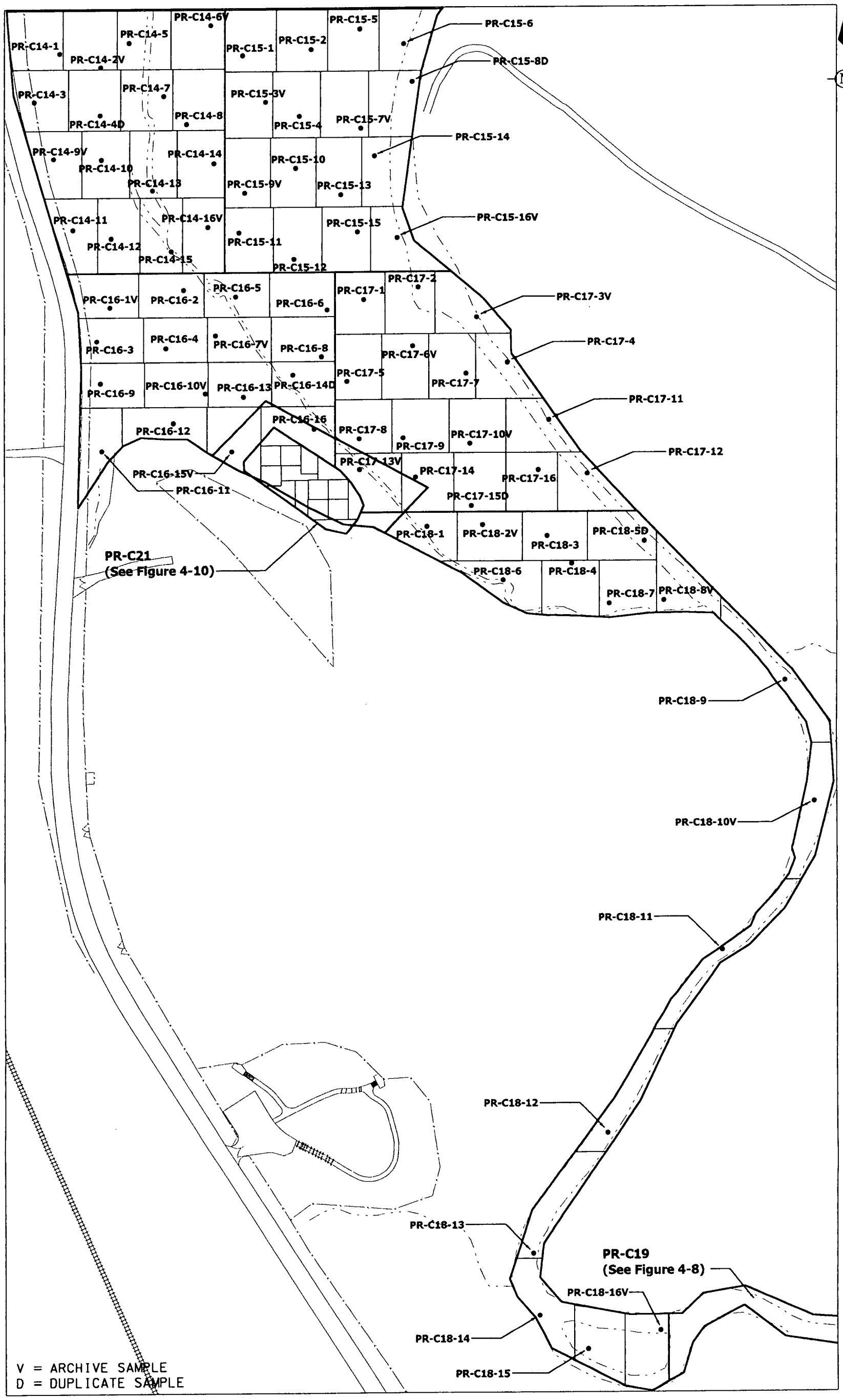
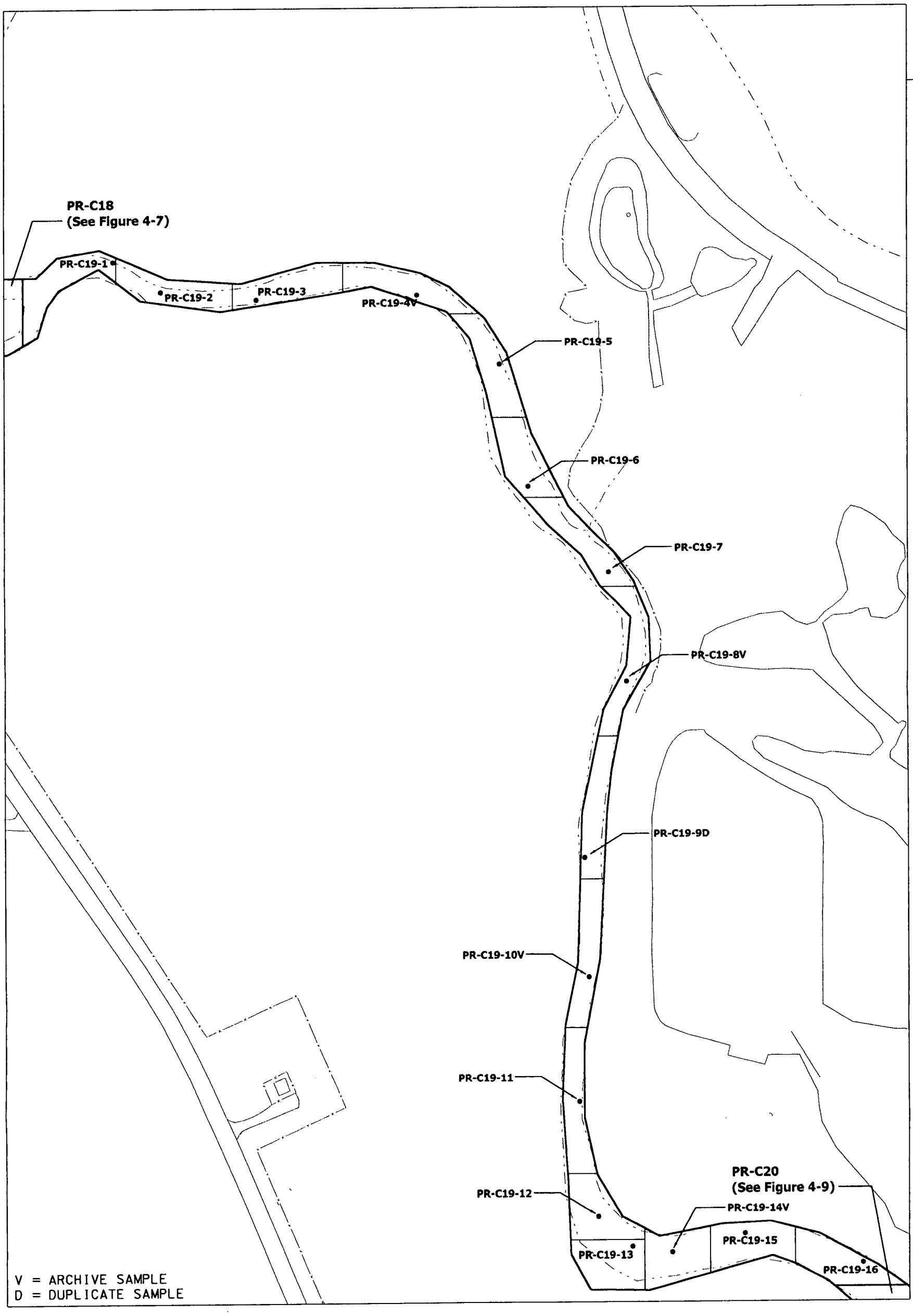


FIGURE 2-7. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN ADJACENT AREAS, SOUTHERN OXBOW, AND STREAM REROUTED AREA - CU's PR-C14 THROUGH PR-C18

STATE PLANAR COORDINATE SYSTEM 1983

05-OCT-2006



LEGEND:

• SAMPLE LOCATION

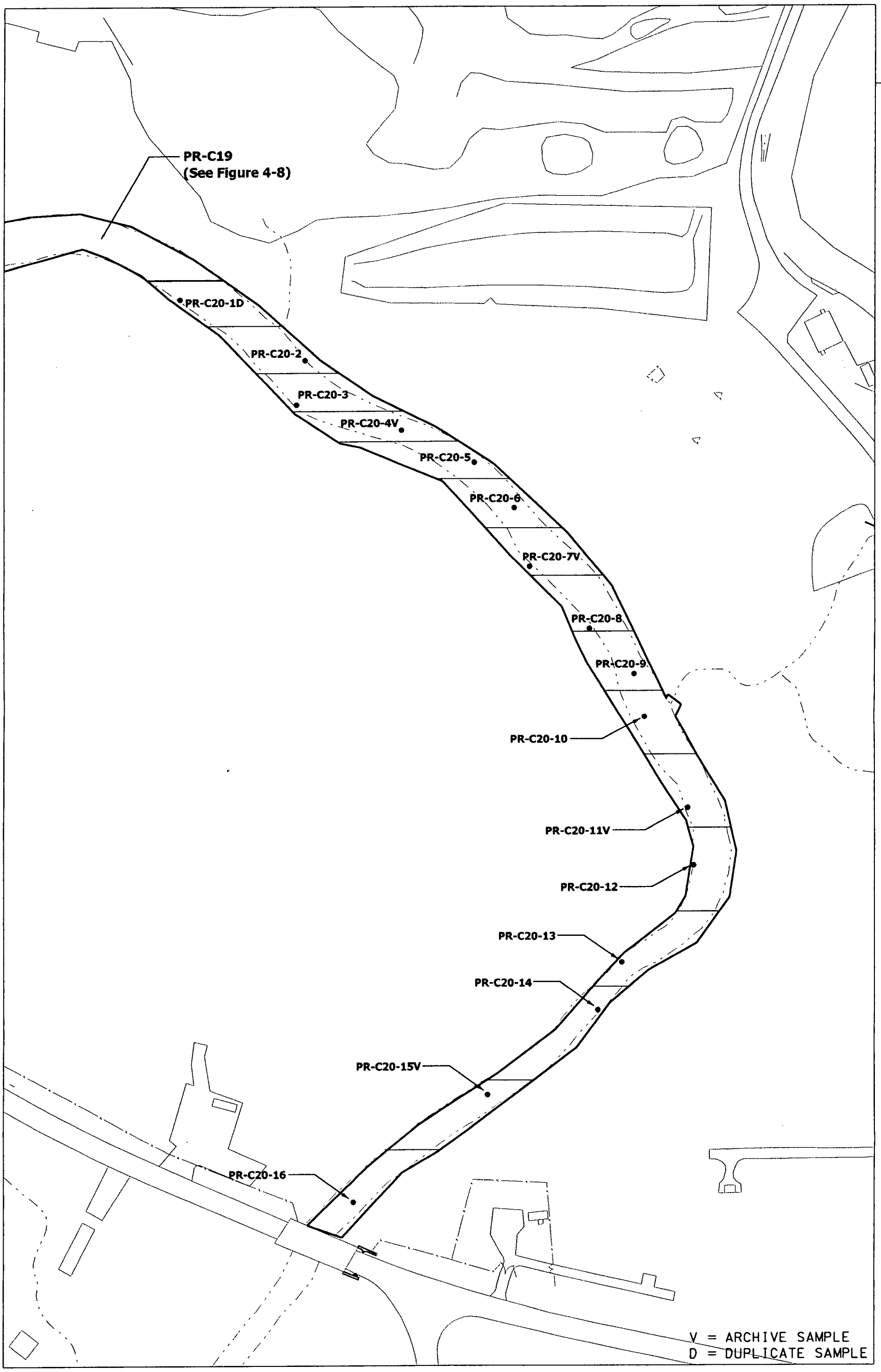
SCALE

100 50 0 100 FEET

FIGURE 2-8. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN (SOUTH #1) - CU PR-C19

STATE PLANAR COORDINATE SYSTEM 1983

03-OCT-2006



LEGEND:

• SAMPLE LOCATION

SCALE

100 50 0 100 FEET

FIGURE 2-9. SUB CU AND SAMPLE LOCATION MAP FOR PADDYS RUN (SOUTH #2) - CU PR-C20

STATE PLANAR COORDINATE SYSTEM 1983

03-OCT-2006

v:\2fmil2\dgn\paddy_021.dgn

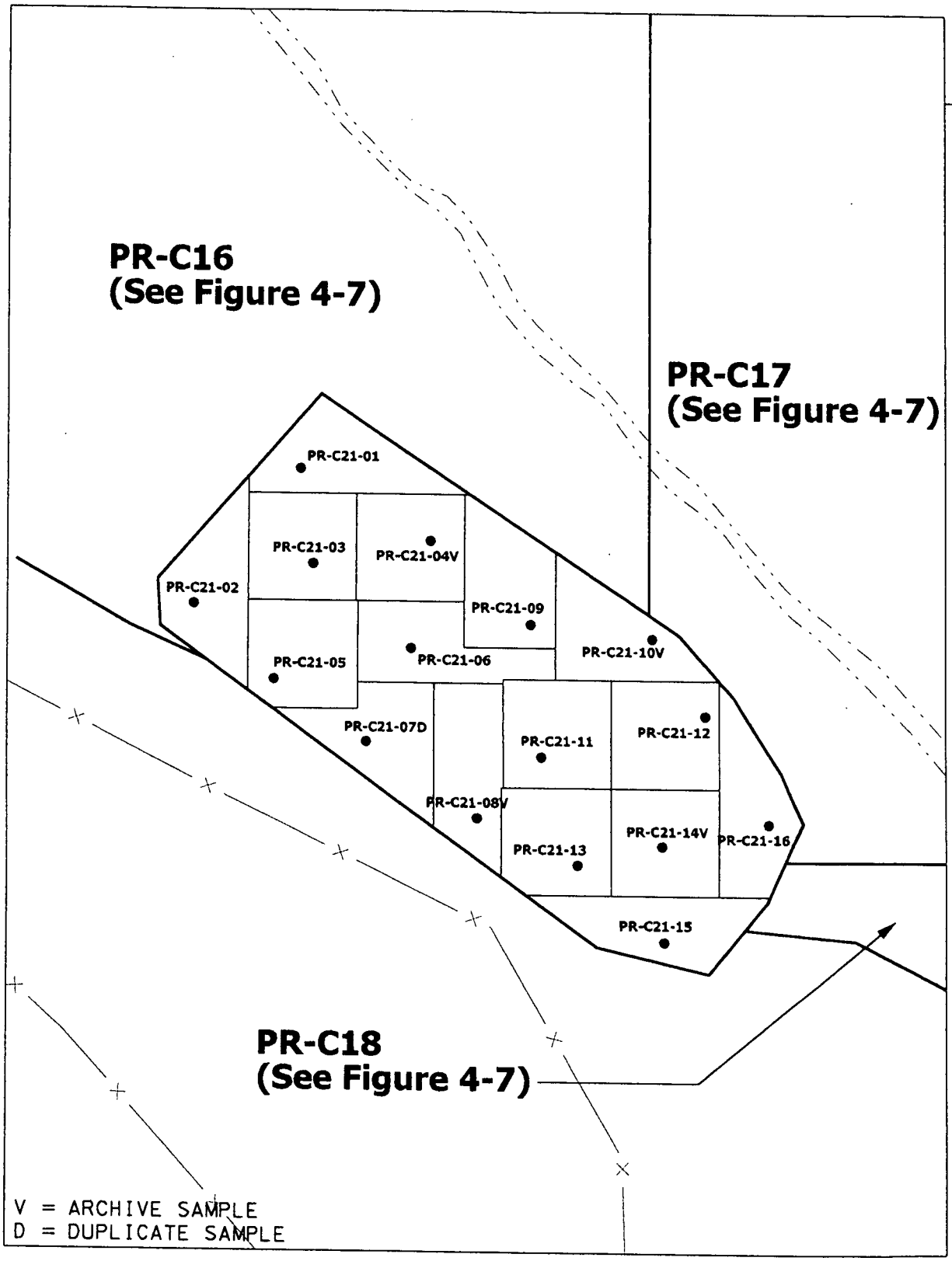


FIGURE 2-10. SUB-CU AND SAMPLE LOCATION MAP FOR THE SOUTHERN OXBOW AREA (#2) - CU PR-C21

v:\82fm12\dgn\boddy_026.dgn
STATE PLANAR COORDINATE SYSTEM 1983
03-OCT-2006

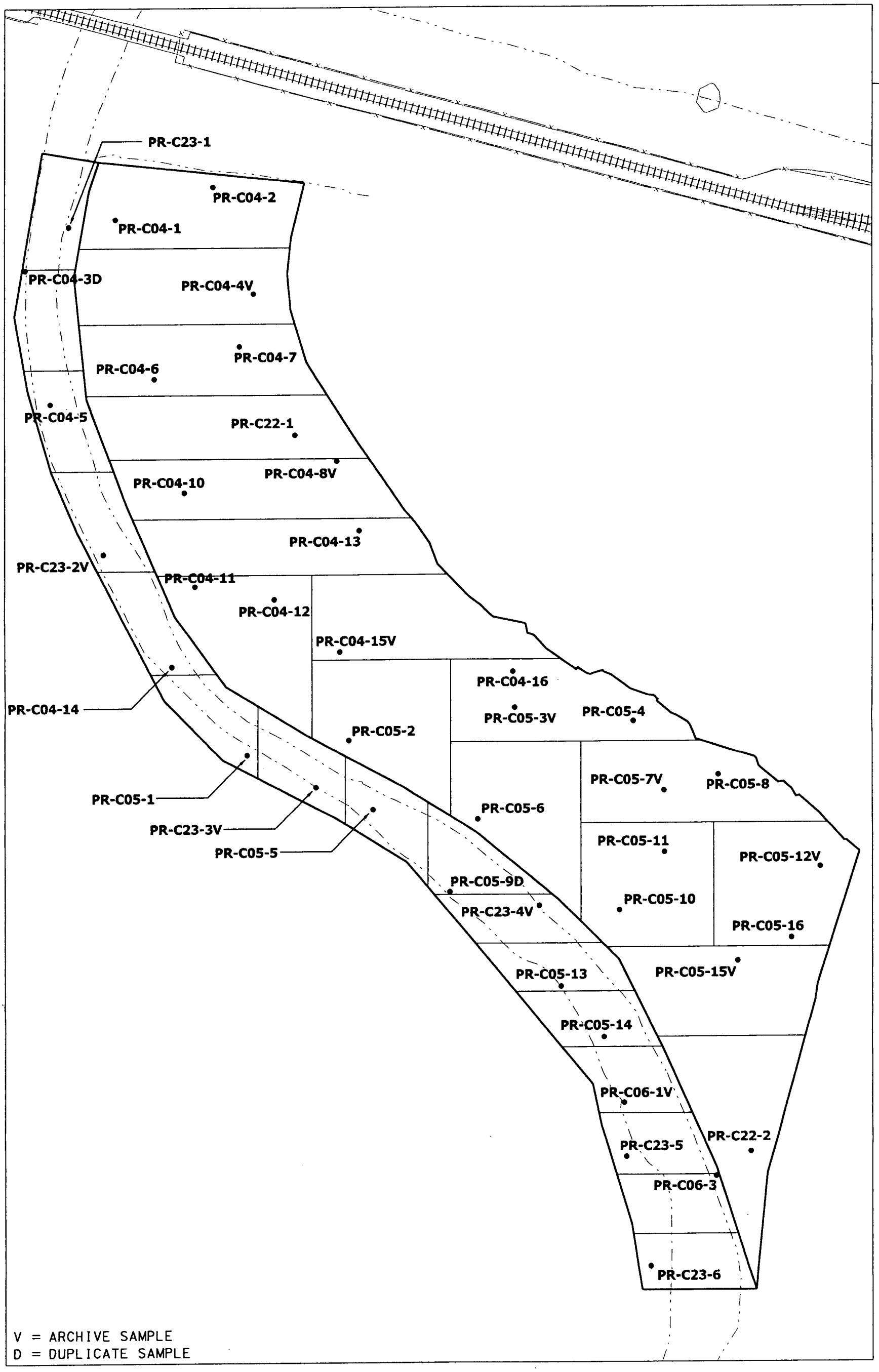
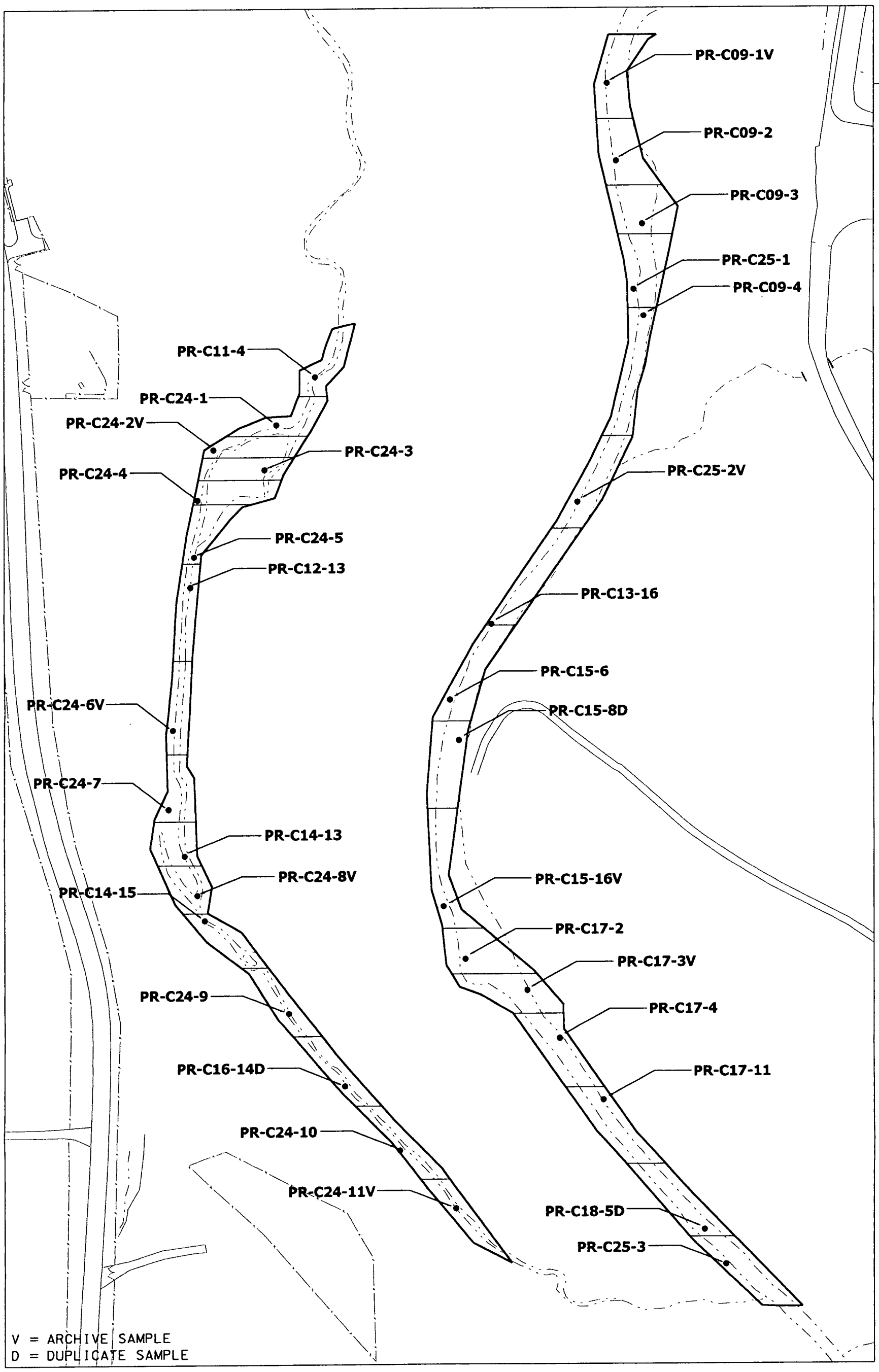


FIGURE 2-11. SUB-CU & SAMPLE LOCATION MAP FOR
THE NORTHERN STREAM BED (CU PR-C23) & FLOODPLAIN (CU PR-C22)

v:\82fm12\dgn\bpoddy_410.dgn
STATE PLANAR COORDINATE SYSTEM 1983
03-OCT-2006



LEGEND:

• SAMPLE LOCATION

SCALE

100 50 0 100 FEET

FIGURE 2-12. SUB CU & SAMPLE LOCATION MAP FOR STREAM BEDS IN THE SOUTHERN OXBOW AREA (CUs PR-C24 & PR-C25)

v:\2fm12\dgn\pdaddy-411.dgn
STATE PLANAR COORDINATE SYSTEM 1983
03-OCT-2006

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.

Before initiating the certification process, all historical soil data within the PR/PPDD 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 PR/PPDD are presented in the Excavation Plan for the Stream Corridors Pilot Plant Drainage Ditch and Paddys Run (DOE 2005a). This includes data collected under the PSP for WAC Attainment Sampling of Area 7 Soils (DOE 1999a), PSP for Predesign Sampling in the A2PII - Parts Two and Three (DOE 1999b), PSP for Real-Time Scan of Paddys Run Corridor and Associated Drainage Features (DOE 2003a), and PSP for Predesign Characterization of Sediments in Paddys Run and Associated Drainage Features (DOE 2004).

Data were also collected during the remediation/excavation activities for excavation control and following the remediation/excavation activities for precertification per the PSP for Excavation Control and Precertification of the Stream Corridors Pilot Plant Drainage Ditch and Paddys Run (Supplement to 20300-PSP-0011) (DOE 2005b).

During remediation/excavation activities in PR/PPDD, above-WAC material was discovered in the Southern Oxbow. This area was excavated until all of the above-WAC 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.

Following the excavation activities in PR/PPDD, 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 and Precertification of the Stream Corridors Pilot Plant Drainage Ditch and Paddys Run.

All areas in PR/PPDD passed the requirements of precertification, and it was determined that certification of the soil in PR/PPDD could be completed.

3.2 CHANGES TO SCOPE OF WORK

The scope of work for PR/PPDD Certification Sampling required one change, which is documented with one V/FCN (see Appendix B) and discussed below.

Variance 20810-PSP-0008-01 documents the collection of soil/sediment samples in the Pilot Plant Drainage Ditch to confirm/verify that water released from the retention basin in the south-eastern portion of the Silos and Support Area did not introduce contamination into the previously sampled (for certification) Pilot Plant Drainage Ditch.

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 2003b). 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, results were entered into the FCP SED. Final certification results are provided in Appendix A, and a summary of the analytical methods follows.

4.1.1 Chemical Methods

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 spectrometry, and the results were used to calculate the total uranium value. The calculation used was as follows:

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

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

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 21-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 PR/PPDD Area 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 PR/PPDD 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 PR/PPDD certification results.

4.2 DATA VERIFICATION AND VALIDATION

This section discusses the data verification and validation (V&V) process used to examine the quality of field and laboratory results. Data were qualified to indicate the level of data usability, or level of confidence in the reported analytical results 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 judgment 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 PR/PPDD 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 were 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 A.1. Additionally, the final data collected under variance 20820-PSP-0004-1 are presented in Appendix A.2.

5.1 CERTIFICATION RESULTS AND EVALUATION

All of the CUs in PR/PPDD passed the certification criteria as discussed in Section 2.2.4.

5.2 PR/PPDD 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 PR/PPDD. 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 Ohio Environmental Protection Agency (OEPA) concurrence.

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.

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U.S. Department of Energy, 2006, "Certification Design Letter and Certification Project Specific Plan for the Stream Corridors Paddys Run and Pilot Plant Drainage Ditch," Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

APPENDIX A

CERTIFICATION SAMPLES, ANALYTICAL RESULTS AND FINAL STATISTICS TABLES

APPENDIX A
STATISTICAL ABBREVIATIONS AND SYMBOLS

The procedure used to determine if the data are 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.

