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PROJECT SPECIFIC PLAN FOR THE PILOT PLANT DRAINAGE DITCH SEEPAGE AND SURFACE WATER BACKGROUND INVESTIGATION MAY 1993 DRAFT ADDENDUM TO THE RI/FS WORK PLAN OU5

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ADDENDUM

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PROJECT SPECIFIC PLAN

for the

PILOT PLANT DRAINAGE DITCH SEEPAGE

and

SURFACE WATER BACKGROUND INVESTIGATION

WBS No. 50.03.16

Draft Addendum to the
Remedial Investigation/Feasibility Study
Work Plan

Prepared by

Fernald Environmental Restoration Management Corporation

Prepared for

U.S. Department of Energy
Fernald Field Office

Under Contract DE-AC05-92OR21972

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1.0 INTRODUCTION

This Project Specific Plan (PSP) has been developed as a means to assess current contaminant concentrations in seeps and surface water in a drainage ditch west of the Pilot Plant and to further evaluate water quality at background locations in Paddys Run and the Great Miami River during the Spring of 1993. The data acquired from this program will supplement existing data and will be used in the site characterization, groundwater modeling, and risk assessments for the Remedial Investigation (RI) Report for Operable Unit (OU) 5. This PSP has been developed under the specifications of the Fernald Environmental Management Project (FEMP) Sitewide CERCLA Quality Assurance Project Plan (SCQ), and all field operations and data handling procedures will be consistent with the specifications in the FEMP SCQ.

Under the FEMP Remedial Investigation/Feasibility Study (RI/FS), the drainage ditch west of the Pilot Plant, Paddys Run, and the Great Miami River are CERCLA-RCRA Unit 5 (CRU5) responsibilities. Therefore, this PSP is an addendum to the OU 5 RI/FS Work Plan. The purpose of this PSP is to further define the source of contaminated surface water within the drainage ditch and collect additional surface water background samples.

To meet the data requirements of the proposed PSP, sampling and analyses will be performed for each of the following areas within the OU 5 boundaries:

- Drainage ditch west of the Pilot Plant (surface water and seep samples)
- Upstream within Paddys Run (surface water sample, W-5)
- Great Miami River (surface water sample, W-1)

This PSP also furnishes specific objectives and details for CRU5 activities not provided in the SCQ and provides documentation of exceptions or additions to the SCQ.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS

The following summaries include the relevant data that lead to the development of the sampling programs that are presented in Section 3.0 of this PSP.

2.1 PILOT PLANT DRAINAGE DITCH

Recent glacial overburden characterization work has identified the presence of a relatively extensive sand/silty sand body within the glacial overburden. This appears to be a continuous unit within the area bounded by the K-65 Silos, the Pilot Plant, and Plant 2/3. This sand body is known to contain perched groundwater and outcrops along the strike of the drainage ditch which originates just west of the Pilot Plant and discharges to Paddys Run just south of the K-65 Silos, as shown in Figure 2-1. On February 5, 1993, a "site walk" was conducted along the drainage ditch, resulting in the identification of several seeps along the length of the drainage ditch. The identification of the seeps substantiated the hypothesis that perched water from the sand body underlying the area is draining into the drainage ditch.

In addition to the seeps, the following are also sources of water to the Pilot Plant drainage ditch:

- Surface water runoff from the upper reach of the drainage ditch west of the Pilot Plant.
- Surface water drainage from areas east of the waste pits and around the biodenitrification surge lagoon which enters a drainpipe that discharges into the drainage ditch at PP-DD-02 (Figure 2-1).
- Underground field tiles which drain areas south of the biodenitrification surge lagoon and discharge into the drainage ditch.

Activities associated with the Waste Pit Area Runoff Control Removal Action included installation of the "Surface Water Drainpipe" and reworking of the Pilot Plant drainage ditch. These activities may have covered and/or damaged the drain tiles which have been in place since before the FEMP was constructed. Therefore, the seeps may be directly from the identified sand body and/or the field tiles which drain the sand.

Analytical results from drainage ditch surface water samples collected by FEMP Environmental Monitoring (EM), NPDES, and RI/FS programs indicate total uranium values which range from 6.0 to 2,730 micrograms per liter (μg/L). All of these surface water samples were collected at the lower reach of the drainage ditch and are shown in Figure 2-1 as the following:

- W10-DD - the Environmental Monitoring surface water sample location.

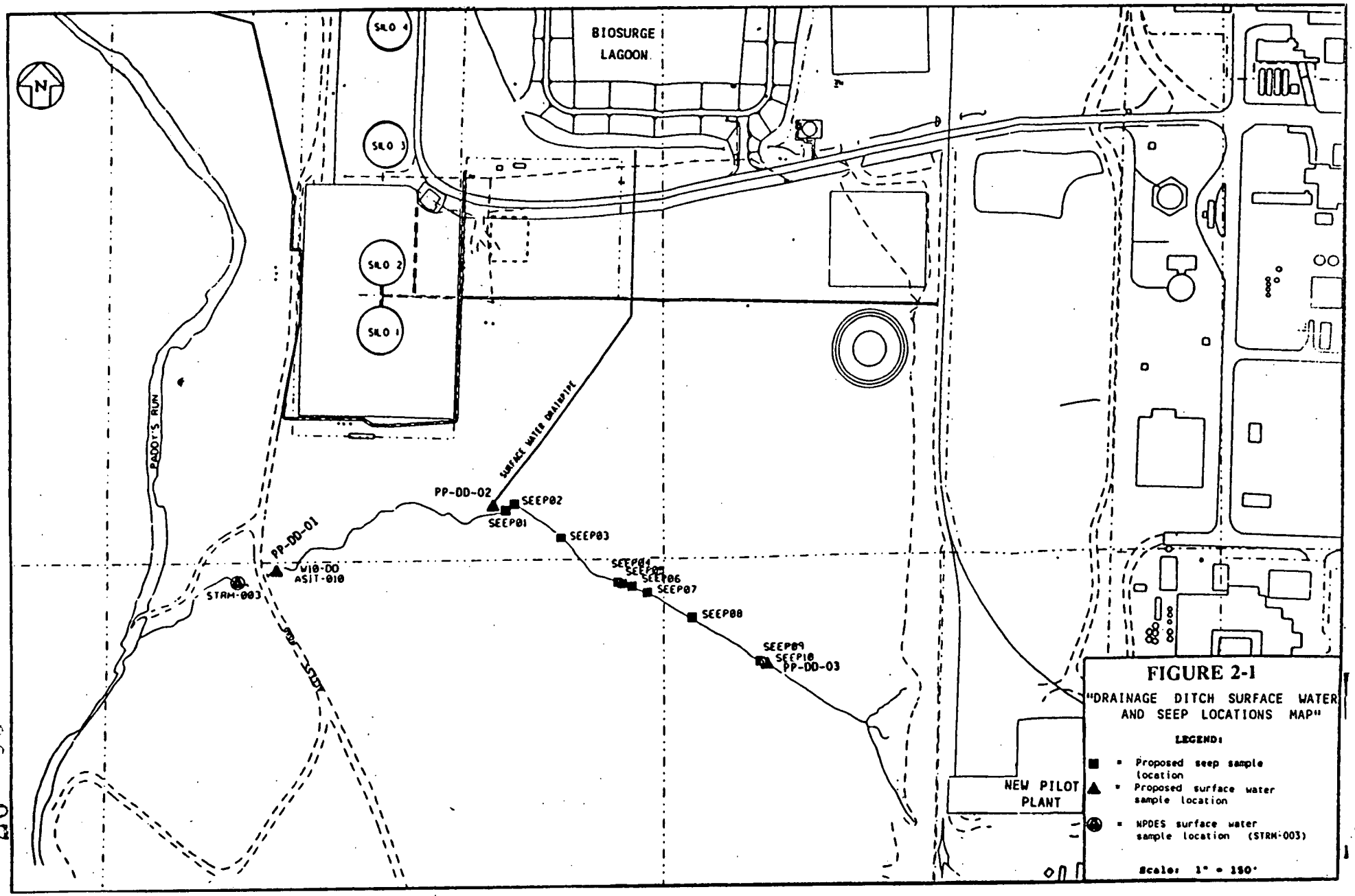

FIGURE 2-1
"DRAINAGE DITCH SURFACE WATER AND SEEP LOCATIONS MAP"

- STRM-003 - the surface water sampling location for the NPDES permit.
- ASIT-010 - the RI/FS surface water and soil sample location.

Location numbers W10-DD and ASIT-010 represent the same sample location for the two separate programs.

The first surface water sample from the drainage ditch was collected by the original site operator in August 1961. The results of the study revealed that total uranium concentrations in drainage ditch surface water were consistently high. In addition, it was determined that surface water runoff from the Pilot Plant drained directly into the ditch. As a result, the pipe which drained Pilot Plant surface water runoff into the ditch was plugged, and a sump was installed in order to pump the runoff water from the Pilot Plant to the general sump.

