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AGENDA - NATURAL RESOURCE TRUSTEE MEETING AUGUST 25, 1994

08/25/94

DOE-FN/FERMCO TRUSTEES
61
AGENDA

Agenda
Natural Resource Trustee Meeting
August 25, 1994
9:00 a.m.

1.0	Operable Unit 5 Remedial Investigation Report Presentation	
	1.1 General Background - Bill Hertel	9:15 - 9:40
	1.2 Ecological Risk Assessment - Dr. Kathy Trapp	9:45 - 11:45
2.0	Update on Species Surveys - Becky Bixby	11:45 - 11:55
	LUNCH	12:00 - 1:00
3.0	Administrative Items - Alicia Taylor	1:15 - 2:15

3.1 Comments/Approval June 6, 1994 Meeting Summary

3.2 Comments/Approval draft letters to NOAA and ACOE

3.3 Discuss Ohio EPA review; regulator v. trustee

3.4 Distribute Hanford Trustee Strategy Paper

3.5 Next Meeting Date and Agenda

SITE-WIDE ECOLOGICAL RISK ASSESSMENT

FERNALD

Grassland Habitat

- Introduction
- Habitats on the FEMP
- Actions taken to reduce contamination
- Summary of biological studies
- Approach taken to assess ecological risk
- Summary of ecological risk assessment

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INTRODUCTION

FERNALD

- Scope of Operable Unit 5 (OU5)
- Amended Consent Agreement states that OU5 is responsible for the Sitewide Ecological Risk Assessment
- Approach taken to assess potential ecological risks discussed with Region V EPA BTAG representative February 17, 1993

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INTRODUCTION

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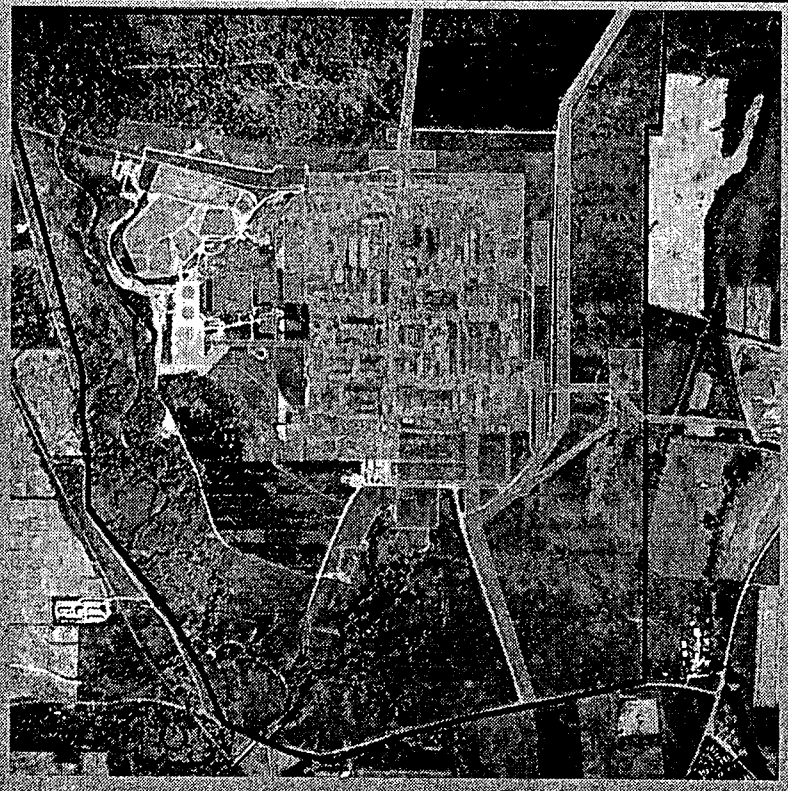

Operable Units 1-4

- Site-wide Ecological Risk Assessment prepared following U.S. EPA Region V guidance
- Focused on on- and off-property areas not likely to be remediated based on human health concerns
- OUs 1-4 must evaluate proposed remedial goals in the FS to insure that ecological receptors will also be protected

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INTRODUCTION

FERNALD

Basic Outline US EPA Region V Guidance Used to prepare Site-Wide Ecological Risk Assessment

OBJECTIVE: Determine if site contaminants pose threat(s) to ecological receptors

Step 1. Site Characterization

a. Describe terrestrial and aquatic habitat and species potentially exposed to contaminants

b. Summarize available information on source, nature, and extent of contamination

c. Summarize known or suspected effects (e.g., fish kills) associated with site contaminants

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INTRODUCTION

FERNALD

Basic Outline US EPA Region V Guidance Used to Prepare Site-Wide Ecological Risk Assessment

Step 2. Screening Assessment

a. Exposure Assessment: conservatively estimate exposure of communities / species

b. Toxicity Screening:

1. Summarize toxicological properties
2. Compare exposure concentration to benchmark value
3. Summary of observed, adverse impacts in potentially exposed habitats
4. Summary of ecologically relevant ARARs

c. Summary

Step 3. Determine need for further studies; finalize risk assessment

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HABITATS ON THE FEMP

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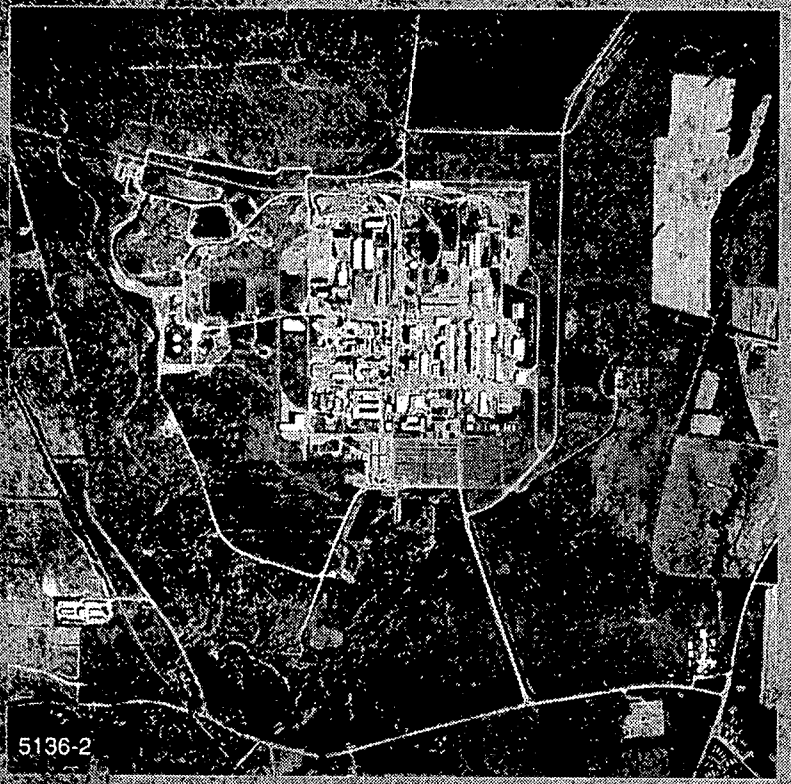

Habitats on FEMP

- Woodlots
- Pine Plantations
- Grasslands
- Riparian Woodlands
- Paddys Run

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HABITATS ON THE FEMP

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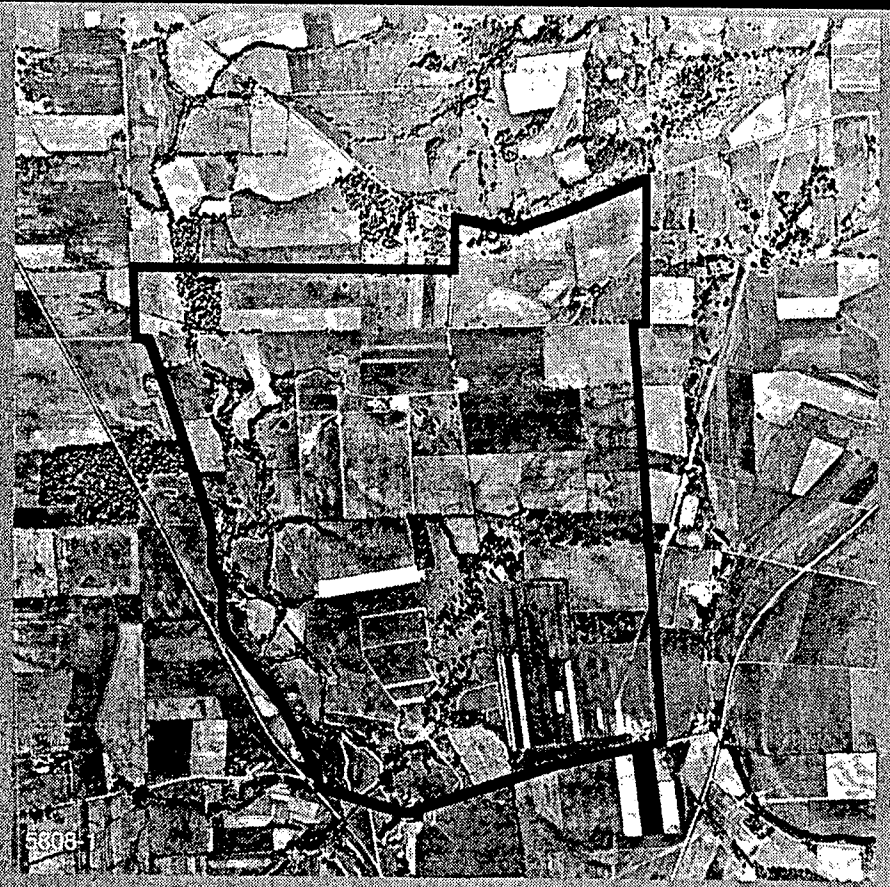