ATTACHMENT A.1

CERTIFICATION SAMPLES, ANALYTICAL RESULTS, AND FINAL STATISTICS TABLES

Certification Unit 1

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C01-1	0.601 -	0.366 -	0.364 -	0.366 -	2.4 U
PR-C01-2	0.473 -	0.304 -	0.305 -	0.304 -	2.37 U
PR-C01-2-D	0.528 -	0.261 -	0.261 -	0.261 -	2.41 U
PR-C01-4	0.594 -	0.309 -	0.324 -	0.309 -	2.32 J
PR-C01-5	0.51 -	0.3 -	0.317 -	0.3 -	3.81 J
PR-C01-6	0.536 -	0.352 -	0.399 -	0.352 -	2.5 U
PR-C01-8	0.571 -	0.257 -	0.242 -	0.257 -	2.5 U
PR-C01-10	0.565 -	0.303 -	0.329 -	0.303 -	2.28 U
PR-C01-11	0.555 -	0.354 -	0.376 -	0.354 -	2.47 U
PR-C01-12	0.596 -	0.371 -	0.352 -	0.371 -	3.01 J
PR-C01-13	0.66 -	0.367 -	0.373 -	0.367 -	2.85 U
PR-C01-14	0.599 -	0.391 -	0.399 -	0.391 -	3.18 J
PR-C01-16	0.569 -	0.282 -	0.27 -	0.282 -	2.58 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0 .66	0 .391	0 .399	0 .391	3.81
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	8
% Nondetects	0%	0%	0%	0%	67%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 2

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C02-2	0.699 -	0.526 -	0.534 -	0.526 -	2.48 U
PR-C02-3	2.2 -	1.44 -	1.45 -	1.44 -	11.2 J
PR-C02-4	0.903 -	0.671 -	0.723 -	0.671 -	3.14 U
PR-C02-5	1.26 -	0.985 -	1.02 -	0.985 -	10.9 J
PR-C02-7	1.43 -	0.997 -	1.03 -	0.997 -	7.8 J
PR-C02-9	1.47 -	1.05 -	1.03 -	1.05 -	5.8 J
PR-C02-10	0.803 -	0.519 -	0.544 -	0.519 -	7.84 J
PR-C02-10-D	0.729 -	0.471 -	0.464 -	0.471 -	3.73 J
PR-C02-11	0.904 -	0.677 -	0.697 -	0.677 -	5.11 J
PR-C02-12	0.953 -	0.648 -	0.665 -	0.648 -	5.97 J
PR-C02-13	0.98 -	0.642 -	0.66 -	0.642 -	7.02 J
PR-C02-14	0.783 -	0.482 -	0.5 -	0.482 -	4.31 J
PR-C02-16	1.05 -	0.818 -	0.832 -	0.818 -	3.06 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	2.2	1.44	1.45	1.44	11.2
Max. >= Limit	**Yes**	No	No	No	No
W-statistic Prob. #	37.5% (LN)	0	0	0	0
Test Procedure	Lognormal	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	3
% Nondetects	0%	0%	0%	0%	25%
Est. Mean*	1.12	- -	- -	- -	- -
UCL	1.36	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	pass	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 3

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C03-1	0.651 -	0.275 J	0.292 J	0.275 J	2.21 J
PR-C03-2	0.726 -	0.379 J	0.369 J	0.379 J	2.02 J
PR-C03-4	1.04 -	1.02 J	1.07 J	1.02 J	9.83 -
PR-C03-4-D	1.03 -	0.809 J	0.855 J	0.809 J	7.48 -
PR-C03-6	1.06 -	0.822 J	0.827 J	0.822 J	12.2 -
PR-C03-7	1.22 -	0.879 J	0.863 J	0.879 J	9.87 -
PR-C03-8	1.2 -	0.965 J	1.01 J	0.965 J	8.82 -
PR-C03-9	1.19 -	1 J	1.06 J	1 J	10.7 -
PR-C03-10	1.02 -	0.806 J	0.816 J	0.806 J	8.69 -
PR-C03-12	1.12 -	0.83 J	0.871 J	0.83 J	6.32 J
PR-C03-13	1.14 -	0.872 J	0.859 J	0.872 J	9.45 -
PR-C03-15	0.865 -	0.7 J	0.692 J	0.7 J	5.45 J
PR-C03-16	1.12 -	0.709 J	0.709 J	0.709 J	5.27 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.22	1.02	1.07	1.02	12.2
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	0
% Nondetects	0%	0%	0%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 4

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C04-1	0.674 -	0.536 J	0.566 J	0.536 J	5.1 J
PR-C04-2	0.876 -	0.765 J	0.762 J	0.765 J	3.46 J
PR-C04-3	0.579 -	0.318 J	0.318 J	0.318 J	2.21 U
PR-C04-3-D	0.587 -	0.229 J	0.218 J	0.229 J	2.44 J
PR-C04-5	0.518 -	0.303 J	0.305 J	0.303 J	2.21 U
PR-C04-6	0.882 -	0.8 J	0.814 J	0.8 J	5.85 J
PR-C04-7	1.04 -	0.892 J	0.849 J	0.892 J	7.93 J
PR-C04-10	0.931 -	0.796 J	0.804 J	0.796 J	5.57 J
PR-C04-11	0.742 -	0.659 J	0.657 J	0.659 J	2.54 U
PR-C04-12	0.836 -	0.671 J	0.702 J	0.671 J	9.65 -
PR-C04-13	1 -	0.889 J	0.867 J	0.889 J	12.1 -
PR-C04-14	0.468 -	0.32 J	0.315 J	0.32 J	2.52 J
PR-C04-16	0.792 -	0.814 J	0.809 J	0.814 J	4.19 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.04	0 .892	0 .867	0 .892	12.1
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	2
% Nondetects	0%	0%	0%	0%	17%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 5

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C05-1	0.485 -	0.663 J	0.668 J	0.663 J	2.41 U
PR-C05-2	0.856 -	0.715 J	0.743 J	0.715 J	3.68 J
PR-C05-4	0.984 -	0.855 J	0.864 J	0.855 J	8.95 -
PR-C05-5	0.831 -	0.725 J	0.715 J	0.725 J	7.54 J
PR-C05-6	0.517 -	0.416 J	0.43 J	0.416 J	4.57 J
PR-C05-8	0.771 -	0.88 J	0.936 J	0.88 J	7.82 -
PR-C05-9	0.953 -	0.978 J	0.96 J	0.978 J	6.03 J
PR-C05-9-D	0.88 -	0.746 J	0.765 J	0.746 J	6.12 J
PR-C05-10	0.974 -	0.695 J	0.695 J	0.695 J	2.8 U
PR-C05-11	0.85 -	0.528 J	0.546 J	0.528 J	7.55 -
PR-C05-13	0.857 -	0.753 J	0.782 J	0.753 J	14.6 -
PR-C05-14	0.521 -	0.36 J	0.357 J	0.36 J	5.68 J
PR-C05-16	0.529 -	0.308 J	0.294 J	0.308 J	2.38 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0 .984	0 .978	0 .96	0 .978	14.6
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	3
% Nondetects	0%	0%	0%	0%	25%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 6

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C06-2	0.961 -	0.628 J	0.671 J	0.628 J	7.6 -
PR-C06-3	1.03 -	0.877 J	0.849 J	0.877 J	8.81 -
PR-C06-4	1.03 -	0.837 J	0.902 J	0.837 J	13.3 -
PR-C06-5	0.547 -	0.309 J	0.306 J	0.309 J	1.36 U
PR-C06-7	0.707 -	0.389 J	0.405 J	0.389 J	1.63 U
PR-C06-8	1.11 -	0.741 J	0.722 J	0.741 J	3.41 J
PR-C06-10	0.539 -	0.33 J	0.328 J	0.33 J	3.76 -
PR-C06-11	0.766 -	0.73 J	0.805 J	0.73 J	5.69 -
PR-C06-12	0.812 -	0.678 J	0.662 J	0.678 J	1.98 U
PR-C06-13	0.73 -	0.51 J	0.551 J	0.51 J	1.88 U
PR-C06-13-D	0.737 -	0.632 J	0.717 J	0.632 J	2.78 J
PR-C06-15	0.921 -	0.703 J	0.661 J	0.703 J	4.48 -
PR-C06-16	0.59 -	0.228 J	0.231 J	0.228 J	1.57 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.11	0 .877	0 .902	0 .877	13.3
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	4
% Nondetects	0%	0%	0%	0%	33%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 7

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C07-1	0.797 -	0.649 J	0.689 J	0.649 J	16.9 -
PR-C07-3	0.724 -	0.331 J	0.332 J	0.331 J	2.5 U
PR-C07-4	0.612 -	0.387 J	0.387 J	0.387 J	2.45 J
PR-C07-5	0.888 -	0.607 J	0.565 J	0.607 J	11.7 -
PR-C07-7	0.8 -	0.72 J	0.743 J	0.72 J	6.22 -
PR-C07-7-D	0.807 -	0.579 J	0.572 J	0.579 J	4.78 -
PR-C07-8	0.622 -	0.394 J	0.39 J	0.394 J	2.46 U
PR-C07-9	0.732 -	0.616 J	0.633 J	0.616 J	4.05 J
PR-C07-10	0.768 -	0.607 J	0.602 J	0.607 J	10.8 -
PR-C07-12	1.38 -	0.948 J	0.993 J	0.948 J	30.1 -
PR-C07-13	0.876 -	0.465 J	0.48 J	0.465 J	2.7 U
PR-C07-14	0.823 -	0.676 J	0.681 J	0.676 J	4.4 J
PR-C07-15	0.791 -	0.5 J	0.517 J	0.5 J	9.09 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.38	0 .948	0 .993	0 .948	30.1
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	3
% Nondetects	0%	0%	0%	0%	25%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 8