Data collected by Environmental Monitoring (Table 2-1) at location W10-DD (Figure 2-1), consist of weekly samples from January 1, 1991 through December 4, 1992. There are no data for the time period of June 12, 1991 through November 27, 1991, because samples could not be collected due to construction of the culvert which crosses the drainage ditch, and due to periods of little precipitation when there was no runoff in the drainage ditch.

Table 2-2 lists the results from surface water sampling at location ASIT-010 also shown in Figure 2-1 conducted on June 28, 1988 and March 10, 1989 for the RI/FS program. Table 2-3 lists results of the two samples collected in support of the NPDES permit from the surface water in the ditch November 24, 1991 and March 10, 1992 at location STRM-003, shown in Figure 2-1. The data in Tables 2-1 through 2-3 indicate that the total uranium concentrations from water collected from the drainage ditch fluctuate over a wide range.

2.2 PADDYS RUN

Surface water sampling of the background location W-5 in Paddys Run has been conducted by the FEMP RI/FS and Environmental Monitoring program (Figure 2-2). The Environmental Monitoring (EM) program has collected monthly samples at the W-5 location for total uranium analysis and a few other general chemical parameters. RI/FS analysis have not been performed on samples from location W-5.

TABLE 2-1
ENVIRONMENTAL MONITORING DRAINAGE DITCH SURFACE WATER
TOTAL U in μg/L LOCATION W-10-DD

DATE SAMPLED	RESULT	DATE SAMPLED	RESULT	DATE SAMPLED	RESULT
01-02-91	430	07-10-91	450	05-20-92	36
01-09-01	360	09-04-91	1070	05-27-92	0.6
01-16-91	410	12-04-92	430	06-03-92	1700
01-23-91	650	01-01-92	590	06-10-92	560
01-30-91	130	01-08-92	540	06-17-92	1300
02-06-91	89	01-15-92	3.4	06-24-92	1280
02-20-91	280	01-29-92	760	07-15-92	150
02-20-91	640	02-05-92	860	07-22-92	690
02-27-91	560	02-12-92	860	07-29-92	640
03-06-91	66	02-19-92	380	08-05-92	510
03-13-91	360	02-26-92	630	08-12-92	960
03-20-91	220	03-04-92	2730	08-26-92	730
03-27-91	470	03-11-92	22.7	09-02-92	1100
04-03-91	350	03-18-92	648	09-09-92	1500
04-17-91	360	03-25-92	530	09-16-92	1800
04-24-91	520	04-01-92	2.3	09-23-92	680
05-01-91	770	04-08-92	2.9	09-30-92	1400
05-08-91	840	04-15-92	580	10-07-22	1560
05-15-91	170	04-22-92	310	10-21-92	630
05-22-91	1050	04-29-92	870	11-04-92	530
05-29-91	1140	05-06-92	100	11-11-92	800
06-05-91	630	05-13-92	200		

μg/L = micrograms per liter

TABLE 2-2
RI/FS DRAINAGE DITCH SURFACE WATER DATA FOR LOCATION ASIT-010

DATE SAMPLE COLLECTED	PARAMETER	RESULTS Filtered	RESULTS Unfiltered	UNITS
06-28-88	TOTAL-U	2199	2219	μg/L
06-28-88	GROSS ALPHA	908	678	pCi/L
06-28-88	GROSS BETA	430	242	pCi/L
06-28-88	RA-226	1	1	pCi/L
06-28-88	RA-228	4.1	3	pCi/L
03-10-89	TOTAL-U	282	231	μg/L
03-10-89	GROSS ALPHA	190	232	pCi/L
03-10-89	GROSS BETA	62	67	pCi/L
03-10-89	RA-226	1	1	pCi/L
03-10-89	RA-228	3	3	pCi/L

μg/L = micrograms per liter
pCi/L = picocuries per liter

TABLE 2-3
NPDES DRAINAGE DITCH SURFACE WATER DATA
FOR LOCATION STRM-003

PARAMETER	10-24-91 RESULTS	03-10-92 RESULTS	UNITS
OIL AND GREASE	< 5.0	< 5.0	MG/L
BOD	2.92	0.48	MG/L
COD	43	0	MG/L
TSS	156	13	MG/L
TKN	0.86	1.87	MG/L
NITRATE = NITRITE -N	< 1	< 1	MG/L
TOTAL PHOSPHORUS	1.3	0.39	MG/L
pH	7.4	8.2	S.U.
AMMONIA-N	AE	0.13	MG/L
NINTRATE-N	< 1.0	< 1.0	MG/L
CYANIDE	< 0.005	< 0.005	MG/L
FLUORIDE	AE	0.46	MG/L
CHROMIUM	0.0138	0.0026	MG/L
CHROMIUM + 6	< 0.006	< 0.006	MG/L
COPPER	< 0.02	< 0.02	MG/L
LEAD	< 0.003	< 0.003	MG/L
NICKEL	< 0.01	< 0.01	MG/L
SILVER	< 0.001	< 0.001	MG/L
CADMIUM	< 0.001	< 0.001	MG/L
MOLYBDENUM	< 0.01	< 0.01	MG/L
ARSENIC, HYDRIDE	< 0.005	< 0.005	MG/L
SULFATES	950	85	MG/L
BORON	< .10	0.23	MG/L
IRON	3.66	0.33	MG/L
SELENIUM, HYDRIDE	< 0.005	< 0.005	MG/L
BARIUM	< 0.20	< 0.5	MG/L
MERCURY	< 0.0002	< 0.0002	MG/L
COLOR	50	20	C.U.
FECAL COLIFORM	AE	1060	#/100ml
SURFACTANTS	AE	AE	MG/L
ALUMINUM	2.81	< 0.2	MG/L
MAGNESIUM	22.9	32.2	MG/L
MAGANESE	NR	0.189	MG/L
TITANIUM	< 1.0	< 1.0	MG/L
URANIUM	1.040	0.67	MG/L
ZINC	0.029	0.028	MG/L
TOTAL ALPHA	0.45	0.26	pCi/ML
TOTAL BETA	0.1	< 0.31	pCi/ML

MG/L - milligrams per liter
S.U. = standard units
C.U. = color
#/100 ml = number of organisms per 100 milliliters of sample
pCi/ML - picocuries per milliliter
AE = data not valid
NR - not requested