FEMP, 1950

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HABITATS ON THE FEMP

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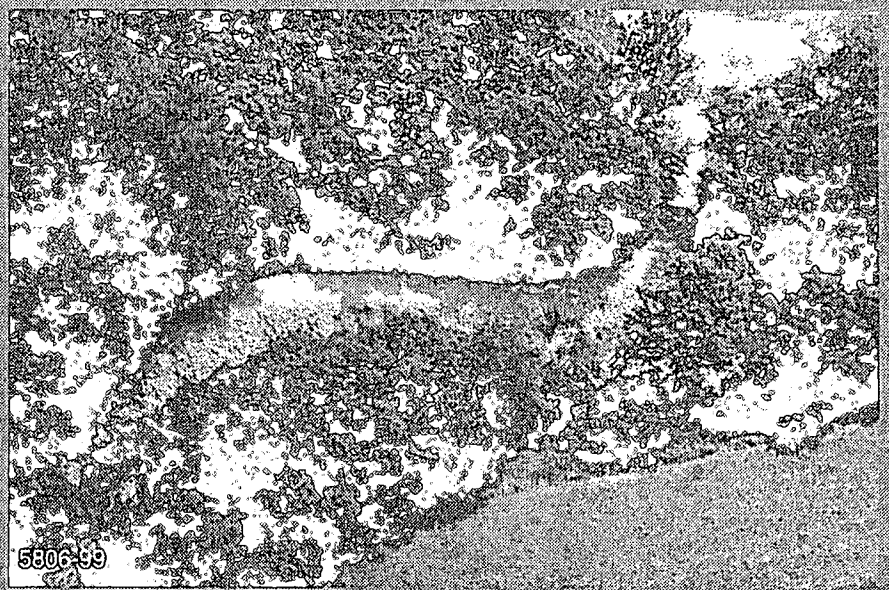
North Woodlot



Inactive Flyash Pile

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HABITATS ON THE FEMP

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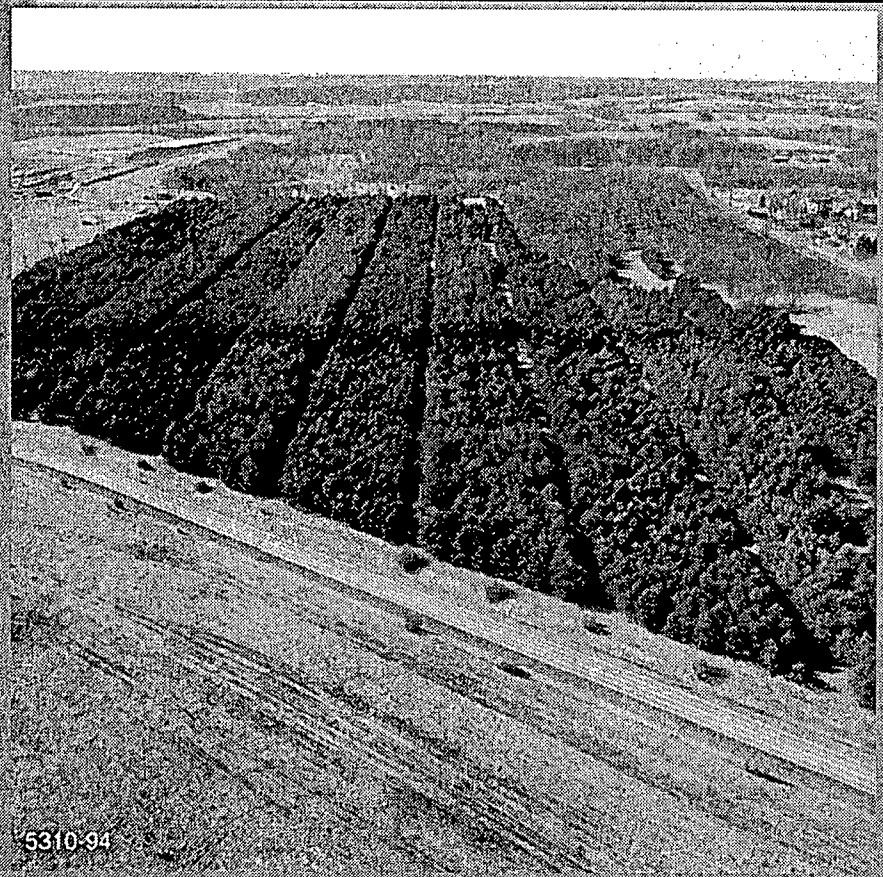

North Pine Plantation

South Pine Plantation

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HABITATS ON THE FEMP

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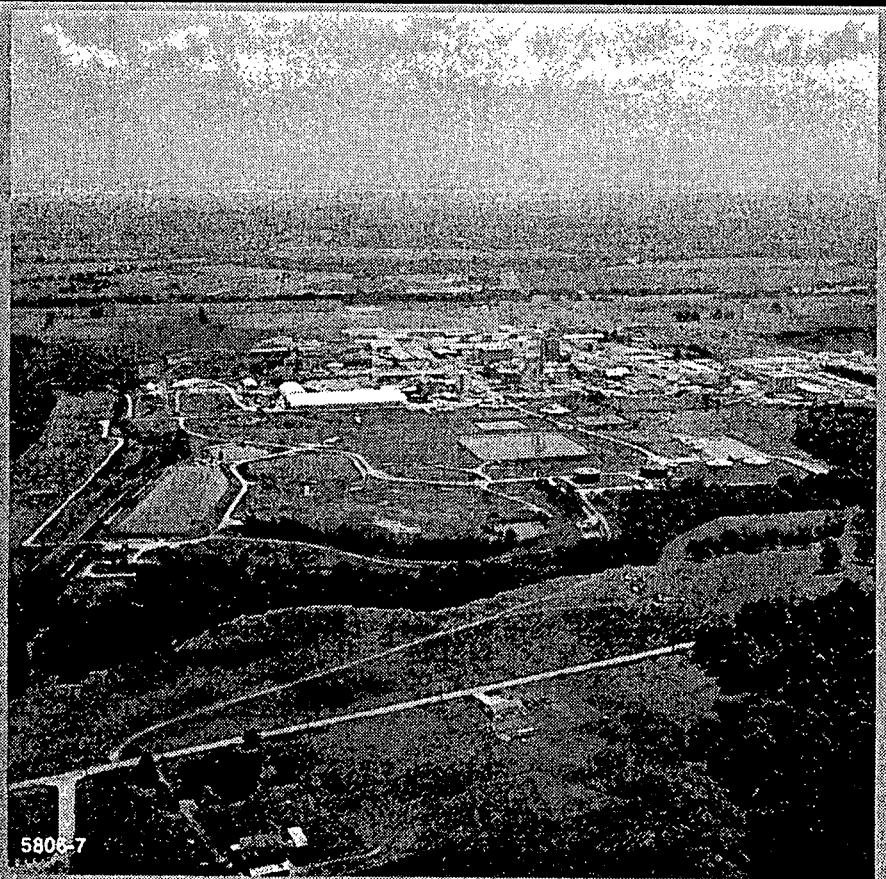

Riparian and Grassland Habitats

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HABITATS ON THE FEMP

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Paddys Run

- Intermittent flow (typically dry from June to January)
- Permeable sand and gravel channel bottom
- Highly erosional substrates and banks
- Cows contribute to bank erosion in some areas
- "Responds" rapidly to rainfall (rapid increase in flow immediately following rainfall events)
- Dynamic physical nature of stream greatly influences biota in stream
- Despite dynamic nature, stream characterized by relatively diverse aquatic assemblages