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C08-1	0.613 J	0.519 -	0.473 -	0.519 -	9.81 J
PR-C08-3	0.57 J	0.303 -	0.29 -	0.303 -	3.33 J
PR-C08-4	3.31 J	1.02 -	0.975 -	1.02 -	16.4 J
PR-C08-5	0.592 J	0.295 -	0.316 -	0.295 -	1.43 U
PR-C08-5-D	0.555 J	0.279 -	0.285 -	0.279 -	1.6 J
PR-C08-7	0.686 J	0.569 -	0.539 -	0.569 -	3.09 U
PR-C08-8	0.676 J	0.585 -	0.597 -	0.585 -	5.87 J
PR-C08-9	0.614 J	0.388 -	0.403 -	0.388 -	3 U
PR-C08-10	0.589 J	0.378 -	0.377 -	0.378 -	2.37 U
PR-C08-11	0.575 J	0.482 -	0.485 -	0.482 -	3.55 J
PR-C08-13	0.723 J	0.494 -	0.5 -	0.494 -	6.14 J
PR-C08-14	0.525 J	0.288 -	0.284 -	0.288 -	2.8 U
PR-C08-16	0.539 J	0.319 -	0.28 -	0.319 -	5.67 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	3.31	1.02	0 .975	1.02	16.4
Max. >= Limit	**Yes**	No	No	No	No
W-statistic Prob. #	< 0.01% (LN)	0	0	0	0
Test Procedure	Median (Sign)	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	4
% Nondetects	0%	0%	0%	0%	33%
Est. Mean*	0.603	- -	- -	- -	- -
UCL	0.686	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	Pass	- -	- -	- -	- -
a-posteriori Sample	7	- -	- -	- -	- -
Size calculation	Pass	- -	- -	- -	- -

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

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

#: 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.

Certification Unit 9

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C09-2	0.583 -	0.371 -	0.374 -	0.371 -	2.47 U
PR-C09-3	0.646 -	0.304 -	0.296 -	0.304 -	2.6 U
PR-C09-4	0.703 -	0.388 -	0.4 -	0.388 -	2.78 J
PR-C09-6	0.799 -	0.776 -	0.777 -	0.776 -	5.93 -
PR-C09-7	0.833 -	0.636 -	0.636 -	0.636 -	3.05 U
PR-C09-8	0.675 -	0.629 -	0.621 -	0.629 -	5.38 -
PR-C09-8-D	0.813 -	0.644 -	0.708 -	0.644 -	5.73 J
PR-C09-9	1.05 -	0.65 -	0.639 -	0.65 -	2.99 U
PR-C09-11	0.693 -	0.396 -	0.373 -	0.396 -	2.56 U
PR-C09-12	0.807 -	0.61 -	0.631 -	0.61 -	7.37 -
PR-C09-13	1.22 -	0.778 -	0.732 -	0.778 -	14.7 -
PR-C09-15	0.721 -	0.417 -	0.418 -	0.417 -	2.33 U
PR-C09-16	0.512 -	0.366 -	0.358 -	0.366 -	4.5 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.22	0 .778	0 .777	0 .778	14.7
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	6
% Nondetects	0%	0%	0%	0%	50%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 10

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C10-1	1.39 -	0.932 J	0.899 J	0.932 J	25.2 -
PR-C10-2	1.53 -	1.02 J	1.05 J	1.02 J	17.8 -
PR-C10-3	0.961 -	0.646 J	0.646 J	0.646 J	19.7 -
PR-C10-5	1.1 -	0.872 J	0.871 J	0.872 J	18.1 -
PR-C10-5-D	1.13 -	0.735 J	0.701 J	0.735 J	15.1 -
PR-C10-6	1.35 -	0.994 J	0.993 J	0.994 J	22.6 -
PR-C10-7	1.81 -	1.04 J	1.04 J	1.04 J	19.3 -
PR-C10-9	1.45 -	0.962 J	0.95 J	0.962 J	14.8 -
PR-C10-11	1.36 -	1.02 J	1.06 J	1.02 J	51.2 -
PR-C10-12	1.4 -	1.18 J	1.17 J	1.18 J	24.5 -
PR-C10-13	1.09 -	0.702 J	0.73 J	0.702 J	8.54 J
PR-C10-15	1.5 -	1.11 J	1.06 J	1.11 J	10.6 -
PR-C10-16	0.67 -	0.337 J	0.356 J	0.337 J	2.44 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.81	1.18	1.17	1.18	51.2
Max. >= Limit	**Yes**	No	No	No	No
W-statistic Prob. #	56.2% (N)	0	0	0	0
Test Procedure	Normal	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	1
% Nondetects	0%	0%	0%	0%	8%
Est. Mean*	1.30	- -	- -	- -	- -
UCL	1.46	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	pass	- -	- -	- -	- -
a posteriori Sample	5	- -	- -	- -	- -
Size calculation	Pass	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 11

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C11-1	1.02 -	0.725 J	0.748 J	0.725 J	7.61 J
PR-C11-2	1.61 -	0.825 J	0.82 J	0.825 J	11 J
PR-C11-4	0.742 -	0.44 J	0.359 J	0.44 J	3.48 U
PR-C11-5	2.42 -	0.814 J	0.828 J	0.814 J	7.51 J
PR-C11-7	0.959 -	0.84 J	0.856 J	0.84 J	8.39 J
PR-C11-8	0.883 -	0.749 J	0.792 J	0.749 J	8.35 J
PR-C11-9	1.07 -	0.733 J	0.747 J	0.733 J	7.32 J
PR-C11-10	1.01 -	0.798 J	0.779 J	0.798 J	14.1 J
PR-C11-12	1.04 -	0.775 J	0.731 J	0.775 J	24.1 -
PR-C11-12-D	1.21 -	0.828 J	0.822 J	0.828 J	24.4 -
PR-C11-13	0.909 -	0.855 J	0.832 J	0.855 J	9.85 J
PR-C11-14	0.772 -	0.466 J	0.495 J	0.466 J	2.49 U
PR-C11-16	0.827 -	0.654 J	0.7 J	0.654 J	3.01 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	2.42	0 .855	0 .856	0 .855	24.4
Max. >= Limit	**Yes**	No	No	No	No
W-statistic Prob. #	4.1% (LN)	0	0	0	0
Test Procedure	Median (Sign)	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	3
% Nondetects	0%	0%	0%	0%	25%
Est. Mean*	0.9845	- -	- -	- -	- -
UCL	1.21	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	Pass	- -	- -	- -	- -
a posteriori Sample	7	- -	- -	- -	- -
Size calculation	Pass	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 12

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C12-1	1.05 -	0.776 -	0.775 -	0.776 -	13.2 -
PR-C12-2	0.732 -	0.642 -	0.698 -	0.642 -	9.58 -
PR-C12-3	1.12 -	0.913 -	0.867 -	0.913 -	11 -
PR-C12-5	0.831 -	0.634 -	0.695 -	0.634 -	2.13 U
PR-C12-7	0.717 -	0.684 -	0.72 -	0.684 -	4.99 -
PR-C12-8	1.09 -	0.697 -	0.709 -	0.697 -	10.7 -
PR-C12-8-D	1.22 -	0.801 -	0.793 -	0.801 -	10.8 -
PR-C12-10	1.09 -	0.915 -	0.958 -	0.915 -	13.1 -
PR-C12-11	1.23 -	0.935 -	0.916 -	0.935 -	16.7 -
PR-C12-12	0.862 -	0.602 -	0.614 -	0.602 -	4.3 J
PR-C12-13	0.812 -	0.755 -	0.803 -	0.755 -	3.76 J
PR-C12-15	0.912 -	0.512 -	0.502 -	0.512 -	2.69 J
PR-C12-16	1.25 -	0.918 -	0.864 -	0.918 -	18.8 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.25	0 .935	0 .958	0 .935	18.8
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	1
% Nondetects	0%	0%	0%	0%	8%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 13

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C13-2	1.07 J	0.994 -	1.02 -	0.994 -	70.1 J
PR-C13-2-D	1.28 J	0.916 -	0.967 -	0.916 -	42.6 J
PR-C13-3	1.04 J	0.774 -	0.843 -	0.774 -	11.9 J
PR-C13-4	0.941 J	0.824 -	0.838 -	0.824 -	8.67 J
PR-C13-5	1 J	0.858 -	0.921 -	0.858 -	7.7 J
PR-C13-6	0.868 J	0.726 -	0.731 -	0.726 -	6.2 J
PR-C13-8	0.835 J	0.603 -	0.63 -	0.603 -	3.06 J
PR-C13-9	0.728 J	0.395 -	0.401 -	0.395 -	3 U
PR-C13-10	0.682 J	0.534 -	0.569 -	0.534 -	5.62 J
PR-C13-12	0.958 J	0.827 -	0.834 -	0.827 -	5.1 J
PR-C13-14	0.764 J	0.638 -	0.617 -	0.638 -	3.4 J
PR-C13-15	0.996 J	0.803 -	0.767 -	0.803 -	2.99 U
PR-C13-16	0.963 J	0.624 -	0.692 -	0.624 -	4.62 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.28	0 .994	1.02	0 .994	70.1
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	1
% Nondetects	0%	0%	0%	0%	8%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 14