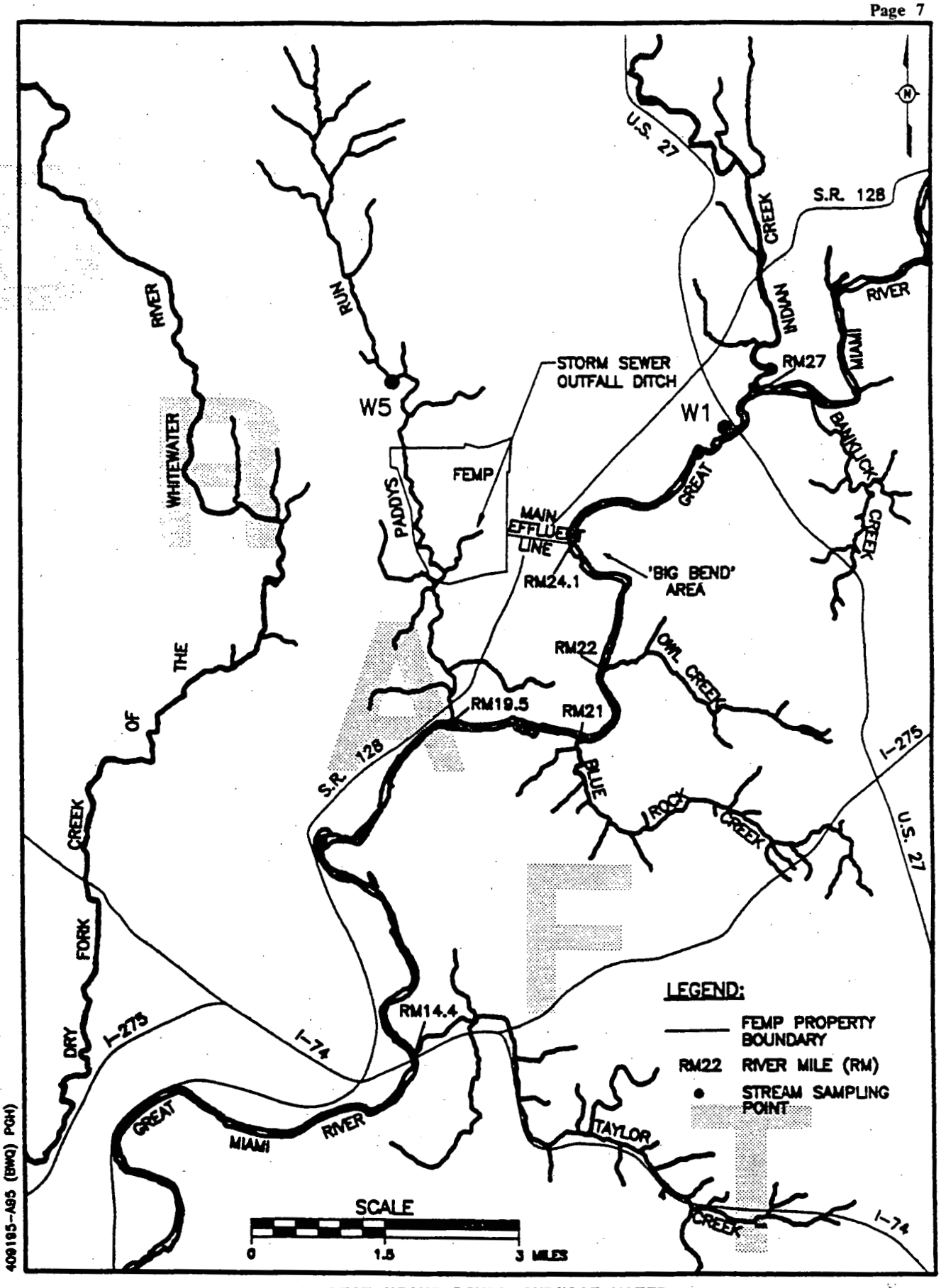

FIGURE 2-2 PADDYS RUN/GREAT MIAMI RIVER SURFACE WATER SAMPLE LOCATIONS

The OU 5 RI report requires more extensive and validated data for surface water quality at this location; therefore, W-5 will be sampled for parameters specified in Section 3.2.

2.3 GREAT MIAMI RIVER

Surface water sampling of the Great Miami River at the location W-1 (Figure 2-2) has been conducted by the FEMP RI/FS and Environmental Monitoring programs. As part of the RI/FS program, surface water samples were collected during 1988 and 1989 and were analyzed for full radionuclides, metals, and other general water chemistry parameters. The Environmental Monitoring program collected monthly samples at the W-1 location for total uranium analysis and other radionuclides. However, the OU 5 RI report and risk assessment require more recent and validated data for surface water quality at this location.

3.0 OBJECTIVES OF THE INVESTIGATION

This PSP addresses the need for surface water sampling in three areas. Samples will be collected from the Pilot Plant Drainage Ditch to determine the quality of water within the ditch and determine the volume and quality of water entering the ditch from seeps and a drainpipe. Flow measurements will also be made in the ditch to determine the volume of water entering through the seeps and drain pipe. Combined, this data will give a loading of contaminants to Paddys Run from the Pilot Plant Drainage Ditch.

Background water quality samples will be collected under SCQ procedures for Paddys Run and the Great Miami River. These samples are intended to provide validated data to support establishing the background water quality of these two surface streams. The validated data will be compared to historic data collected under a variety of programs to evaluate the usefulness of the historic data in establishing background.

3.1 PILOT PLANT DRAINAGE DITCH OBJECTIVES

Three surface water samples and up to ten seep samples will be collected along the drainage ditch, as shown previously in Figure 2-1. After the drainage ditch surface water sampling is completed, the flow rate of the surface water in the ditch will be measured by installing a weir at the PP-DD-01 and PP-DD-03 locations. The weir measurements will be used to estimate the rate of discharge to the ditch from the

seeps. The discharge from the drainpipe will be measured at the same time as the weir readings are made.

Total uranium analysis from the seep samples will be used to evaluate the possible sources of uranium contamination to the drainage ditch and select seeps for more extensive analyses. Seeps where the total uranium value exceeds 20 μg/L will be re-sampled for the radiological, HSL, and general chemistry analyses listed in TAL 50.03.16A in Appendix A. It is possible that only some of the original seeps can be included in the re-sampling because some seeps may not yield enough water for the expanded set of analyses. Both filtered (0.45 micron) and non-filtered samples will be submitted for HSL inorganic and radionuclide analyses. The SCQ procedures for sampling will be used with the addition of project specific procedures explained in Section 3.1.2.

3.1.1 Drainage Ditch Surface Water Sampling Procedure

In order to minimize the impact of turbidity in the drainage ditch, surface water samples will be collected before the seeps are sampled. For the same reason, surface water samples will be collected from the lower reach of the drainage ditch at location PP-DD-01, then from the "surface water drainpipe" at location PP-DD-02 and last from upstream location PP-DD-03, as shown in Figure 2-1. The surface water samples will be analyzed for HSL inorganics, volatile and semivolatile organics, general chemistry, total and isotopic uranium and thorium, and radium 226/228. The target analyte list for these samples is TAL 50.03.16A and is included in Appendix A. A portion of each sample will be submitted to the FERMCO laboratory for total uranium analysis.

3.1.2 Drainage Ditch Seep Sampling Procedure

On February 5, 1993, a "site walk" was conducted along the drainage ditch. Ten seeps were identified along the length of the drainage ditch and the seep locations were surveyed to State Planar Coordinates. Markers were placed at each of the seep locations which are shown on Figure 2-1.

The number of seeps that are "flowing" at the time the sampling occurs will be the number of seeps that are actually sampled. It is possible that some seeps will have insufficient flow and the actual number of seeps that are sampled may be less than the ten seep locations shown in Figure 2-1. The seep samples will be analyzed for total uranium at the on-site laboratory.

There is not a specific procedure within the SCQ for seep sampling; therefore, the description below outlines the project specific method that will be used:

- Remove the upper 1 to 2 inches of vegetation and/or topsoil with a shovel at the seep location prior to sampling.
- Using a shovel, cut a "vertical slice" into the edge of the slope where the groundwater is seeping out.
- Place a stainless steel container against the vertical face of the seep.
- Drape plastic sheets over the top of the stainless steel containers and secure so that airborne particulates and/or precipitation will not affect sample integrity during the sampling event.
- Collect the seep water until the seep water becomes free of visible turbidity.
- Empty the turbid seep water from the stainless steel containers into an approved disposal container.
- Place the stainless steel container against the seep again to collect a representative sample.
- Pour the seepage water from the stainless steel container into the sample containers.
- Both filtered and non-filtered samples will be collected for total uranium analysis.
- A 0.45 micron filter will be used for sample filtration.

The time required to collect the seep samples will depend upon the seepage rate of each individual seep. However, sampling is expected to be completed at each sample location within six hours of the time the stainless steel container is installed to collect the sample. The field crew will periodically check the sample containers to determine when enough water has been collected from the seeps.

3.1.3 Drainage Ditch Surface Water Flow Measurement

After the drainage ditch surface water samples are collected, the flow rate of the drainage ditch water will be measured at locations PP-DD-01 and PP-DD-03 shown in Figure 2-1. Flow rate will be measured once per day for a period of three days. The purposes for measuring the flow rate are to estimate the amount of seepage contribution to the drainage ditch and to aid in evaluation of the drainage ditch surface water quality and to determine the contaminant loading to Paddys Run from the ditch.

The following steps will be followed to measure the flow rate of the drainage ditch water:

- Construct two weirs as shown in Figure 3-1.
- Install the weirs in the vicinity of PP-DD-01 and PP-DD-03.
- Install weirs at a point where the drainage ditch surface water channel is less than three feet wide and where flow is relatively laminar.
- Each weir shall be installed perpendicular to the surface water flow direction within the drainage ditch.
- Use four or five sand bags to secure the weir.
- Measure the head (H, in feet) of the surface water above the spillway once a day for three days.
- Calculate the surface water flow (Q) by using the following equation:

$$Q = 3.33(L - 0.2H)H^{3/2}$$

  where
  Q is the discharge (cubic feet per second)
  L is the width of the spillway (feet)
  H is the height of water flowing over the weir spillway (feet)

- Remove weirs after measurements are completed.

The equation above will give an "instantaneous" approximate measurement of flow rate at the time the weir was measured. Also, the discharge from the "surface water drainpipe" will be measured at the same times as the weirs by collecting the flow of water from the drainpipe, timing how long it takes to fill a known volume, and converting that value to gallons per minute.

3.2 PADDYS RUN SURFACE WATER SAMPLING

A surface water sample will be collected at Location W-5 (Figure 2-2) for HSL inorganics, volatile and semivolatile organics, pesticides, PCBs, full radiological and general chemistry. The specific analyses are listed in TAL 50.03.16C in Appendix A. The HSL inorganic and the radiological analyses will be performed on both filtered and non-filtered samples. The Paddys Run surface water sample will be collected in accordance with the methods described in the SCQ, Section 7.1.1, and Table 7-1 of this PSP.