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HABITATS ON THE FEMP

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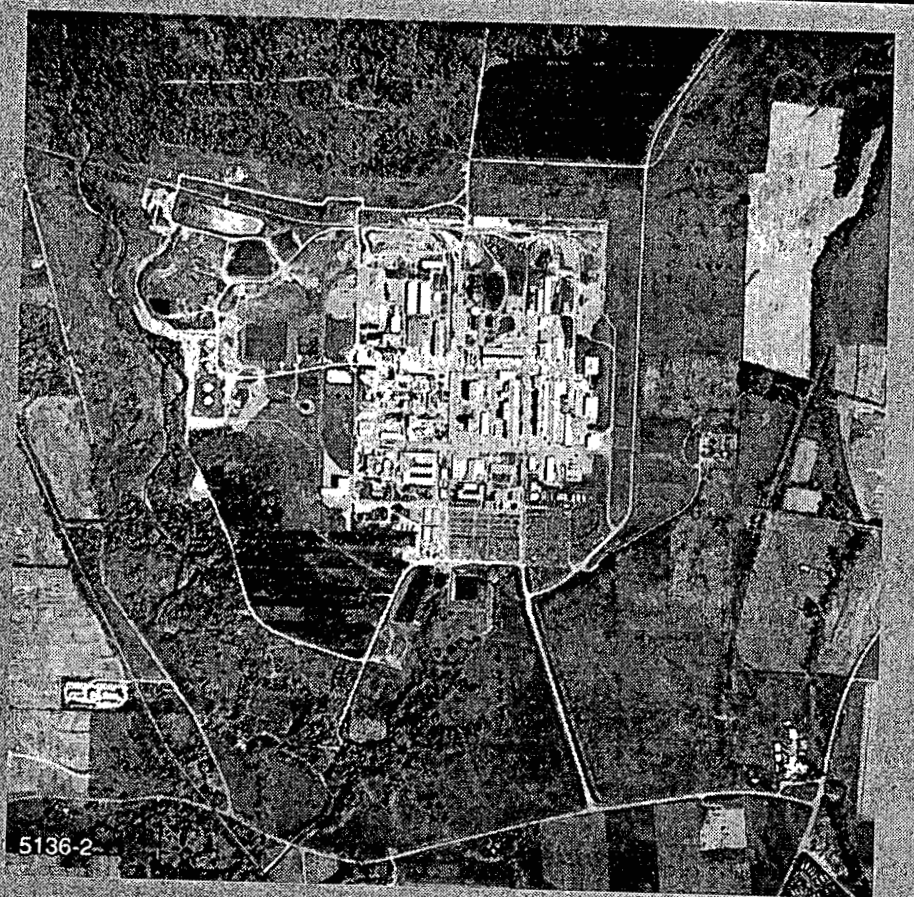

Habitats on the FEMP

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HABITATS ON THE FEMP

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Paddys Run, July 1994

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HABITATS ON THE FEMP

FERNALD

Bank erosion on Paddys Run, near waste pit area, July 1994

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HABITATS ON THE FEMP

FERNALD

Bank erosion along Paddys Run, Spring 1991

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HABITATS ON THE FEMP

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High water line on Paddys Run, July 1994

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HABITATS ON THE FEMP

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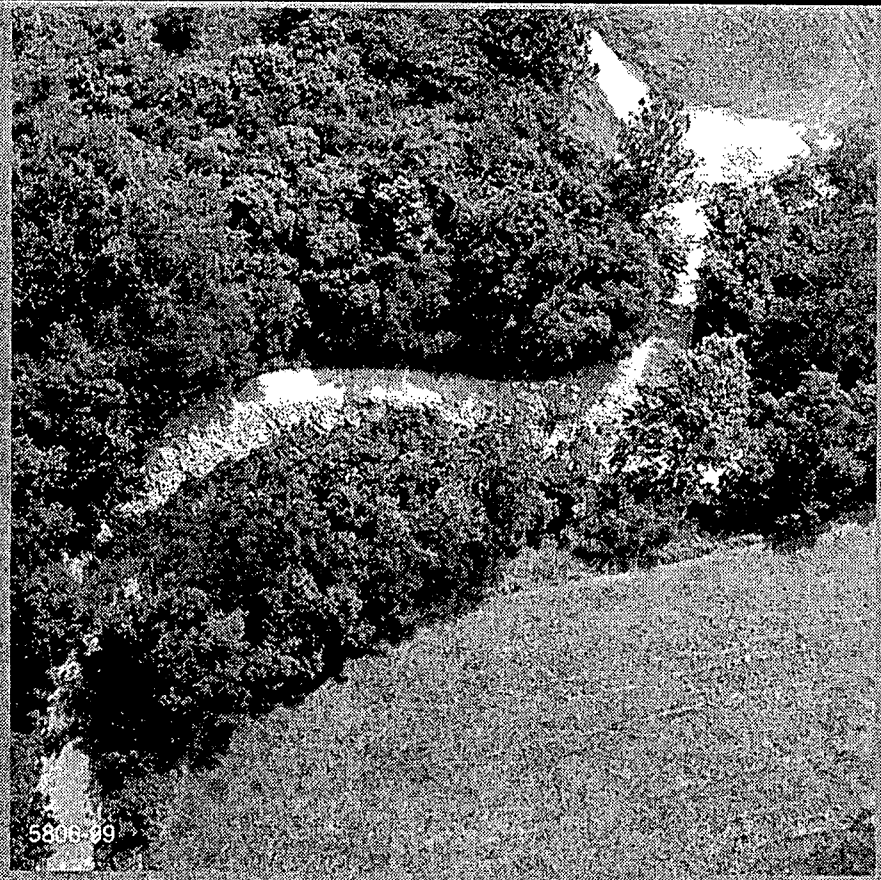

Inactive Flyash Pile along Paddys Run

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APPROACH TO ASSESSING POTENTIAL ECOLOGICAL RISKS

FERNALD

- Approximately 80% of the on-property acreage at the FEMP (800 acres), as well as off-property areas, were examined in Site-wide Ecological Risk Assessment
- FEMP subdivided into Study Areas based on:
  - relationship to production area
  - habitat type (woodlot, grassland, etc.)
  - home range of receptor organisms used in radiological dose models
- Permitted areas that potentially received higher concentrations of contaminants to be examined separately from areas less likely to receive contamination

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APPROACH TO ASSESSING POTENTIAL ECOLOGICAL RISKS

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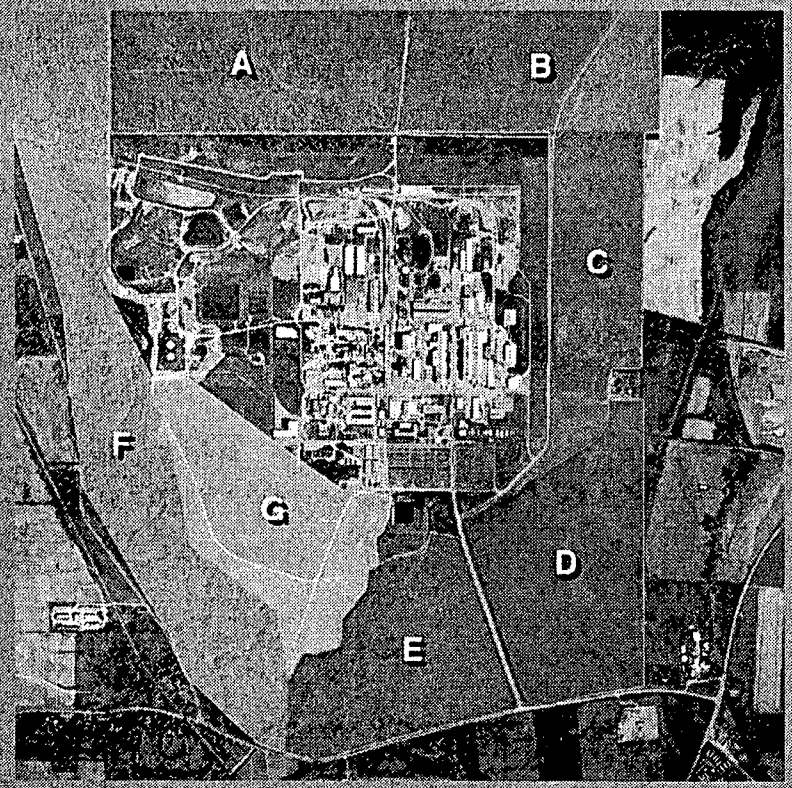

LEGEND:

- A Woodlot / Wetland
- B Pine Plantation
- C Grassland
- D Grassland
- E Grassland
- F Paddys Run
- G Pine Plantation

Studies Areas Used for Ecological Risk Assessment

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ACTIONS TAKEN TO REDUCE CONTAMINATION