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C14-1	1.31 -	0.937 -	0.908 J	0.937 -	7.76 J
PR-C14-3	1.23 -	1.13 -	1.23 J	1.13 -	8.04 J
PR-C14-4	1.25 -	0.819 -	0.792 J	0.819 -	6.94 J
PR-C14-4-D	1.23 -	0.938 -	0.961 J	0.938 -	9.55 J
PR-C14-5	1.25 -	0.944 -	0.96 J	0.944 -	12.6 -
PR-C14-7	1.25 -	0.949 -	0.903 J	0.949 -	6.54 J
PR-C14-8	1.1 -	0.732 -	0.765 J	0.732 -	11.3 -
PR-C14-10	2.85 -	0.866 -	0.856 J	0.866 -	14.6 -
PR-C14-11	1.13 -	0.665 -	0.68 J	0.665 -	17.2 -
PR-C14-12	1.3 -	0.721 -	0.66 J	0.721 -	17.3 -
PR-C14-13	0.896 -	0.719 -	0.705 J	0.719 -	4.07 U
PR-C14-14	0.827 -	0.613 -	0.545 J	0.613 -	4.54 J
PR-C14-15	0.9 -	0.792 -	0.782 J	0.792 -	5.45 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	2.85	1.13	1.23	1.13	17.3
Max. >= Limit	**Yes**	No	No	No	No
W-statistic Prob. #	< 0.01% (LN)	0	0	0	0
Test Procedure	Median (Sign)	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	1
% Nondetects	0%	0%	0%	0%	8%
Est. Mean*	1.24	- -	- -	- -	- -
UCL	1.3	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	Pass	- -	- -	- -	- -

a posteriori Sample	7	- -	- -	- -	- -
Size calculation	Pass	- -	- -	- -	- -

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

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

#: 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.

Certification Unit 15

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C15-1	1.08 -	0.713 J	0.711 -	0.713 J	11.2 -
PR-C15-2	0.764 -	0.577 J	0.566 -	0.577 J	3.1 U
PR-C15-4	0.787 -	0.385 J	0.382 -	0.385 J	2.79 U
PR-C15-5	0.919 -	0.563 J	0.561 -	0.563 J	2.94 U
PR-C15-6	0.676 -	0.438 J	0.5 -	0.438 J	1.62 U
PR-C15-8	0.582 -	0.291 J	0.293 -	0.291 J	2.84 J
PR-C15-8-D	0.594 -	0.224 J	0.215 -	0.224 J	1.48 U
PR-C15-10	0.749 -	0.545 J	0.518 -	0.545 J	4.58 J
PR-C15-11	0.922 -	0.709 J	0.704 -	0.709 J	4.47 J
PR-C15-12	0.884 -	0.604 J	0.578 -	0.604 J	3.42 J
PR-C15-13	0.736 -	0.484 J	0.45 -	0.484 J	2.92 U
PR-C15-14	1.1 -	0.763 J	0.757 -	0.763 J	6.32 -
PR-C15-15	0.666 -	0.436 J	0.428 -	0.436 J	2.83 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.1	0 .763	0 .757	0 .763	11.2
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	6
% Nondetects	0%	0%	0%	0%	50%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 16

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C16-2	0.951 J	0.768 -	0.791 -	0.768 -	9.49 -
PR-C16-3	1.12 J	0.831 -	0.783 -	0.831 -	15 -
PR-C16-4	1.07 J	0.908 -	0.964 -	0.908 -	20.3 -
PR-C16-5	1.1 J	0.814 -	0.808 -	0.814 -	4.88 -
PR-C16-6	0.85 J	0.927 -	0.977 -	0.927 -	12.8 -
PR-C16-8	1.14 J	0.847 -	0.833 -	0.847 -	17.4 -
PR-C16-9	1.11 J	1 -	0.959 -	1 -	13.2 -
PR-C16-11	0.916 J	0.77 -	0.738 -	0.77 -	8.48 -
PR-C16-12	1.11 J	1.07 -	1.1 -	1.07 -	9.71 -
PR-C16-13	0.864 J	0.741 -	0.721 -	0.741 -	11 -
PR-C16-14	1.16 J	0.908 -	0.856 -	0.908 -	7.32 -
PR-C16-14-D	1.14 J	0.924 -	0.914 -	0.924 -	6.31 -
PR-C16-16	1.36 J	0.922 -	0.872 -	0.922 -	7.5 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.36	1.07	1.1	1.07	20.3
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	0
% Nondetects	0%	0%	0%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 17

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C17-1	0.858 -	0.901 J	1.02 J	0.901 J	8.71 J
PR-C17-2	0.547 -	0.357 J	0.343 J	0.357 J	1.61 U
PR-C17-4	0.615 -	0.37 J	0.359 J	0.37 J	3.33 J
PR-C17-5	1.08 -	1.06 J	1.1 J	1.06 J	9.52 J
PR-C17-7	0.94 -	0.829 J	0.846 J	0.829 J	3.43 U
PR-C17-8	1.23 -	0.823 J	0.768 J	0.823 J	3.57 U
PR-C17-9	1.02 -	0.957 J	0.988 J	0.957 J	13.6 J
PR-C17-11	0.568 -	0.285 J	0.287 J	0.285 J	1.62 U
PR-C17-12	0.524 -	0.318 J	0.327 J	0.318 J	1.59 U
PR-C17-14	0.87 -	0.53 J	0.573 J	0.53 J	4.12 J
PR-C17-15	1.03 -	0.733 J	0.793 J	0.733 J	6.12 J
PR-C17-15-D	0.947 -	0.504 J	0.588 J	0.504 J	4.46 J
PR-C17-16	0.902 -	0.686 J	0.72 J	0.686 J	5.69 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.23	1.06	1.1	1.06	13.6
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	5
% Nondetects	0%	0%	0%	0%	42%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 18

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C18-1	1.2 J	0.898 -	0.848 -	0.898 -	4.25 -
PR-C18-3	0.979 J	0.774 -	0.773 -	0.774 -	3.33 U
PR-C18-4	1.02 J	0.851 -	0.834 -	0.851 -	6.33 J
PR-C18-5	0.641 J	0.305 -	0.267 -	0.305 -	2.62 U
PR-C18-5-D	0.868 J	0.369 -	0.386 -	0.369 -	2.65 U
PR-C18-6	1.04 J	0.892 -	0.853 -	0.892 -	7.45 -
PR-C18-7	1.03 J	1.11 -	1.14 -	1.11 -	2.85 J
PR-C18-9	0.503 J	0.348 -	0.284 -	0.348 -	2.87 U
PR-C18-11	0.686 J	0.389 -	0.385 -	0.389 -	2.68 U
PR-C18-12	0.454 J	0.419 -	0.41 -	0.419 -	2.66 U
PR-C18-13	0.549 J	0.474 -	0.452 -	0.474 -	4.18 J
PR-C18-14	0.668 J	0.404 -	0.401 -	0.404 -	2.66 U
PR-C18-15	0.713 J	0.392 -	0.392 -	0.392 -	5.26 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.2	1.11	1.14	1.11	7.45
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	6
% Nondetects	0%	0%	0%	0%	50%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 19

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C19-1	0.61 -	0.381 -	0.386 -	0.381 -	3.12 U
PR-C19-2	0.683 -	0.422 -	0.34 -	0.422 -	3.59 J
PR-C19-3	0.612 -	0.39 -	0.303 -	0.39 -	2.92 U
PR-C19-5	0.827 -	0.585 -	0.546 -	0.585 -	2.94 U
PR-C19-6	0.676 -	0.44 -	0.415 -	0.44 -	3.48 U
PR-C19-7	0.662 -	0.402 -	0.391 -	0.402 -	3.51 U
PR-C19-9	0.683 -	0.418 -	0.421 -	0.418 -	2.85 U
PR-C19-9-D	0.62 -	0.323 -	0.303 -	0.323 -	2.73 U
PR-C19-11	0.592 -	0.429 -	0.419 -	0.429 -	3.55 J
PR-C19-12	0.704 -	0.426 -	0.389 -	0.426 -	3.51 J
PR-C19-13	0.659 -	0.35 -	0.329 -	0.35 -	2.76 U
PR-C19-15	0.643 -	0.424 -	0.345 -	0.424 -	2.94 U
PR-C19-16	0.729 -	0.676 -	0.623 -	0.676 -	3.39 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0 .827	0 .676	0 .623	0 .676	3.59
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	9
% Nondetects	0%	0%	0%	0%	75%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 20

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C20-1	0.616 J	0.355 -	0.29 -	0.355 -	2.49 U
PR-C20-1-D	0.425 J	0.29 -	0.333 -	0.29 -	1.36 U
PR-C20-2	0.7 J	0.568 -	0.558 -	0.568 -	3.3 J
PR-C20-3	0.483 J	0.285 -	0.274 -	0.285 -	1.7 J
PR-C20-5	0.523 J	0.275 -	0.288 -	0.275 -	3.09 -
PR-C20-6	0.474 J	0.32 -	0.302 -	0.32 -	2.41 U
PR-C20-8	0.601 J	0.579 -	0.621 -	0.579 -	3.29 J
PR-C20-9	0.508 J	0.368 -	0.356 -	0.368 -	2.47 U
PR-C20-10	0.513 J	0.212 -	0.216 -	0.212 -	2.65 J
PR-C20-12	0.598 J	0.33 -	0.333 -	0.33 -	1.35 U
PR-C20-13	0.657 J	0.321 -	0.317 -	0.321 -	1.52 U
PR-C20-14	0.493 J	0.236 -	0.242 -	0.236 -	1.45 U
PR-C20-16	0.467 J	0.296 -	0.289 -	0.296 -	2.3 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0 .7	0 .579	0 .621	0 .579	3.3
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	6
% Nondetects	0%	0%	0%	0%	50%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 21