EQUIPMENT NEEDED:

Carpenter square
Shovel
Level
Two 15" x 36" x 3/4" pine boards
15 to 20 sand bags
Saw

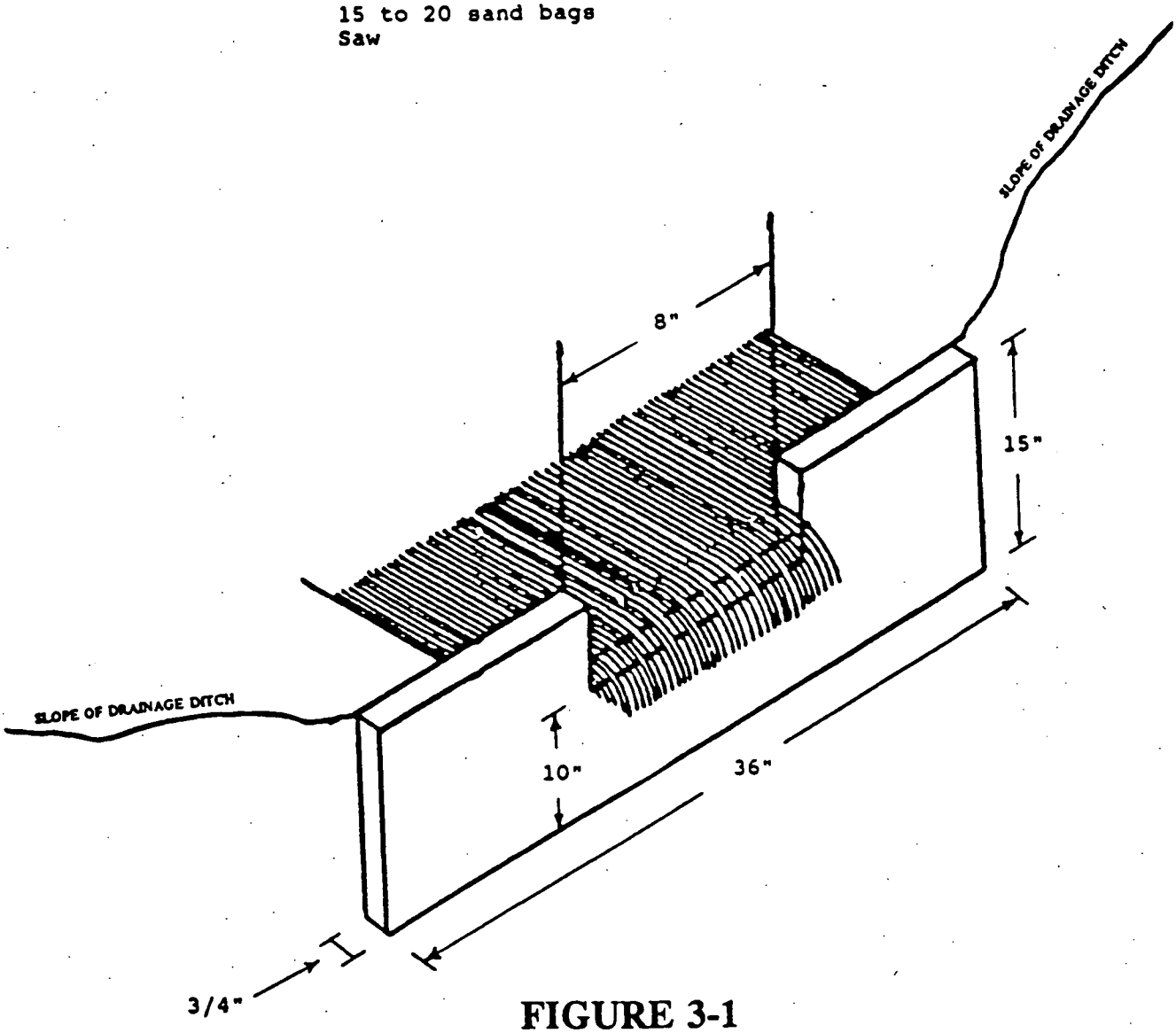

FIGURE 3-1

Diagram of Weir Construction Details

3.3 GREAT MIAMI RIVER SURFACE WATER SAMPLING

A surface water sample will be collected from the Great Miami River at upstream location W-1 (Figure 2-2. The sample will be analyzed for HSL inorganics, volatile and semivolatile organics, pesticides, PCBs, and general chemistry. The specific analyses are listed in TAL 50.03.16D in Appendix A. The HSL inorganic analyses will be conducted on both non-filtered and samples filtered through a 0.45 micron filter. This surface water sample will be collected in accordance with the methods described in the SCQ, Section 7.1.1 and Table 7-1 of this PSP.

3.4 PLAN OBJECTIVES SUMMARY

Data collected from this PSP are intended to satisfy the following objectives:

- Further define the source of contamination in the Pilot Plant drainage ditch.
- Determine the seepage contribution to the Pilot Plant Drainage Ditch and its effect on surface water quality within the drainage ditch.
- Establish background surface water quality within Paddys Run at location W-5.
- Establish background surface water quality within the Great Miami River by sampling at location W-1.

These data will be used in the RI report for OU 5, the risk assessment, and for the remedial alternative development.

Tables 3-1, 3-2, and 3-3 summarize the objectives for each of the activities contained in this PSP. The total uranium analyses that will be conducted at the FERMCO Laboratory will be for ASL B. All other analyses will be at ASL C as defined in the SCQ. An ASL D data package will be requested for ten percent of the ASL C samples collected under this PSP. Table 3-4 is a summary of the sampling by area.

4.0 ORGANIZATION AND RESPONSIBILITIES

This PSP has been developed by the CRU5 RI/FS Project's Manager to fulfill data needs for the FEMP Site Characterization to be reported in the OU 5 RI. The CRU5 RI/FS Project Manager has full responsibility and authority for the content and specifications in this PSP. Any changes to the activities specified in this PSP must have the approval of the CRU5 RI/FS Project Manager prior to

TABLE 3-1
PSP SUMMARY OBJECTIVES FOR
PILOT PLANT DRAINAGE DITCH SAMPLING

Activity	Collect up to 10 seep water samples; analyze for total uranium at the FERMCO laboratory. Collect two surface and one drainpipe water quality samples and analyze TAL 50.03.16A in Appendix A. Install weirs and measure flow rate of the drainage ditch at PP-DD-03, PP-DD-01, and the drainpipe (Figure 2-1). Both 0.45 micron filtered and non-filtered samples will be collected and analyzed for HSL inorganic, radionuclide and total uranium. If total uranium concentration at a seep exceeds 20 μg/l, re-sample for TAL 50.03.16A
Objectives	Determine the levels of contamination in the surface water and seeps. Quantify surface water flow in the drainage ditch and estimate seepage rate.
Prioritized data uses	Determine the level of contamination and flow from seeps and surface water. Use this data in the OU 5 RI report, risk assessment, and the selection of a remedial alternative.
Appropriate analytical level	Total uranium: ASL B; HSL inorganics, volatiles, semivolatiles: ASL C; Radionuclides: ASL C; general chemistry: ASL B; ten percent of ASL C analyses will require an ASL D report. Drainage ditch flow rate data: ASL A
Constituents of concern	HSL inorganics, volatiles, semivolatiles, radionuclides, and general chemistry, (TAL 50.03.16A), and total uranium (TAL 50.03.16B) in Appendix A.
Required detection limits	As specified in the SCQ, drinking water standards, MCLs, and preliminary remediation goals for radionuclides.
Critical Samples	All of the samples will be critical in further defining the source of contamination to the drainage ditch. At least seven of the ten seeps must be sampled for total uranium to determine the extent of contamination.

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TABLE 3-2
PSP SUMMARY OBJECTIVES FOR
PADDYS RUN SURFACE WATER SAMPLING

Activity	Collect one surface water sample from Paddys Run and analyze for TAL 50.03.16C in Appendix A. Collect both filtered (0.45 micron) and non-filtered samples for HSL metals and radionuclide analyses.
Objectives	Determine background values for Paddys Run surface water quality.
Prioritized data uses	Background surface water data from Paddys Run for the OU 5 RI report and risk assessment.
Appropriate analytical level	HSL inorganics, volatiles, semivolatiles: ASL C; Radionuclides: ASL C; general chemistry: ASL B; Filtered HSL inorganics: ASL C. An ASL D data report is required for all the ASL C analyses.
Constituents of concern	HSL inorganics, volatiles, semivolatiles, pesticides/PCBs, radionuclides, and general chemistry as noted in TAL 50.03.16C in Appendix A.
Required detection limits	As specified in the SCQ, drinking water standards, MCLs, and preliminary remediation goals for radionuclides.
Critical Samples	The sample collected at location W-5 is critical for establishing background water quality for the OU 5 RI report and risk assessment.