FERNALD

Removal Action No. 2

- Stormwater retention basin
- Removal Action No. 2 (Waste Pit Area Runoff Control)
- Removal Action No. 16 (Production Area Runoff Control)
- Removal Action No. 14 (Soil Excavation near former Sewage Treatment Plant)

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SUMMARY OF BIOLOGICAL STUDIES

FERNALD

- OU5 Remedial Investigation report summarizes results of ecological studies performed on FEMP between 1952-1994
- Site-wide Ecological Risk Assessment specifically summarized and compared data obtained from these studies pertaining to:
  - Annual electrofishing surveys of the Great Miami River (1984-1993)
  - Paddys Run macroinvertebrates
  - Paddys Run fish
  - Birds observed on the FEMP
- Review of these summarized data suggest that these populations are typical of those found in similar habitats in southwestern Ohio

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

Nonradiological

1. Exposure Assessment
2. Identify Final COCs (compare to benchmarks)
3. Risk Characterization (toxicity quotients)

Radiological

1. Exposure Assessment
2. Quantify Total Dose
3. Risk Characterization (compare to benchmark)

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 1 - Exposure Assessment
  - Summarized by Study Area
  - Nonradiological - contaminant exposure concentrations determined by medium (e.g., surface water)
  - Radiological - models developed to quantify potential dose received by ecological receptors

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 1 - Exposure Assessment (cont.)
  - Reflected current contaminant concentrations to extent possible (i.e., 1993 data)
  - Effects of removal actions in reducing contaminant concentrations accounted for
  - Statistics used to determine representative contaminant concentrations (eg., maximum; UCL) by Study Area by medium
  - Statistics used to compare representative contaminant concentrations to background concentrations, when appropriate

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 2 - Identify Final Contaminants of Concern - Nonradiological
  - As outlined in US EPA Region V guidance, representative concentrations compared to benchmark values
  - Benchmark values = conservative, media-specific concentrations protective of ecological receptors (e.g., OEPA Chronic Ambient Water Quality Criteria)
  - Contaminants present in concentrations exceeding benchmark values regarded as final contaminants of concern

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 3 - Risk Characterization - Nonradiological
  - Toxicity Quotient (TQ) method used characterize potential risks to ecological receptors
  - TQ = Exposure Concentration/Benchmark Value
    TQ Lead for Paddys Run On-Property = 156/30 = 5.2
  - TQ > 1.0 considered indicative of potential risk to ecological receptors

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

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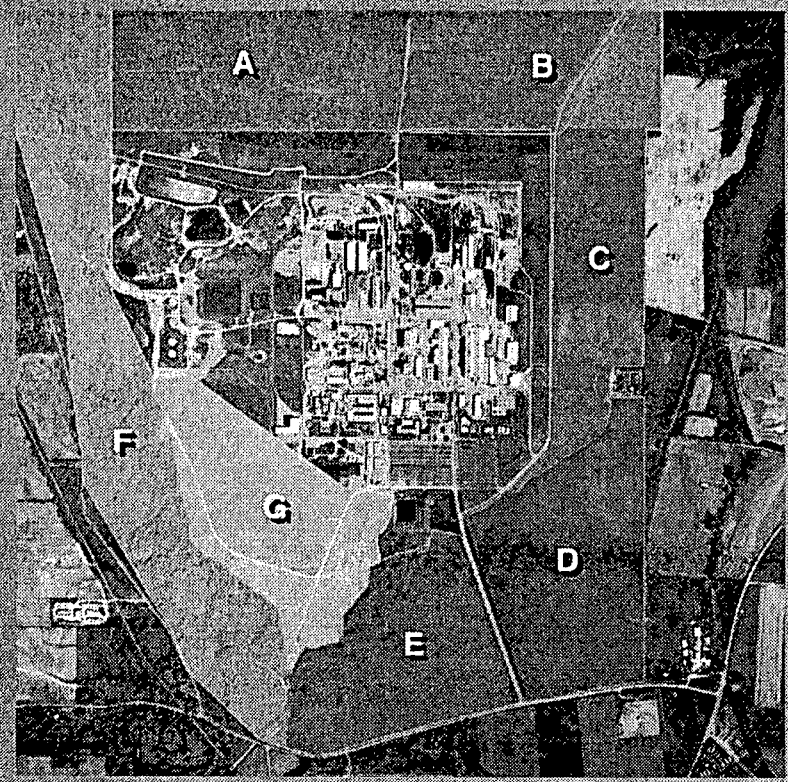
Step 3 - Risk Characterization - Nonradiological (cont.)



MAXIMUM SOIL TOXICITY QUOTIENT VALUE PER STUDY AREA

	A	PAH TQ = 2.10
	B	Mo TQ = 1.24
	C	U TQ = 15.7
	D	Pb TQ = 10.9
	E	PAH TQ = 12.5
	F	U TQ = 1.0
	G	Sb TQ = 2.95

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SURFACE WATER AND SEDIMENT TOXICITY QUOTIENT VALUES

	Final Contaminants of Potential Concern Based on Representative Concentration													
	Aluminum	Ammonia	Barium	Bis(2-ethylhexyl) phthalate	Cadmium	Cyanide	Di-n-octyl phthatlate	Iron	Lead	Manganese	Mercury	Phenanthrene	Uranium	Zinc
SURFACE WATER														
Paddys Run														
On Property	1.66			4.76	1.47		1.09		5.20					
Off Property				2.62			1.87		2.32				9.89	
Great Miami River														
Reach 1[a]		1.90									3.50			
Reach 2[a]	7.68													
Reach 3[a]	220		1.57	19.0	5.29	1.78			1.47	5.72				
SEDIMENTS														
Paddys Run														
On Property			1.47		1.10	4.90				3.57				
Off Property										1.66				
Great Miami River														
Reach 1[a]														
Reach 2[a]			3.25					1.16	1.13	2.43		2.33		
Reach 3[a]			2.23							2.22				1.43

[b]Reach 1 = Upstream of the effluent line
Reach 2 = Between effluent line and confluence of Paddys Run
Reach 3 = Downstream of the confluence of Paddys Run

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SOIL TOXICITY QUOTIENT VALUES

Location	Final Inorganic Contaminants of Potential Concern Based on Representative Concentration								
	Aluminum	Antimony	Cadmium	Lead	Manganese	Molybdenum	Silver	Uranium	Zinc
Area A			1.18			1.17			1.41
Area B	1.06				1.02	1.24			
Area C	2.54	2.15		2.85	1.40			15.7	
Area D		1.06		10.9					
Area E	1.61	1.02				1.45			
Area F								1.10	
Area G		2.95	1.16				1.03		
Outer Contour				5.75					
Inner Contour					2.28				

Location	Final Organic Contaminants of Potential Concern Based on Representative Concentration							
	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b)-fluoranthene	Benzo(g,h,i) perylene	Chrysene	Dibenzo(a,h) anthracene	Indendo(1,2,3-cd) pyrene	Benzo(k)-fluoranthene
Area A	2.10	1.60	2.10		2.10			
Area B								
Area C			1.80	1.10		4.54	1.50	1.30
Area D								
Area E		1.15	3.70	3.10	3.20	12.5	3.00	3.30
Area F								
Area G								
Outer Contour								
Inner Contour								

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 1 - Exposure Assessment - Radiological
  - Same steps followed to quantify nonradiological exposure concentrations used to summarize radiological exposure concentrations:
    - Reflected current contaminant concentrations to extent possible (i.e. 1993 data)
    - Effects of removal actions in reducing contaminant concentrations accounted for
    - Statistics used to determine representative contaminant concentrations per Study Area per medium
    - Statistics used to compare representative contaminant concentrations to background concentrations, when appropriate

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 2 - Quantifying Total Potential Radiological Dose
  - Conservative, site-specific models used to quantify total potential dose received by ecological receptors
  - Factors considered in selecting ecological receptors for models:
    - known sensitivity to radioactivity
    - size of home ranges
    - behavior patterns that would bring them into contact with contaminants
    - availability of information in the literature
    - occurrence on the FEMP

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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 2 - Quantifying Total Potential Radiological Dose (cont.)
  - Ecological receptors used in models:
    - white-footed deer mouse
    - western meadow vole
    - pine tree
    - shiners (*Notropis* sp.)