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C21-1	1.04 -	0.983 J	0.953 -	0.983 J	3.44 J
PR-C21-2	0.942 -	0.796 J	0.775 -	0.796 J	3.59 U
PR-C21-3	0.871 -	0.707 J	0.722 -	0.707 J	3.52 U
PR-C21-5	1.24 -	0.884 J	0.952 -	0.884 J	18.5 J
PR-C21-6	0.892 -	0.668 J	0.681 -	0.668 J	3.2 U
PR-C21-7	0.919 -	0.702 J	0.694 -	0.702 J	3.12 U
PR-C21-7-D	0.915 -	0.639 J	0.629 -	0.639 J	5.98 J
PR-C21-9	1.21 -	0.927 J	0.951 -	0.927 J	10.6 J
PR-C21-11	0.875 -	0.544 J	0.58 -	0.544 J	4.5 J
PR-C21-12	1.56 -	0.745 J	0.774 -	0.745 J	8.58 J
PR-C21-13	1.13 -	0.722 J	0.736 -	0.722 J	8.59 J
PR-C21-15	1.05 -	0.538 J	0.585 -	0.538 J	3.11 U
PR-C21-16	0.886 -	0.561 J	0.555 -	0.561 J	4.31 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.56	0 .983	0 .953	0 .983	18.5
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	5
% Nondetects	0%	0%	0%	0%	42%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 22

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C04-1	0.674 -	0.536 J	0.566 J	0.536 J	5.1 J
PR-C04-2	0.876 -	0.765 J	0.762 J	0.765 J	3.46 J
PR-C04-6	0.882 -	0.8 J	0.814 J	0.8 J	5.85 J
PR-C04-7	1.04 -	0.892 J	0.849 J	0.892 J	7.93 J
PR-C04-10	0.931 -	0.796 J	0.804 J	0.796 J	5.57 J
PR-C04-11	0.742 -	0.659 J	0.657 J	0.659 J	2.54 U
PR-C04-12	0.836 -	0.671 J	0.702 J	0.671 J	9.65 -
PR-C04-13	1 -	0.889 J	0.867 J	0.889 J	12.1 -
PR-C04-16	0.792 -	0.814 J	0.809 J	0.814 J	4.19 J
PR-C05-2	0.856 -	0.715 J	0.743 J	0.715 J	3.68 J
PR-C05-4	0.984 -	0.855 J	0.864 J	0.855 J	8.95 -
PR-C05-6	0.517 -	0.416 J	0.43 J	0.416 J	4.57 J
PR-C05-8	0.771 -	0.88 J	0.936 J	0.88 J	7.82 -
PR-C05-10	0.974 -	0.695 J	0.695 J	0.695 J	2.8 U
PR-C05-11	0.85 -	0.528 J	0.546 J	0.528 J	7.55 -
PR-C05-16	0.529 -	0.308 J	0.294 J	0.308 J	2.38 U
PR-C22-1	0.888 -	0.772 -	0.799 -	0.772 -	4.08 J
PR-C22-2	0.785 -	0.661 -	0.656 -	0.661 -	10.2 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.04	0.892	0.867	0.892	12.1
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	18	18	18	18	18
Nondetects	0	0	0	0	3
% Nondetects	0%	0%	0%	0%	17%
Est. Mean*	--	--	--	--	--
UCL	--	--	--	--	--
Prob. > Limit	--	--	--	--	--
Pass / Fail	--	--	--	--	--
a posteriori Sample	--	--	--	--	--
Size calculation	--	--	--	--	--

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 23

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C04-3	0.579 -	0.318 J	0.318 J	0.318 J	2.21 U
PR-C04-3-D	0.587 -	0.229 J	0.218 J	0.229 J	2.44 J
PR-C04-5	0.518 -	0.303 J	0.305 J	0.303 J	2.21 U
PR-C04-14	0.468 -	0.32 J	0.315 J	0.32 J	2.52 J
PR-C05-1	0.485 -	0.663 J	0.668 J	0.663 J	2.41 U
PR-C05-5	0.831 -	0.725 J	0.715 J	0.725 J	7.54 J
PR-C05-9	0.953 -	0.978 J	0.96 J	0.978 J	6.03 J
PR-C05-9-D	0.88 -	0.746 J	0.765 J	0.746 J	6.12 J
PR-C05-13	0.857 -	0.753 J	0.782 J	0.753 J	14.6 -
PR-C05-14	0.521 -	0.36 J	0.357 J	0.36 J	5.68 J
PR-C06-3	1.03 -	0.877 J	0.849 J	0.877 J	8.81 -
PR-C23-1	0.482 -	0.382 -	0.381 -	0.382 -	2.34 U
PR-C23-5	0.619 -	0.421 -	0.441 -	0.421 -	2.51 U
PR-C23-6	0.509 -	0.333 -	0.352 -	0.333 -	2.35 U
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	1.03	0.978	0.96	0.978	14.6
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	5
% Nondetects	0%	0%	0%	0%	17%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

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

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

#: 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.

Certification Unit 24

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C11-4	0.742 -	0.44 J	0.359 J	0.44 J	3.48 U
PR-C12-13	0.812 -	0.755 -	0.803 -	0.755 -	3.76 J
PR-C14-13	0.896 -	0.719 -	0.705 J	0.719 -	4.07 U
PR-C14-15	0.9 -	0.792 -	0.782 J	0.792 -	5.45 J
PR-C16-14	1.16 J	0.908 -	0.856 -	0.908 -	7.32 -
PR-C16-14-D	1.14 J	0.924 -	0.914 -	0.924 -	6.31 -
PR-C24-1	0.741 -	0.625 -	0.646 -	0.625 -	3.46 J
PR-C24-3	0.698 -	0.526 -	0.517 -	0.526 -	5.48 J
PR-C24-4	0.769 -	0.733 -	0.765 -	0.733 -	3.41 U
PR-C24-5	0.699 -	0.691 -	0.691 -	0.691 -	2.86 U
PR-C24-7	0.898 -	0.732 -	0.697 -	0.732 -	2.64 U
PR-C24-9	0.734 -	0.635 -	0.687 -	0.635 -	2.07 U
PR-C24-10	0.785 -	0.688 -	0.704 -	0.688 -	3.86 J
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	ug/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0 .898	0 .733	0 .765	0 .733	5.48
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	6
% Nondetects	0%	0%	0%	0%	0%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -
a posteriori Sample	- -	- -	- -	- -	- -
Size calculation	- -	- -	- -	- -	- -

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

Certification Unit 25

	Primary COCs				
SampleID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total
PR-C09-2	0.583 -	0.371 -	0.374 -	0.371 -	2.47 U
PR-C09-3	0.646 -	0.304 -	0.296 -	0.304 -	2.6 U
PR-C09-4	0.703 -	0.388 -	0.4 -	0.388 -	2.78 J
PR-C13-16	0.963 J	0.624 -	0.692 -	0.624 -	4.62 J
PR-C15-6	0.676 -	0.438 J	0.5 -	0.438 J	1.62 U
PR-C15-8	0.582 -	0.291 J	0.293 -	0.291 J	2.84 J
PR-C15-8-D	0.594 -	0.224 J	0.215 -	0.224 J	1.48 U
PR-C17-2	0.547 -	0.357 J	0.343 J	0.357 J	1.61 U
PR-C17-4	0.615 -	0.37 J	0.359 J	0.37 J	3.33 J
PR-C17-11	0.568 -	0.285 J	0.287 J	0.285 J	1.62 U
PR-C18-5	0.641 J	0.305 -	0.267 -	0.305 -	2.62 U
PR-C18-5-D	0.868 J	0.369 -	0.386 -	0.369 -	2.65 U
PR-C25-1	0.55 -	0.301 -	0.27 -	0.301 -	1.87 U
PR-C25-3	0.795 -	0.69 -	0.752 -	0.69 -	3.78 -
Limit	1.7	1.8	1.7	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g
Conf. Level	95%	95%	95%	95%	95%
Max. Result	0.963	0.69	0.752	0.69	4.62
Max. >= Limit	No	No	No	No	No
W-statistic Prob. #	0	0	0	0	0
Test Procedure	0	0	0	0	0
Sample Size	12	12	12	12	12
Nondetects	0	0	0	0	7
% Nondetects	0%	0%	0%	0%	50%
Est. Mean*	- -	- -	- -	- -	- -
UCL	- -	- -	- -	- -	- -
Prob. > Limit	- -	- -	- -	- -	- -
Pass / Fail	- -	- -	- -	- -	- -

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

Note: Est. Mean = Estimated measure of central tendency (Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: 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.