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TABLE 3-3
PSP SUMMARY OBJECTIVES FOR
THE GREAT MIAMI RIVER SURFACE WATER SAMPLING

Activity	Collect one surface water sample from the Great Miami River and analyze for TAL 50.03.16D in Appendix A. Perform HSL metals analyses on both filtered (0.45 micron) and non-filtered surface water samples.
Objectives	Determine background values for Great Miami River water quality.
Prioritized data uses	Background surface water data from the Great Miami River for the RI report and risk assessment.
Appropriate analytical level	HSL inorganics, volatiles, semivolatiles, pesticides/PCBs: ASL C; radionuclides: ASL C; general chemistry: ASL B. Filtered HSL inorganics and Radionuclides ASL C. An ASL D data report is required for all the ASL C analyses.
Constituents of concern	HSL inorganics, volatiles, semivolatiles, pesticides/PCBs, and general chemistry, TAL 50.03.16D in Appendix A.
Required detection limits	As specified in the SCQ, drinking water standards, MCLs, and preliminary remediation goals for radionuclides.
Critical Samples	The sample collected at location W-1 is critical for establishing background water quality for the OU 5 RI report and risk assessment.

TABLE 3-4
SUMMARY LIST OF SAMPLES BY AREA

Sample Type		Pilot Plant Drainage Ditch	Paddys Run (W-5)[c]	Great Miami River (W-1)[d]	Total
Groundwater Seeps	Filtered	10[b]			10
	Unfiltered	10[b]			10
Surface Water[e]	Filtered	6[a]	1	1	8
	Unfiltered	6[a]	1	1	8
Duplicate Water	Filtered	1[a]	1	1	3
	Unfiltered	1[a]	1	1	3
Field Blanks		1	1	1	3
Rinsates		1[a]			1
Trip Blanks		1	1	1	3
		37	6	6	49

[a] TAL 50.03.16A in Appendix A
[b] TAL 50.03.16B in Appendix A
[c] TAL 50.03.16C in Appendix A
[d] TAL 50.03.16D in Appendix A
[e] Also includes Seeps with > 20 μg/L total uranium

implementation. It is the responsibility of the CRU5 RI/FS Project Manager to secure any off-property access permits required for the completion of this PSP.

4.1 FIELD ACTIVITIES

Field activities are to be conducted by the FEMP Site Characterization/Data Management (SC/DM) staff using SCQ approved work procedures. Groundwater sampling will be conducted using the procedures covered in Section 6 and Appendix K of the SCQ. In addition, the Site Characterization group will assign unique sample numbers for all samples collected and be responsible for sample handling, preservation. Shipment to and notification of the laboratories will be the responsibility of the FEMP Sample Management Office. At the completion of field activities associated with this PSP, a task completion report will be prepared and submitted to the CRU5 RI/FS Project Manager. The report will include copies of all field forms, data sheets, and activity logs, as well as a written summary of the field

4.2 HEALTH AND SAFETY

The FERMCO Health and Safety Department will be responsible for the development, implementation, and monitoring of a site-specific health and safety plan for each of the field work sites. This plan will include specific programs for radiological and non-radiological monitoring and controls as specified by the SCQ and presented in Section 5 of this PSP.

4.3 QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)

The FERMCO QA department will assure the contents of this PSP conform to the requirements of the SCQ. The FERMCO QC department will monitor field activities to assure that all work conducted in the execution of this PSP conforms to the appropriate standards specified in the SCQ.

5.0 HEALTH AND SAFETY CONSIDERATIONS

Effective health and safety programs for any activity are based on an effective training program. All involved personnel will receive adequate training prior to implementation of the field work for this PSP. This training will make employees aware of all physical, radiological, and chemical hazards which may be encountered during this project.

All FEMP employees and subcontractor personnel who will be performing field work during this project are required to have completed all Occupational Safety and Health Administration (OSHA)-mandated 1910.120 Hazardous Waste Site Worker training. In addition, personnel must complete all applicable annual refresher training.

The Department of Energy (DOE) regulations at the FEMP require a series of site-specific training courses. These courses are designed to augment OSHA-required training and provide additional training specific to the hazards which exist at the FEMP. Field personnel participating in the performance of this project will be trained to the SCQ. In summary, employee awareness and clearly delineated lines of authority and responsibility have been designed to provide for effective health and safety related knowledge specific to each activity.

5.1 TASK SPECIFIC PLANS

All aspects of this PSP will be performed in accordance with all existing applicable DOE, the United States Environmental Protection Agency (U.S. EPA), OSHA, and the State of Ohio Health and Safety Regulations. Additionally, all activities will be managed in accordance with commonly accepted practices used in the hazardous waste industry.

Each field activity has a separate task-specific health and safety plan, which has been prepared in accordance with the FEMP Site Health and Safety Plan. For each project task and sub-task, a health and safety technician will monitor the field crew's activities. Project-specific health and safety plans provide for the hazards typically encountered by personnel when performing the specified field work. The plans specify proper equipment for health and safety monitoring and personnel protection, as well as criteria for selecting monitoring equipment and protective clothing. Each member of a field crew is required to participate in a health and safety training session specific to each field project before beginning the field work.

5.2 RADIOLOGICAL MONITORING AND CONTROLS

Radiological monitoring for this work plan will be achieved using existing institutional controls commonly utilized at the FEMP. For those areas of the FEMP which are under existing institutional radiological controls, any employee who will be entering such areas is required to possess and wear a thermal luminescent detector (TLD) to monitor for exposure to radiological contamination. In addition, each employee is required to participate in a regularly-scheduled urine analysis program which is designed to monitor for radiological exposure.

For areas which are subject to more restrictive radiological controls where the potential for exposure is greater, Radiation Worker Permits are necessary and will be obtained prior to the field work being performed in those areas. A radiological technician will be assigned to each field crew performing any activities in an area which could be expected to result in site workers being exposed to levels of radiological contamination exceeding DOE limits.

Ingress and egress of personnel, equipment and vehicles to and from radiologically-controlled areas will be monitored with "real time" radiation detection instruments. Monitoring results which exceed FEMP-

determined exposure guidelines will be further evaluated as to the possible source(s). Measures necessary to mitigate observed radiological contamination will be implemented. Such measures may include, but are not limited to, personnel training, decontamination, employee exposure monitoring, increased personnel monitoring, personnel protective equipment, and sampling of suspect materials encountered.

If the responsible radiological technician assigned to the field activities being performed identifies a real or potential condition which could or will result in an unsafe condition, then that person has the responsibility to cease field operations until the unsafe condition has been corrected.

5.3 NON-RADIOLOGICAL MONITORING AND CONTROLS

Monitoring of potential health and safety problems associated with non-radiological hazards is performed by a health and safety technician. Also, all field crews are responsible for hazard awareness and recognition. Task specific training is designed to enhance the performance of all field work using safe work practices.

Evaluating the potential for personnel exposure to organic contaminants will be achieved mainly through the use of an HNu P-101 Photoionization Detector or equivalent. Other equipment which could potentially be used include Draeger Tubes, oxygen meters, and combustible gas indicators.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

The primary objectives of the quality assurance (QA) and quality control (QC) sections of this plan relate to the collection of field information and data which are sufficient to accurately assess current contaminant concentrations in surface water and seeps. The objectives of this field sampling effort will be designed, organized and implemented in a manner which will optimize the collection of information which meets predetermined data quality objectives. To ensure that information is gathered in such a manner that data quality objectives are met, quality control measures will be used to determine conformance with overall CRU5 RI/FS program objectives.

6.1 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

Field quality control samples will be taken to evaluate the possibility that some controllable practice, such as decontamination or sampling technique, may be responsible for introducing bias in project analytical

results. The following types of QC samples will be collected: sampling equipment rinsates, field blanks, trip blanks, and duplicate samples as outlined in Section 6 and Appendix K of the SCQ.

6.2 TRAINING, RECORDS ADMINISTRATION, AND DOCUMENT CONTROL

All FEMP employees and subcontractors assigned to this project will be required to participate in a series of regularly-scheduled training sessions which are designed to enhance employee awareness of his or her responsibilities and duties in the project. Field staff will receive comprehensive project and task specific training. Daily project "Tailgate Safety Meetings" will be conducted before the beginning of field work each day to augment health and safety training .

7.0 GENERAL FIELD ACTIVITIES AND PROCEDURES

This section presents a generalized description of the field activities to be used to provide the additional contaminant nature and extent information necessary for RI/FS purposes. Field activities will consist of various surface water and seep sampling activities. This will be accomplished by the collection of surface water and perched groundwater seep samples along the drainage ditch and surface water samples within Paddys Run and the Great Miami River. The information derived from the field investigation should provide sufficient information to further define the relationship between contamination sources and the receiving water, namely the Drainage Ditch and Paddys Run. Surface water sampling will also aid in establishing background water quality for Paddys Run and the Great Miami River.