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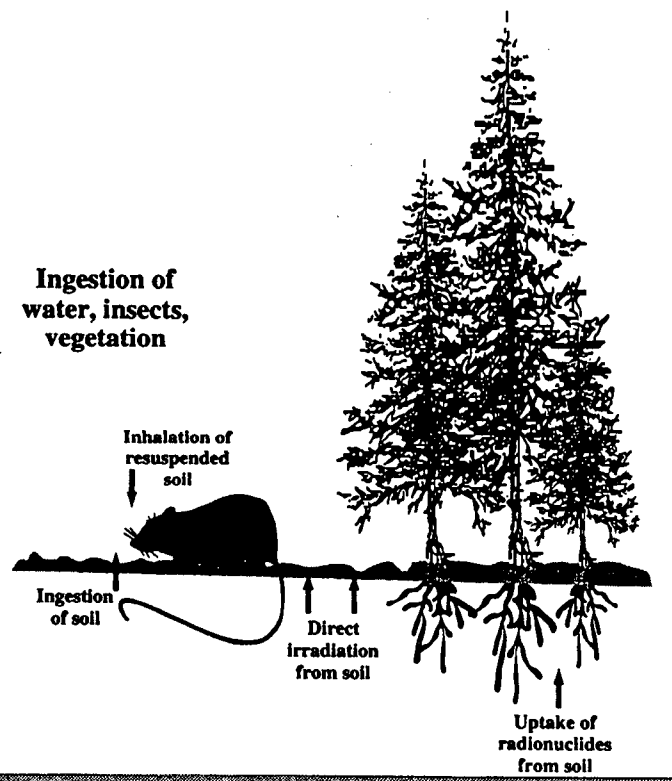
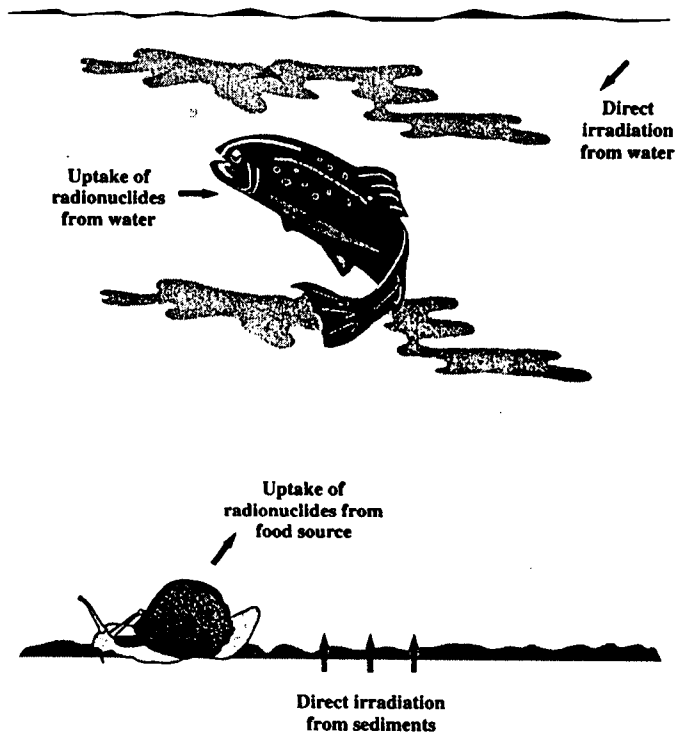
APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

Terrestrial Receptors



Aquatic Receptors



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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

- Step 3 - Risk Characterization - Radiological
  - Compared calculated potential dose to benchmark value (36.5 rad / year) published in *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards* International Atomic Energy Agency (IAEA) 1992
  - Very conservative value; protective of chronic, adverse impacts

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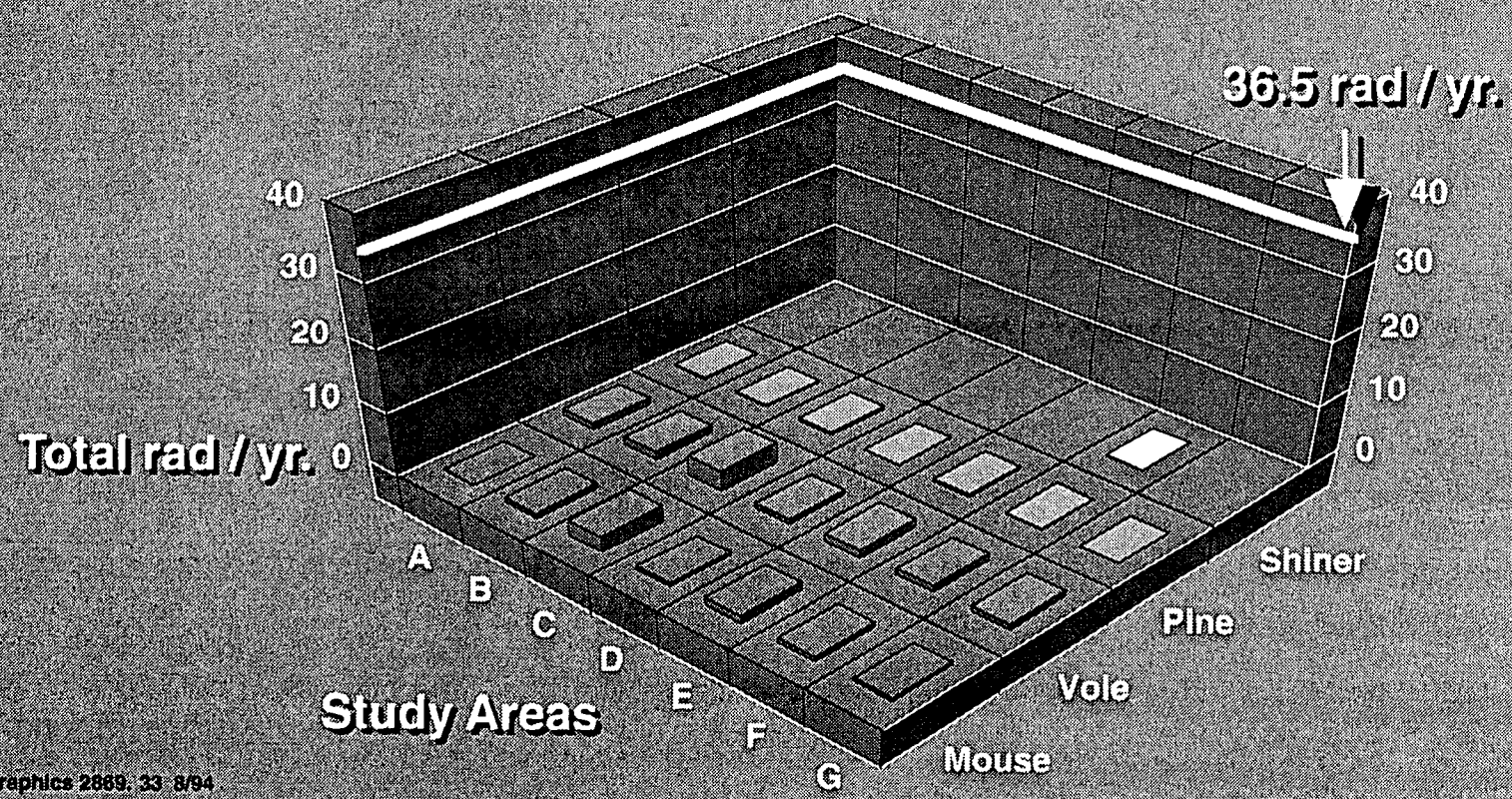
APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

FERNALD

Step 3 - Risk Characterization - Radiological (cont.)

On-Property Receptors 1



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APPROACH TAKEN TO ASSESS ECOLOGICAL RISK