ATTACHMENT A.2

CERTIFICATION SAMPLES AND ANALYTICAL RESULTS TABLE FOR VARIANCE 20820-PSP-0004-1

Variance 20820-PSP-0004-1 Data

SampleID	Radium-226
PPDD-CC-1	0.875 -
PPDD-CC-2	1.195 -
PPDD-CC-3	1.058 -
PPDD-CC-4	1.006 -
PPDD-CC-5	0.945 -
PPDD-CC-6	1.058 -
Limit	1.7
Units	pCi/g
Conf. Level	95%
Max. Result	1.195
Max. >= Limit	No
W-statistic Prob. #	0
Test Procedure	0
Sample Size	6
Nondetects	0
% Nondetects	0%
Est. Mean*	- -
UCL	- -
Prob. > Limit	- -
Pass / Fail	- -

a posteriori Sample	- -
Size calculation	- -

APPENDIX B

VARIANCE/FIELD CHANGE NOTICES TO THE CERTIFICATION DESIGN LETTER AND CERTIFICATION PROJECT SPECIFIC PLAN FOR THE STREAM CORRIDORS PADDYS RUN AND PILOT PLANT DRAINAGE DITCH

VARIANCE / FIELD CHANGE NOTICE	Significant? (Yes or No): YES	V/F: 20820-PSP-0004-1
WBS NO.: PROJECT/DOCUMENT/ECDC # 20820-PSP-0004 Rev. A		Page: 1 of 2
PROJECT TITLE: Certification Design Letter and Certification Project Specific Plan For the Stream Corridors Paddys Run and Pilot Plant Drainage Ditch		Date: 8/19/06

VARIANCE / FIELD CHANGE NOTICE (Include justification):

This Variance/Field Change Notice (V/FCN) documents the collection of soil/sediment samples in the Pilot Plant Drainage Ditch to confirm/verify that water released from the retention basin in the south-eastern portion of the Silos and Support Area did not introduce contamination into the previously sampled (for certification) Pilot Plant Drainage Ditch (See Figure 1).

The estimated total number of samples is 6. These samples will be analyzed for radium-226 (TAL B) at this time.

See Attachment 1 for the TAL and the Sampling and Analytical Requirements. The Sample Id and its associated location is listed on Attachment 1, where:

PPDD = Pilot Plant Drainage Ditch Sample
CC = Certification Confirmatory Sample
1, 2, 3, etc. = sequential number
R = Radiological Sample

Field sketch required: No
Surveying Required: Yes, Surveyors will survey these sample points prior to sampling.
Field data validation: Yes

Justification:

It was discovered that water had flowed from a retention basin in the south-eastern portion of the Silos and Support Area of Area 7. Samples are going to be collected to verify/confirm that the water did not introduce contamination into the previously sampled (for certification) Pilot Plant Drainage Ditch. Per Section 6.4 of the PSP, the changes to the PSP will be documented with a V/FCN.

REQUESTED BY: Debbie Brennan Date: 8/19/06

X IF REQD	VARIANCE/FCN APPROVAL	DATE	X IF REQD	VARIANCE/FCN APPROVAL	DATE
X	QUALITY ASSURANCE: R. Friske	9-25-06	X	PROJECT MANAGER: J.D. Chiou	9/19/06
	DATA QUALITY MANAGEMENT		X	CHARACTERIZATION MANAGER: F. Miller	19 Sep 06
X	ANALYTICAL CUSTOMER SUPPORT	9/21/06		RTIMP Manager	
X	WAO		X	SAMPLING MANAGER: T. Bahrlage	9/27/06

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
SAMPLING AND ANALYTICAL REQUIREMENTS

TAL	Method	Matrix	ASL [a]	TAT	Preservative	Container [b]	Minimum Mass/Volume
B	Gamma Spec	Soil	D/E	10-days EDD [c] 14-day Final	None	Plastic or Glass	300 g

Special Instructions (samplers):

[a] Samples will be analyzed according to ASL D requirements but the minimum detection level may cause some analyses to be considered ASL E.

[b] Sample container types may be changed at the direction of the Field Sampling Lead, as long as the volume requirements, container compatibility requirements, and SCQ requirements are met.

[c] One sample per CU may be selected for analysis utilizing a 21-day in-growth with a 30-day TAT. Samples with a 7-day in-growth will be denoted by a "7DAY" suffix while the sample chosen as a 21-day in-growth will be denoted by a "21DAY" suffix attached to the laboratory data.

Special Instructions (SPL/Lab):

No field QC will be collected under this V/FCN.

Analytical Data Validation is required - VSL D/E.

Data Package Requirement – Certificates of Analysis within 10 days and a full ASL D/E data package within 14 days.

Historical Data for shipping: The highest total uranium result for this area is 44.0 mg/kg at boring location RTB-1. The highest radium-226 result in this area is 73.8 pCi/g at boring location A7SSA-C09-11.

TAL 20820-PSP-0004-B

(6 estimated soil analysis specified in V/FCN)

Analyte	On-Property FRL	MDL
Radium-226	1.7 pCi/g	0.3 pCi/g

SAMPLE LOCATIONS AND IDENTIFICATION

Sample ID	Depth	TAL	Northing	Easting
PPDD-CC-1^R	0.0 – 0.5'	B	480123.3	1347257.11
PPDD-CC-2^R	0.0 – 0.5'	B	480091.3	1347323
PPDD-CC-3^R	0.0 – 0.5'	B	480012.89	1347388.55
PPDD-CC-4^R	0.0 – 0.5'	B	479991.91	1347437.28
PPDD-CC-5^R	0.0 – 0.5'	B	479967.19	1347491.19
PPDD-CC-6^R	0.0 – 0.5'	B	479952.11	1347537

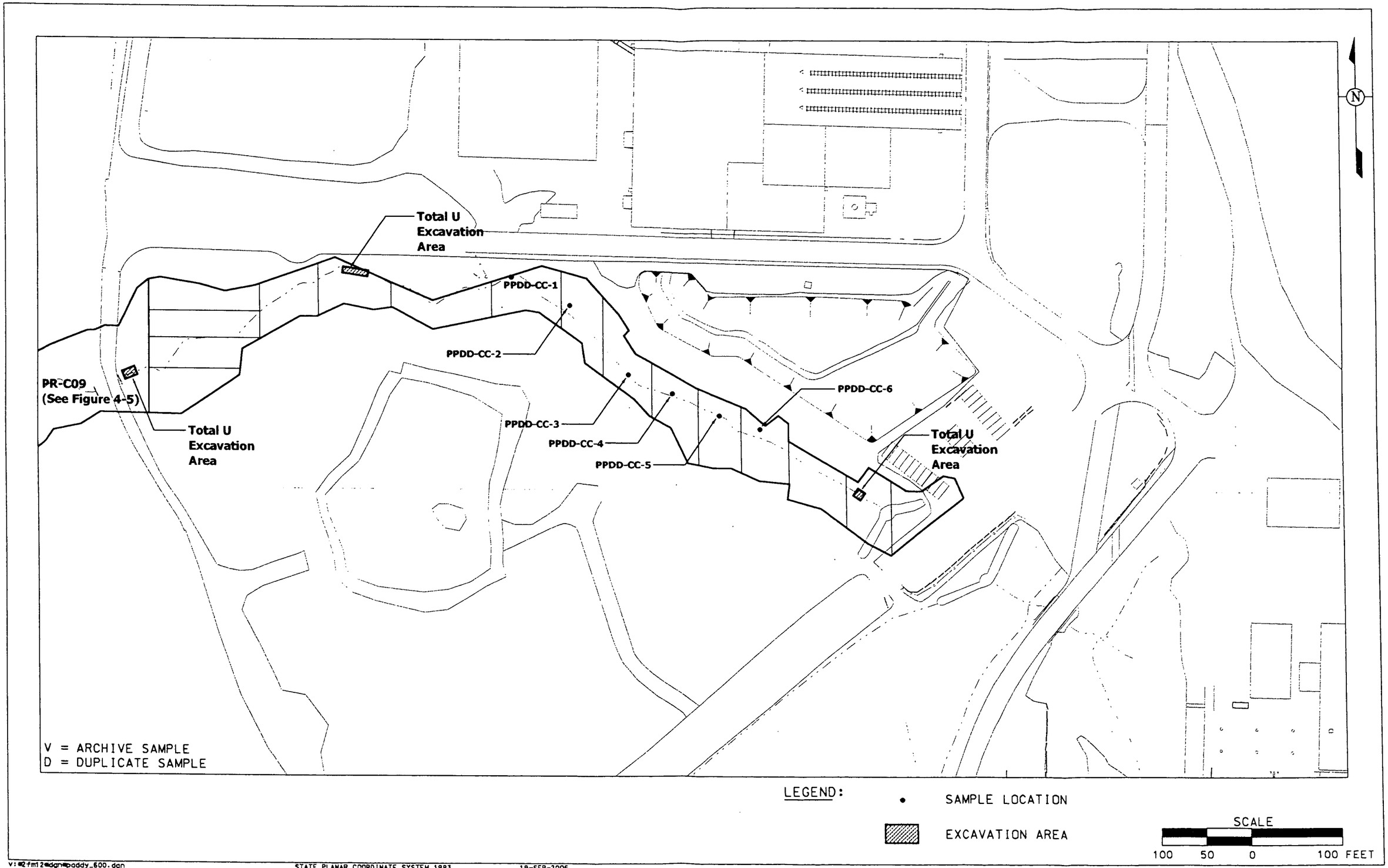

FIGURE 1. ADDITIONAL SAMPLE LOCATIONS MAP FOR THE PILOT PLANT DRAINAGE DITCH