7.1 SURFACE WATER SAMPLING

Surface water samples will be collected at five locations: three along the drainage ditch west of the Pilot Plant, one at the W-5 location on Paddys Run, and one at the W-1 location on the Great Miami River. Sampling personnel will ensure that access to the sampling locations will not result in the inadvertent introduction of nearby materials into the water to be sampled. If the waters to be sampled are flowing, the sample will be taken from that portion of the water visually identified as containing the greatest amount of flow to allow for representativeness. Additional care will be taken to avoid the introduction of floating organic material such as leaves, twigs, etc. The sample will be taken with no disturbance to the bottom sediments at the sampling location. Downstream samples will be collected before upstream samples.

Actual sampling will be accomplished by the use of a grab container. If necessary, a length of rope will be attached to the grab container. The sample will then be transferred to the sample container. A specific amount of water will be transferred to a separate container for field parameter analysis of temperature, specific conductance, pH, and dissolved oxygen.

The surface water will be placed into the appropriate container, with preservative when required, capped, labeled, and placed into a cooler. Drainage ditch surface water samples will be analyzed for the parameters specified in TAL 50.03.16A (Appendix A). The surface water samples collected from Paddys Run and the Great Miami River will be analyzed for parameters specified in TAL 50.03.16C (Appendix A) and TAL 50.03.16D (Appendix A), respectively.

7.2 DRAINAGE DITCH FLOW RATE MEASUREMENT

After the drainage ditch surface water samples are collected, two weirs will be installed along the drainage ditch at the locations PP-DD-03 and PP-DD-01 as shown in Figure 2-1. In addition, the flow rate of water flowing from the "surface water drainpipe" shown at PP-DD-02 in Figure 2-1 will be calculated by timing how long it takes to fill a container of a known volume. The weirs will be used to measure flow rate of the drainage ditch over a three-day period, after the drainage ditch surface water samples have been collected. The flow rate data obtained will be used to quantify the flow in the ditch and the contribution from seeps and the drain pipe.

7.3 SEEP SAMPLING

Seep sampling field activities are detailed in Section 3.1.2 of this PSP. Actual sampling will be accomplished by the use of a stainless steel collection container. The sample will then be transferred to the sample containers. A specific amount of water will be transferred to a separate container for field parameter analysis of temperature, conductivity, pH, and dissolved oxygen.

Seeps with greater than 20 μg/L of total uranium will be re-sampled for more extensive analysis. These water samples will be placed into the appropriate container, with preservative when required, capped, labeled, and placed into a cooler. Water sample analysis will be for the parameters specified in TAL 50.03.16A (Appendix A).

7.4 FIELD ACTIVITY PROCEDURES

Sampling equipment will be decontaminated per Appendix K of the SCQ prior to performing sampling at the next location. All procedures for sample collection through sample shipment and decontamination will be performed in accordance with directives of the SCQ, except as specifically defined in this PSP.

The SCQ procedures referenced by this PSP are listed in Table 7-1. The field forms used will be those listed in Appendix A of the SCQ.

TABLE 7-1
REFERENCE GUIDELINES

Administrative Procedures	Reference Document
QA/QC	SCQ, Sections 4,5,10 and 11; Appendix A, Table 2-2; Appendix D; Appendix J
Chain of Custody	SCQ Volume I, Section 7.1
Corrective Action	SCQ Volume I, Section 15.2
Daily Logs	SCQ Appendix J, Subsection J.4.1
Variances	SCQ Volume I, Section 15.4.1

Field Procedures	Reference Document
General Surface Water Sampling Techniques	SCQ Appendix K, Subsection K.4.3; Compendium of Superfund Field Operations Methods, Section 10.2.6.2
Field Analytical Methods	SCQ Appendix K, Subsection K.4.1; SCQ Volume I, Subsection 6.2.3
Parameter Specific Sampling Procedures	SCQ Appendix K, Subsection K.4.3.3
Decontamination	SCQ, Appendix K, Subsection K.11
Classification, Transportation, and Shipment of FEMP RI/FS Samples	SCQ, Appendix K.

7.5 WASTE DISPOSITION

The following wastes will be generated during characterization activities:

- Contact wastes
- Equipment decontamination solutions

The following subsections provide the proposed disposition methodology for each type of waste generated.

7.5.1 Contact Wastes

Contact wastes, such as personal protective equipment (PPE) and rags or wipes (paper towels, Chemwipes, etc.), will be placed in plastic bags or 55-gallon drums and transported to the FEMP for appropriate disposition. Contact waste handling and disposition is discussed in the SCQ, Appendix K.

7.5.2 Decontamination Solutions

Equipment decontamination solutions will be transferred to U.S. Department of Transportation (DOT)-approved, bung-type, 55-gallon drums, labeled as "Decontamination Solutions." The drums will be placed on wooden pallets, underlaid by diked Herculite sheeting to prevent contaminant migration resulting from spills or leaks. Upon completion of field activities for each characterization phase, the drummed decontamination solutions will be transported to the FEMP for storage and appropriate disposal.

8.0 FIELD SAMPLING

Sampling for this PSP will be conducted by CRU5 and Site Characterization/Data Management (SC/DM) staff of FERMCO.

8.1 SAMPLE TEAM ORGANIZATION

Due to the nature, objectives, and programmatic requirements of this project, actual sampling locations and analysis parameter selection are designated by FERMCO personnel of CRU5.

8.1.1 Organizational Structure

Field sampling crews will be directly supervised by the SC/DM Field Operations Manager. Each field crew will consist of two sampling technicians. Additional sampling custodial staff will interact with the sampling crews and the FEMP or contract laboratory performing the sampling analysis.

8.1.2 Responsibilities of Team Members

The Field Operations Manager is responsible for the coordination and effective use of all personnel on site and for proper maintenance of the record of all field activities. In addition, the Field Operations Manager is responsible for field quality control including issuance and tracking of measurement and test equipment.

Field sampling personnel are responsible for the collection of the samples in accordance with the approved PSP. All activities associated with the execution of sampling are to be documented on the appropriate Field Activity Daily Logs (FADLs) which are to be completed by the sampling technicians for each location. The field sampling personnel are also responsible for sample labeling, handling, storage, and the completion of sample-required paperwork, such as a Chain of Custody/Request for Analysis (CC/RFA) Form. These must be completed before the samples are submitted to the Sample Management Office. These technicians are also responsible for ensuring that the proper sampling equipment is available and in serviceable condition. Also, proper decontamination of equipment between each sampling point is the responsibility of this staff.

The Sample Management Office staff who interact with the FEMP or contract laboratory are responsible for ensuring that proper sampling containers, preservatives and sampling coolers are available and in serviceable condition. The Sample Management Office staff are also responsible for logging in all collected samples, delivering the samples to the FEMP laboratory, or sending the samples with accompanying paperwork, to the appropriate contract laboratory.

8.1.3 Sampling Schedule

Surface water and sediment sampling must be conducted in April or May in order to assure that there will be water in Paddys Run and its tributaries. Analytical data from all field work must be available for validation by August 1, 1993, in order to meet the deadlines for the OU 5 RI report.

APPENDIX A

TARGET ANALYTE LISTS

PILOT PLANT DRAINAGE DITCH SEEPAGE INVESTIGATION

SURFACE WATER SAMPLES AND SEEPS WITH > 20 ug/L TOTAL URANIUM

TAL 50.03.16 A

FEMP RI/FS - HSL - ANALYTICAL PARAMETERS

	INORGANICS *	Pay Item
1	Aluminum	143 **
2	Antimony	
3	Arsenic	
4	Barium	
5	Beryllium	
6	Cadmium	
7	Calcium	
8	Chromium (Total)	
9	Cobalt	
10	Copper	
11	Cyanide	
12	Iron	
13	Lead	
14	Magnesium	
15	Manganese	
16	Mercury	
17	Molybdenum	
18	Nickel	
19	Potassium	
20	Selenium	
21	Silicon	
22	Silver	
23	Sodium	
24	Thallium	
25	Vanadium	
26	Zinc	

	VOLATILE ORGANICS	
1	1,1-Dichloroethane	47
2	1,1-Dichloroethene	
3	1,1,1-Trichloroethane	
4	1,1,2-Trichloroethane	
5	1,1,2,2-Tetrachloroethane	
6	1,2-Dichloroethane	
7	1,2-Dichloroethene (total)	
8	1,2-Dichloroethylene	
9	1,2-Dichloropropane	
10	2-Butanone	
11	2-Hexanone	
12	4-Methyl-2-pentanone	
13	Acetone	
14	Benzene	
15	Bromodichloromethane	
16	Bromoform	
17	Bromomethane	
18	Carbon disulfide	
19	Carbon tetrachloride	
20	Chlorobenzene	
21	Chloroethane	
22	Chloroform	
23	Chloromethane	
24	cis-1,3-Dichloropropene	
25	Dibromochloromethane	
26	Ethylbenzene	
27	Methylene chloride	
28	Styrene	
29	Tetrachloroetnene	
30	Toluene	
31	Total xylenes	
32	trans-1,3-Dichloropropene	
33	Trichloroethene	
34	Vinyl acetate	
35	Vinyl chloride	