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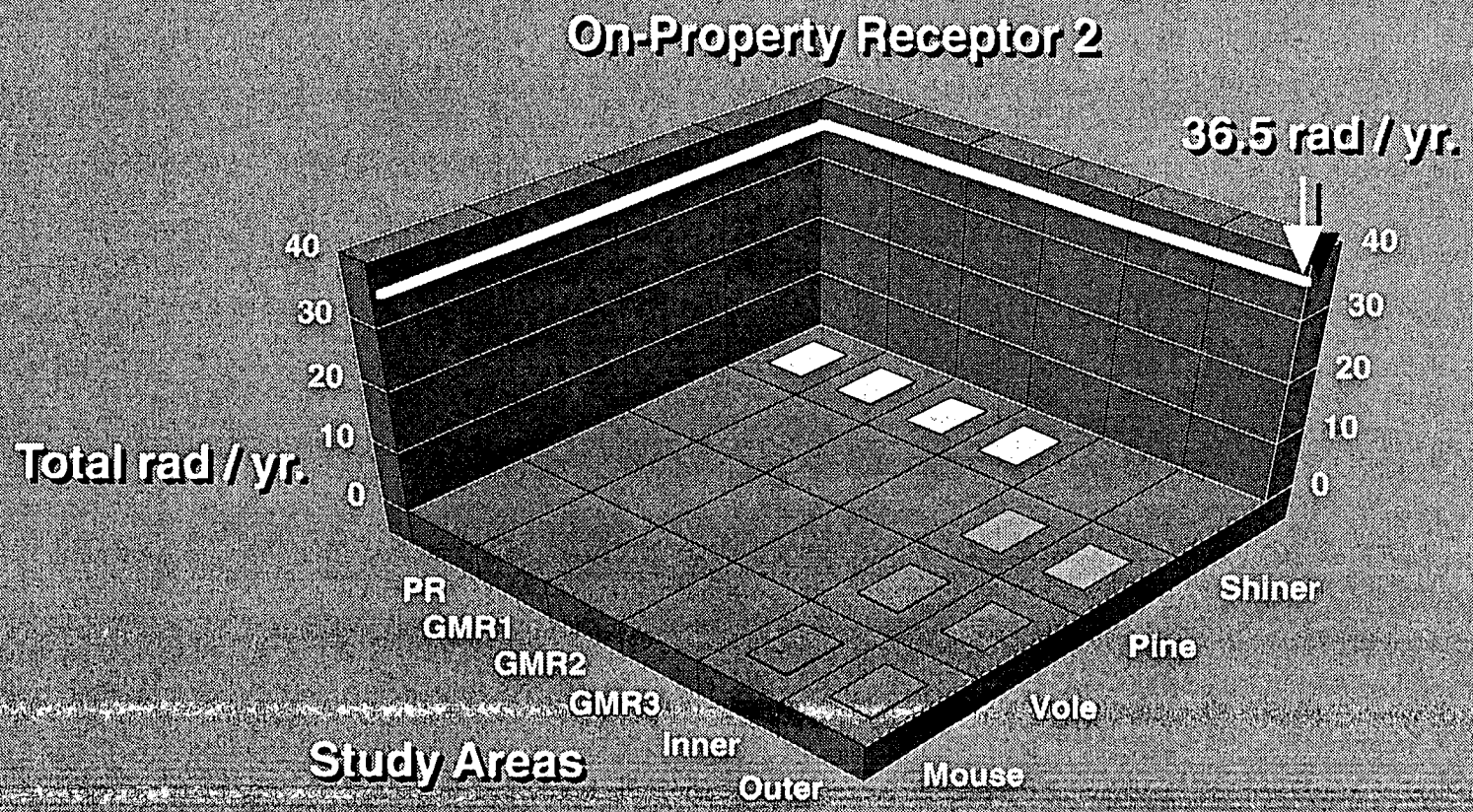
Step 3 - Risk Characterization - Radiological (cont.)



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DOSE ABSORBED BY RECEPTOR ORGANISMS IN EACH STUDY AREA BASED ON REPRESENTATIVE CONCENTRATION (RAD/YR)[a]

Receptor	Study Areas						
	A	B	C	D	E	F (Paddys Run)	G
Mouse	0.578	0.636	2.39	0.358	1.17	0.669	0.455
Vole	0.991	1.19	3.12	0.617	1.22	1.03	0.770
Pine Tree	0.0701	0.0738	0.420	0.0547	0.198	0.0558	0.0851
Shiner	b	b	b	b	b	0.0928	b

Receptor	Study Areas					
	Paddys Run Offsite	Great Miami River[c]	Great Miami River[d]	Great Miami River[e]	Offsite Inner Contour	Offsite Outer Contour
Mouse	b	b	b	b	0.130	0.0232
Vole	b	b	b	b	0.117	0.0102
Pine Tree	b	b	b	b	0.0312	0.00384
Shiner	0.0812	0.133	0.0338	0.0873	b	b

[a]Benchmark Criterion = 3.65E+01 rad/yr
[b]An empty cell = not applicable
[c]The Great Miami River Above the Effluent Line
[d]The Great Miami River Between the Effluent Line and the Confluence with Paddys Run
[e]The Great Miami River at the Confluence with Paddys Run

SUMMARY

FERNALD

- Studies conducted between 1951-1993 indicate that macroinvertebrates, birds, and fish communities typical of southwestern Ohio
- Model results indicate that radionuclides do not represent a risk to ecological receptors
- Conservative screening methods identified a number of nonradiological contaminants that pose a potential risk to ecological receptors
- As part of the FS, appropriate actions will take place to reduce these contaminant concentrations to levels that will reduce / eliminate the risk potential

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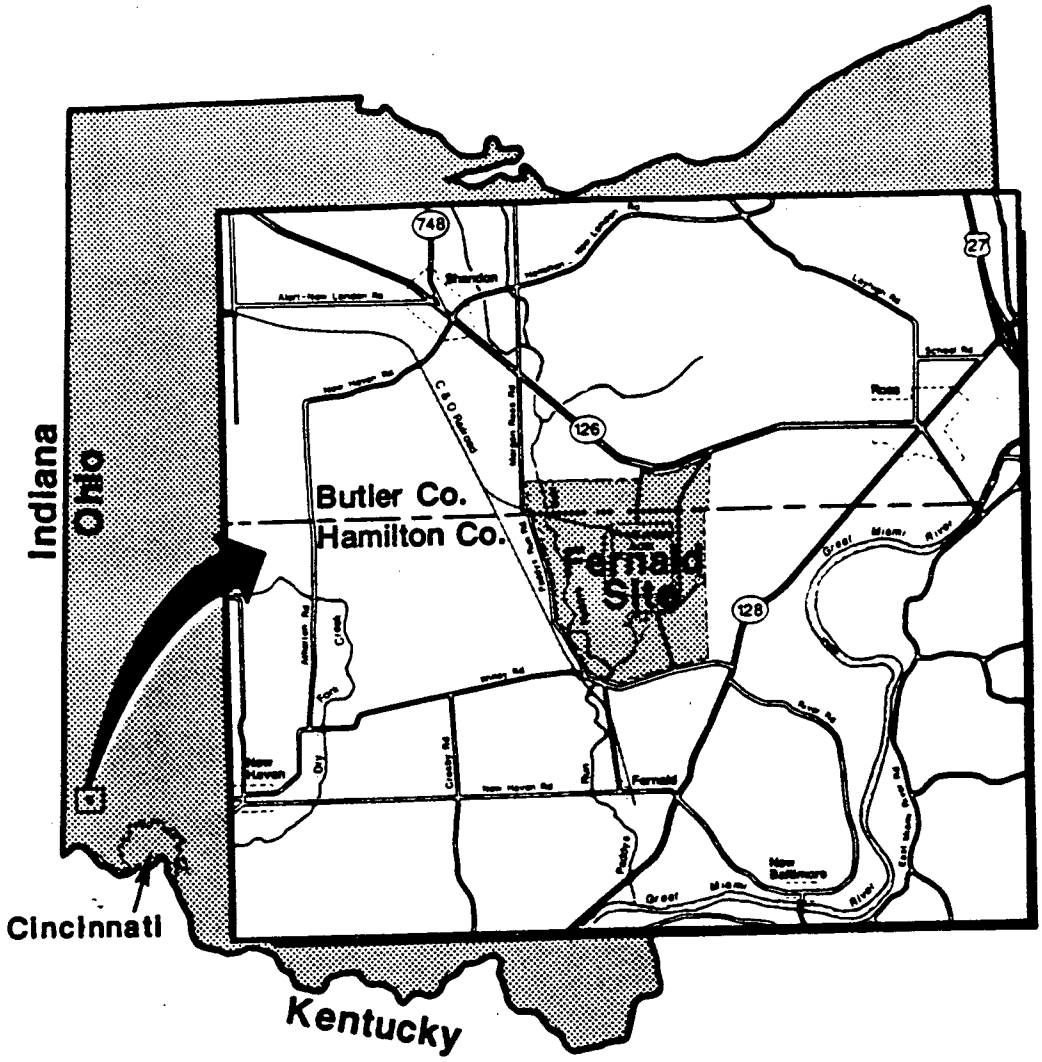

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FIGURE 1-1. FEMP SITE LOCATION MAP

Operable Unit 5 comprises environmental media at the FEMP Site

Specifically:

- Site soil and perched water not included in the definitions of Operable Units 1-4
- Surface water and Sediment
- Regional groundwater contained in the Great Miami Aquifer
- Flora and Fauna
- Air

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Features of the Operable Unit 5 RI Report:

- Provides a site description and history - Section 1
- Documents study area investigations - Section 2
- Describes the physical characteristics of the Site - Section 3
- Defines the nature and extent of contamination - Section 4
- Models the fate and transport of contaminants - Section 5
- Provides a baseline human health risk assessment - Section 6
- Provides an ecological risk assessment - Section 6

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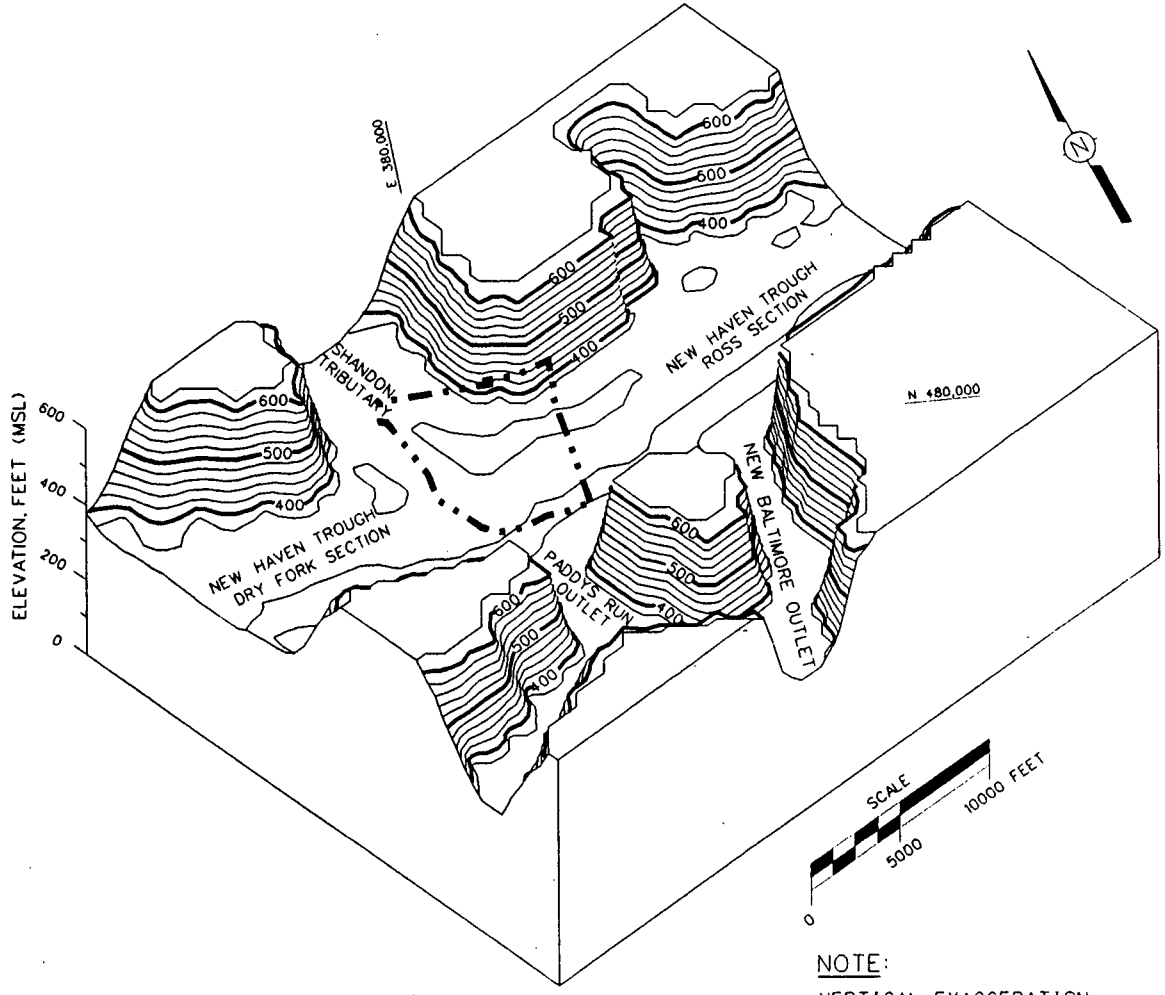
History of Off-Property Groundwater Monitoring

- In late 1981, the site detected elevated concentrations of uranium in three wells located south of the property boundary
- Results were reported to the State of Ohio
- Routine sampling of private wells located near the site began in 1982 and continues today (36 private wells sampled during 1993)
- As part of the RI/FS program, monitoring wells were also installed off-property in order to better define the nature and extent of contamination

Actions Taken to Mitigate Impacts from Groundwater Contamination

- Offered Bottled Drinking Water (if total uranium concentration in a private well is greater than 2.7 ppb)
- Provided an alternate water supply to an industry
- Partially funded public water supply (approximately $5 million)
- South Plume Removal Action



NOTE:
VERTICAL EXAGGERATION
= 20X

LEGEND:

400 CONTOUR

FEMP BOUNDARY

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/USR/ERMA3/FMPC/IDX/A146.DGN FER DUS RIDATA 6-10-94 STATE PLANAR COORDINATE SYSTEM 1927

FIGURE 3-16. 3-DIMENSIONAL BEDROCK CONFIGERATION

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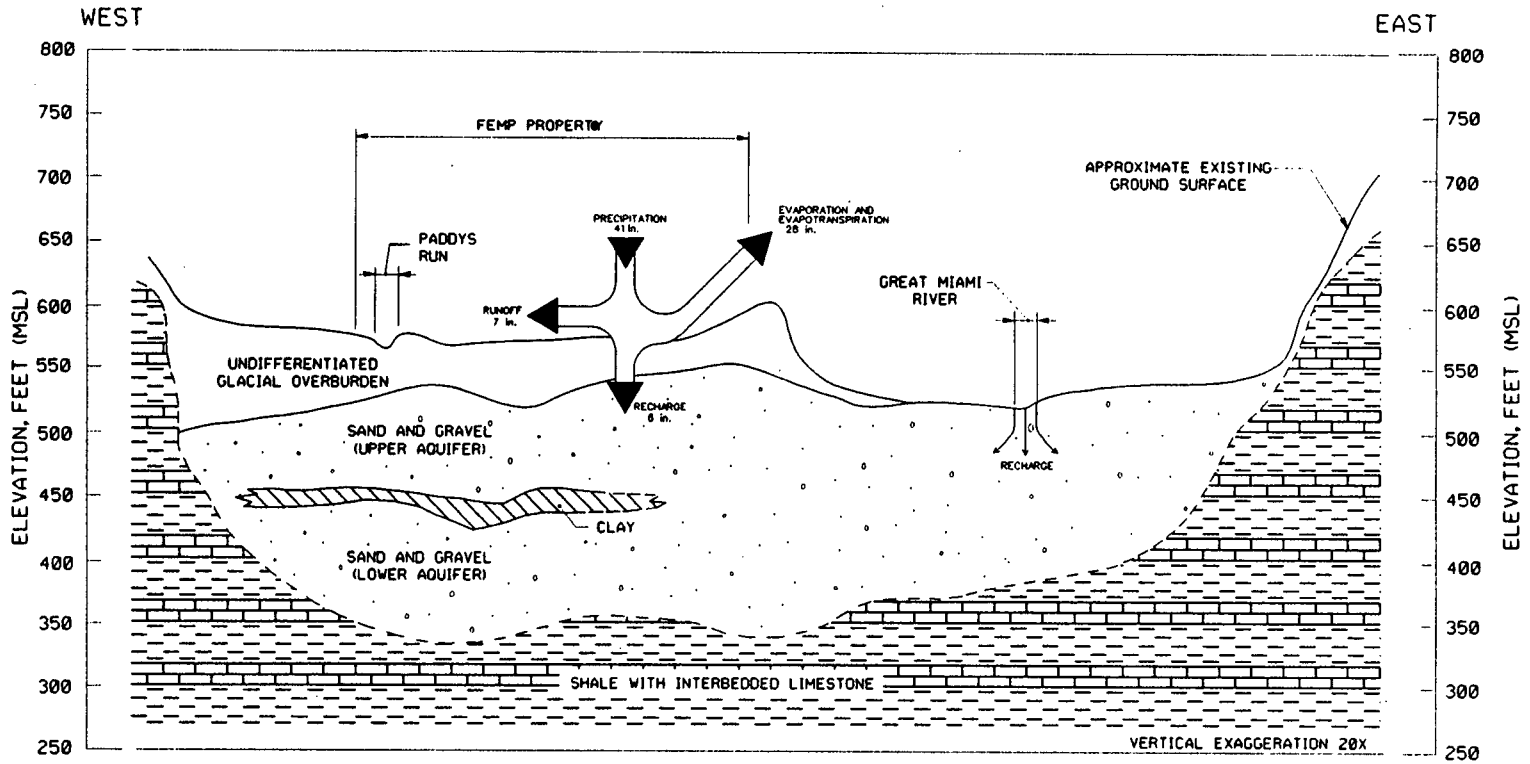
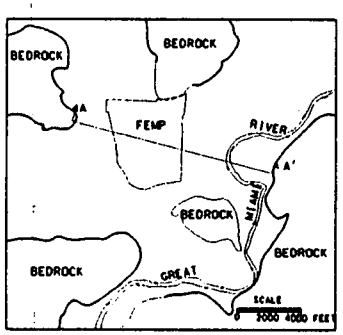