	SEMIVOLATILE ORGANICS	Pay Item
1	1,2-Dichlorobenzene	52
2	1,2,4-Trichlorobenzene	
3	1,3-Dichlorobenzene	
4	1,4-Dichlorobenzene	
5	2-Chloronaphthalene	
6	2-Chlorophenol	
7	2-Methylnaphthalene	
8	2-Methylphenol	
9	2-Nitroaniline	
10	2-Nitrophenol	
11	2,4-Dichlorophenol	
12	2,4-Dimethylphenol	
13	2,4-Dinitrophenol	
14	2,4-Dinitrotoluene	
15	2,4,5-Trichlorophenol	
16	2,4,6-Trichlorophenol	
17	2,6-Dinitrotoluene	
18	3-Nitroaniline	
19	3,3'-Dichlorobenzidine	
20	4-Bromophenyl phenylether	
21	4-Chloro-3-methylphenol	
22	4-Chloroaniline	
23	4-Chlorophenyl-phenyl ether	
24	4-Methylphenol	
25	4-Nitroaniline	
26	4-Nitrophenol	
27	4,6-Dinitro-2-methylphenol	
28	Acenaphthene	
29	Acenaphthylene	
30	Anthracene	
31	Benzoic acid	
32	Benzo(a)anthracene	
33	Benzo(a)pyrene	
34	Benzo(b)fluoranthene	
35	Benzo(g,h,i)perylene	
36	Benzo(k)fluoranthene	
37	Benzyl alcohol	
38	bis(2-Chloroethoxy)methane	
39	bis(2-Chloroethyl)ether	
40	bis(2-Chloroisopropyl) ether	
41	bis(2-Ethylhexyl)phthalate	
42	Butyl benzyl phthalate	
43	Carbazole	
44	Chrysene	
45	Dibenzofuran	
46	Dibenzo(a,h)anthracene	
47	Diethylphthalate	
48	Dimethylphthalate	
49	Di-n-butyl phthalate	
50	Di-n-octyl phthalate	
51	Fluoranthene	
52	Fluorene	
53	Hexachlorobenzene	
54	Hexachlorobutadiene	
55	Hexachlorocyclopentadiene	
56	Hexachloroethane	
57	Indeno(1,2,3-cd)pyrene	
58	Isophorone	
59	Naphthalene	
60	Nitrobenzene	
61	N-Nitroso-di-n-propylamine	
62	N-Nitrosodiphenylamine	
63	Pentachlorophenol	
64	Phenanthrene	
65	Phenol	
66	Pyrene	

FEMP RI/FS - GENERAL GROUNDWATER QUALITY - ANALYTICAL PARAMETERS

	GENERAL CHEMISTRY	Pay Item
1	Ammonia	143 **
2	Chloride	
3	Fluoride	
4	Nitrate	
5	Phenols	
6	Phosphorus (total)	
7	Sulfate	
8	Sulfide	
9	Total Organic Carbon (TOC)	
10	Total Organic Halogens (TOX)	
11	Total Organic Nitrogen (TON)	

	MISC. GENERAL CHEMISTRY	
1	Alkalinity	134

FEMP RI/FS - RADIOLOGICAL - ANALYTICAL PARAMETERS

	RADIOLOGICAL *	
1	Radium 226/228	114
2	Thorium 228	116
3	Thorium 230	
4	Thorium 232	
5	Total Thorium	
6	Total Uranium	120
7	Uranium 234	
8	Uranium 235/236	
9	Uranium 238	

* The HSL Inorganics and Radiological analysis to be performed on both filtered and non-filtered samples.
** Inorganics and general chemistry parameters are combined in one pay item (Pay Item 143).

PILOT PLANT DRAINAGE DITCH SEEPAGE INVESTIGATION

SURFACE WATER AND SEEP SAMPLES

TAL 50.03.16 B

FEMP RI/FS – RADIOLOGICAL – ANALYTICAL PARAMETERS

	RADIOLOGICAL	Pay Item
1	Total Uranium	121

PILOT PLANT DRAINAGE DITCH SEEPAGE INVESTIGATION

PADDY'S RUN SURFACE WATER SAMPLING (W-5)

TAL 50.03.16 C

FEMP RI/FS - FULL HSL - ANALYTICAL PARAMETERS

	INORGANICS*	Pay Item
1	Aluminum	143**
2	Antimony	
3	Arsenic	
4	Barium	
5	Beryllium	
6	Cadmium	
7	Calcium	
8	Chromium (Total)	
9	Cobalt	
10	Copper	
11	Cyanide	
12	Iron	
13	Lead	
14	Magnesium	
15	Manganese	
16	Mercury	
17	Molybdenum	
18	Nickel	
19	Potassium	
20	Selenium	
21	Silicon	
22	Silver	
23	Sodium	
24	Thallium	
25	Vanadium	
26	Zinc	

	VOLATILE ORGANICS	Pay Item
1	1,1-Dichloroethane	47
2	1,1-Dichloroethene	
3	1,1,1-Trichloroethane	
4	1,1,2-Trichloroethane	
5	1,1,2,2-Tetrachloroethane	
6	1,2-Dichloroethane	
7	1,2-Dichloroethene (total)	
8	1,2-Dichloroethylene	
9	1,2-Dichloropropane	
10	2-Butanone	
11	2-Hexanone	
12	4-Methyl-2-pentanone	
13	Acetone	
14	Benzene	
15	Bromodichloromethane	
16	Bromoform	
17	Bromomethane	
18	Carbon disulfide	
19	Carbon tetrachloride	
20	Chlorobenzene	
21	Chloroethane	
22	Chloroform	
23	Chloromethane	
24	cis-1,3-Dichloropropene	
25	Dibromochloromethane	
26	Ethylbenzene	
27	Methylene chloride	
28	Styrene	
29	Tetrachloroethene	
30	Toluene	
31	Total xylenes	
32	trans-1,3-Dichloropropene	
33	Trichloroethene	
34	Vinyl acetate	
35	Vinyl chloride	

	SEMIVOLATILE ORGANICS	Pay Item
1	1,2-Dichlorobenzene	52
2	1,2,4-Trichlorobenzene	
3	1,3-Dichlorobenzene	
4	1,4-Dichlorobenzene	
5	2-Chloronaphthalene	
6	2-Chlorophenol	
7	2-Methylnaphthalene	
8	2-Methylphenol	
9	2-Nitroaniline	
10	2-Nitrophenol	
11	2,4-Dichlorophenol	
12	2,4-Dimethylphenol	
13	2,4-Dinitrophenol	
14	2,4-Dinitrotoluene	
15	2,4,5-Trichlorophenol	
16	2,4,6-Trichlorophenol	
17	2,6-Dinitrotoluene	
18	3-Nitroaniline	
19	3,3'-Dichlorobenzidine	
20	4-Bromophenyl phenylether	
21	4-Chloro-3-methylphenol	
22	4-Chloroaniline	
23	4-Chlorophenyl-phenyl ether	
24	4-Methylphenol	
25	4-Nitroaniline	
26	4-Nitrophenol	
27	4,6-Dinitro-2-methylphenol	
28	Acenaphthene	
29	Acenaphthylene	
30	Anthracene	
31	Benzoic acid	
32	Benzo(a)anthracene	
33	Benzo(a)pyrene	
34	Benzo(b)fluoranthene	
35	Benzo(g,h,i)perylene	
36	Benzo(k)fluoranthene	
37	Benzyl alcohol	
38	bis(2-Chloroethoxy)methane	
39	bis(2-Chloroethyl)ether	
40	bis(2-Chloroisopropyl) ether	
41	bis(2-Ethylhexyl)phthalate	
42	Butyl benzyl phthalate	
43	Carbazole	
44	Chrysene	
45	Dibenzofuran	
46	Dibenzo(a,h)anthracene	
47	Diethylphthalate	
48	Dimethylphthalate	
49	Di-n-butyl phthalate	
50	Di-n-octyl phthalate	
51	Fluoranthene	
52	Fluorene	
53	Hexachlorobenzene	
54	Hexachlorobutadiene	
55	Hexachlorocyclopentadiene	
56	Hexachloroethane	
57	Indeno(1,2,3-cd)pyrene	
58	Isophorone	
59	Naphthalene	
60	Nitrobenzene	
61	N-Nitroso-di-n-propylamine	
62	N-Nitrosodiphenylamine	
63	Pentachlorophenol	
64	Phenanthrene	
65	Phenol	
66	Pyrene	

	PESTICIDES / PCBs	Pay Item
1	4,4'-DDD	49
2	4,4'-DDE	
3	4,4'-DDT	
4	Aldrin	
5	alpha-BHC	
6	alpha-Chlordane	
7	Aroclor 1016	
8	Aroclor 1221	
9	Aroclor 1232	
10	Aroclor 1242	
11	Aroclor 1248	
12	Aroclor 1254	
13	Aroclor 1260	
14	beta-BHC	
15	delta-BHC	
16	Dieldrin	
17	Endosulfan sulfate	
18	Endosulfan-I	
19	Endosulfan-II	
20	Endrin	
21	Endrin aldehyde	
22	Endrin ketone	
23	gamma-BHC	
24	gamma-Chlordane	
25	Heptachlor	
26	Heptachlor epoxide	
27	Methoxychlor	
28	Toxaphene	

* Full HSL Inorganics and Full Radiological analysis to be performed on both filtered and non-filtered samples.
** Full HSL Inorganics and General Chemistry parameters are one combined pay item (Pay Item 143).

PILOT PLANT DRAINAGE DITCH SEEPAGE INVESTIGATION

PADDY'S RUN SURFACE WATER SAMPLING (W-5)

TAL 50.03.16 C

FEMP RI/FS - GENERAL GROUNDWATER QUALITY - ANALYTICAL PARAMETERS

	GENERAL CHEMISTRY	Pay Item
1	Ammonia	143**
2	Chloride	
3	Fluoride	
4	Nitrate	
5	Phenols	
6	Phosphorus (total)	
7	Sulfate	
8	Sulfide	
9	Total Organic Carbon (TOC)	
10	Total Organic Halogens (TOX)	
11	Total Organic Nitrogen (TON)	

	MISC. GENERAL CHEMISTRY	
1	Alkalinity	134

FEMP RI/FS - FULL RADIOLOGICAL - ANALYTICAL PARAMETERS

	RADIOLOGICAL *	Pay Item
1	Cesium 137	56
2	Neptunium 237	
3	Plutonium 238	
4	Plutonium 239/240	
5	Radium 226	
6	Radium 228	
7	Ruthenium 106	
8	Strontium 90	
9	Technetium 99	
10	Thorium 228	
11	Thorium 230	
12	Thorium 232	
13	Total Thorium	
14	Total Uranium	
15	Uranium 234	
16	Uranium 235/236	
17	Uranium 238	

	MISC. RADIOLOGICAL *	
1	Gross alpha	19
2	Gross beta	

* Full HSL Inorganics and Full Radiological analysis to be performed on both filtered and non-filtered samples.
** Full HSL Inorganics and General Chemistry parameters are one combined pay item (Pay Item 143).

PILOT PLANT DRAINAGE DITCH SEEPAGE INVESTIGATION

GREAT MIAMI RIVER SAMPLING (W-1)

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FEMP RI/FS - FULL HSL - ANALYTICAL PARAMETERS

	INORGANICS *	Pay Item
1	Aluminum	143 **
2	Antimony	
3	Arsenic	
4	Barium	
5	Beryllium	
6	Cadmium	
7	Calcium	
8	Chromium (Total)	
9	Cobalt	
10	Copper	
11	Cyanide	
12	Iron	
13	Lead	
14	Magnesium	
15	Manganese	
16	Mercury	
17	Molybdenum	
18	Nickel	
19	Potassium	
20	Selenium	
21	Silicon	
22	Silver	
23	Sodium	
24	Thallium	
25	Vanadium	
26	Zinc	

	VOLATILE ORGANICS	
1	1,1-Dichloroethane	47
2	1,1-Dichloroethene	
3	1,1,1-Trichloroethane	
4	1,1,2-Trichloroethane	
5	1,1,2,2-Tetrachloroethane	
6	1,2-Dichloroethane	
7	1,2-Dichloroethene (total)	
8	1,2-Dichloroethylene	
9	1,2-Dichloropropane	
10	2-Butanone	
11	2-Hexanone	
12	4-Methyl-2-pentanone	
13	Acetone	
14	Benzene	
15	Bromodichloromethane	
16	Bromoform	
17	Bromomethane	
18	Carbon disulfide	
19	Carbon tetrachloride	
20	Chlorobenzene	
21	Chloroethane	
22	Chloroform	
23	Chloromethane	
24	cis-1,3-Dichloropropene	
25	Dibromochloromethane	
26	Ethylbenzene	
27	Methylene chloride	
28	Styrene	
29	Tetrachloroethene	
30	Toluene	
31	Total xylenes	
32	trans-1,3-Dichloropropene	
33	Trichloroethene	
34	Vinyl acetate	
35	Vinyl chloride	

	SEMIVOLATILE ORGANICS	Pay Item
1	1,2-Dichlorobenzene	52
2	1,2,4-Trichlorobenzene	
3	1,3-Dichlorobenzene	
4	1,4-Dichlorobenzene	
5	2-Chloronaphthalene	
6	2-Chlorophenol	
7	2-Methylnaphthalene	
8	2-Methylphenol	
9	2-Nitroaniline	
10	2-Nitrophenol	
11	2,4-Dichlorophenol	
12	2,4-Dimethylphenol	
13	2,4-Dinitrophenol	
14	2,4-Dinitrotoluene	
15	2,4,5-Trichlorophenol	
16	2,4,6-Trichlorophenol	
17	2,6-Dinitrotoluene	
18	3-Nitroaniline	
19	3,3'-Dichlorobenzidine	
20	4-Bromophenyl phenylether	
21	4-Chloro-3-methylphenol	
22	4-Chloroaniline	
23	4-Chlorophenyl-phenyl ether	
24	4-Methylphenol	
25	4-Nitroaniline	
26	4-Nitrophenol	
27	4,6-Dinitro-2-methylphenol	
28	Acenaphthene	
29	Acenaphthylene	
30	Anthracene	
31	Benzoic acid	
32	Benzo(a)anthracene	
33	Benzo(a)pyrene	
34	Benzo(b)fluoranthene	
35	Benzo(g,h,i)perylene	
36	Benzo(k)fluoranthene	
37	Benzyl alcohol	
38	bis(2-Chloroethoxy)methane	
39	bis(2-Chloroethyl)ether	
40	bis(2-Chloroisopropyl) ether	
41	bis(2-Ethylhexyl)phthalate	
42	Butyl benzyl phthalate	
43	Carbazole	
44	Chrysene	
45	Dibenzofuran	
46	Dibenzo(a,h)anthracene	
47	Diethylphthalate	
48	Dimethylphthalate	
49	Di-n-butyl phthalate	
50	Di-n-octyl phthalate	
51	Fluoranthene	
52	Fluorene	
53	Hexachlorobenzene	
54	Hexachlorobutadiene	
55	Hexachlorocyclopentadiene	
56	Hexachloroethane	
57	Indeno(1,2,3-cd)pyrene	
58	Isophorone	
59	Naphthalene	
60	Nitrobenzene	
61	N-Nitroso-di-n-propylamine	
62	N-Nitrosodiphenylamine	
63	Pentachlorophenol	
64	Phenanthrene	
65	Phenol	
66	Pyrene	

	PESTICIDES / PCBs	Pay Item
1	4,4'-DDD	49
2	4,4'-DDE	
3	4,4'-DDT	
4	Aldrin	
5	alpha-BHC	
6	alpha-Chlordane	
7	Aroclor 1016	
8	Aroclor 1221	
9	Aroclor 1232	
10	Aroclor 1242	
11	Aroclor 1248	
12	Aroclor 1254	
13	Aroclor 1260	
14	beta-BHC	
15	delta-BHC	
16	Dieldrin	
17	Endosulfan sulfate	
18	Endosulfan-I	
19	Endosulfan-II	
20	Endrin	
21	Endrin aldehyde	
22	Endrin ketone	
23	gamma-BHC	
24	gamma-Chlordane	
25	Heptachlor	
26	Heptachlor epoxide	
27	Methoxychlor	
28	Toxaphene	

FEMP RI/FS - GENERAL GROUNDWATER QUALITY - ANALYTICAL PARAMETERS

	GENERAL CHEMISTRY	Pay Item
1	Ammonia	143 **
2	Chloride	
3	Fluoride	
4	Nitrate	
5	Phenols	
6	Phosphorus (total)	
7	Sulfate	
8	Sulfide	
9	Total Organic Carbon (TOC)	
10	Total Organic Halogens (TOX)	
11	Total Organic Nitrogen (TON)	

	MISC. GENERAL CHEMISTRY	
1	Alkalinity	134

* Full HSL Inorganics analysis is to be performed on both filtered and non-filtered samples.
** Inorganics and general chemistry parameters are combined in one pay item (Pay Item 143).