GENERALIZED CROSS SECTION



LOCATION OF CROSS SECTION

VERTICAL SCALE
0 100 200 FEET

HORIZONTAL SCALE
0 2000 4000 FEET

NOTE:
ALL VALUES ARE ANNUAL AVERAGES

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FIGURE 3-5
FEMP HYDRAULIC BUDGET AND CONCEPTUAL PATHWAYS

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/usr/ermas3/fmpc/idx/b90.dgn ou5 RI data 06/12/94

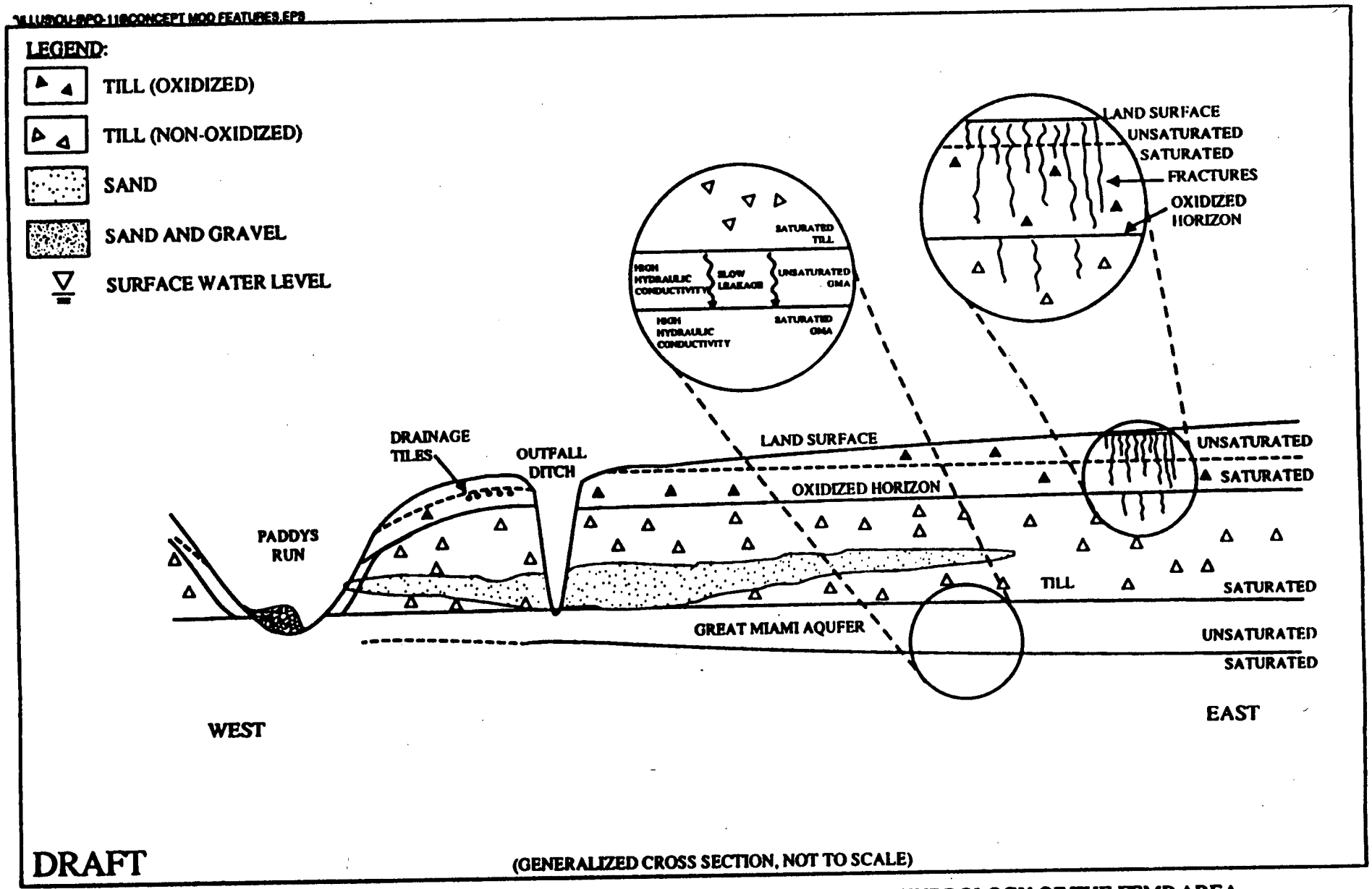

FIGURE 7-1. MAJOR FEATURES OF THE CONCEPTUAL MODEL OF THE HYDROLOGY OF THE FEMP AREA

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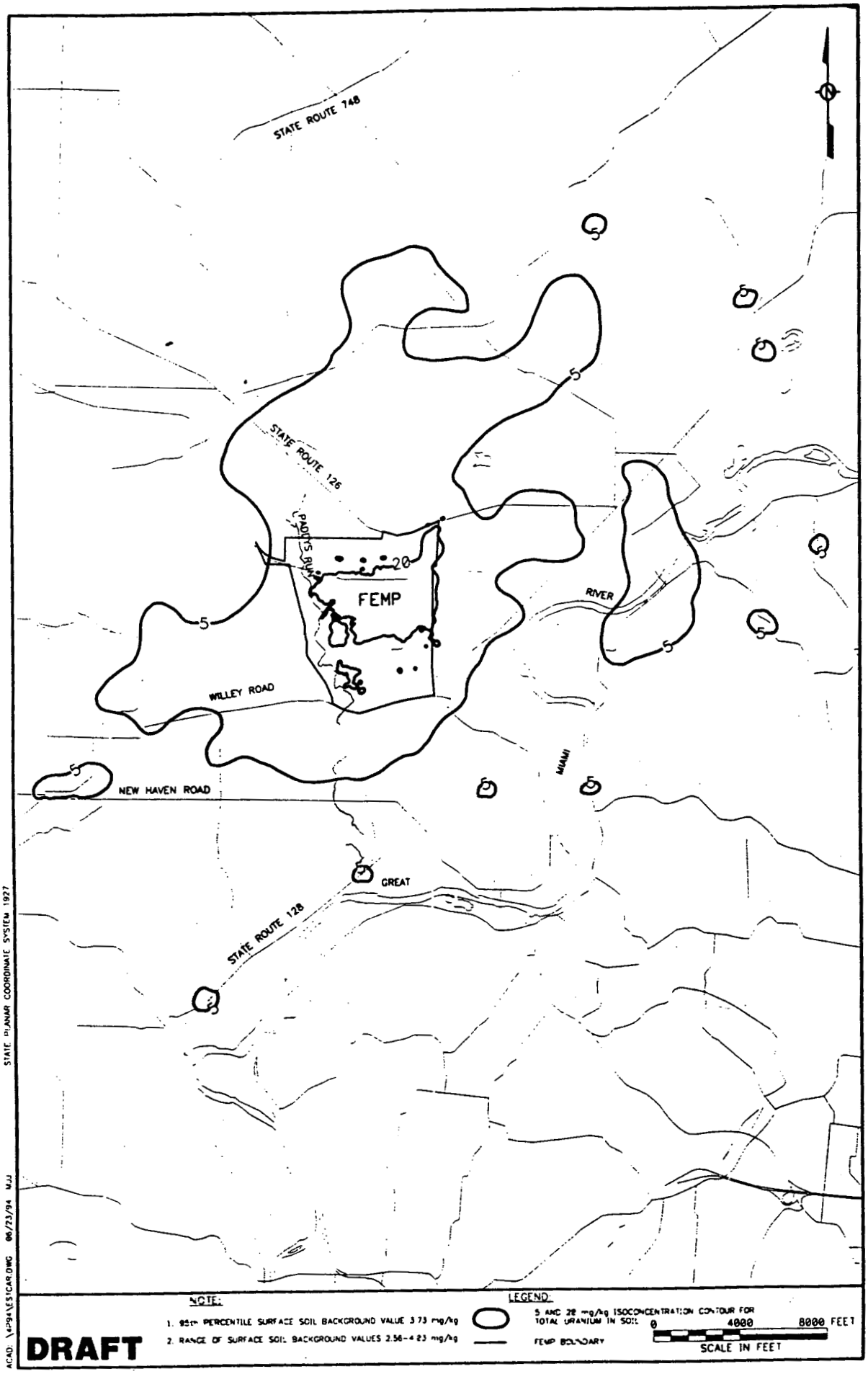


FIGURE 7-2. 5 AND 20 mg/kg ISOCONCENTRATION CONTOUR FOR TOTAL URANIUM IN SOIL, OU5, FEMP

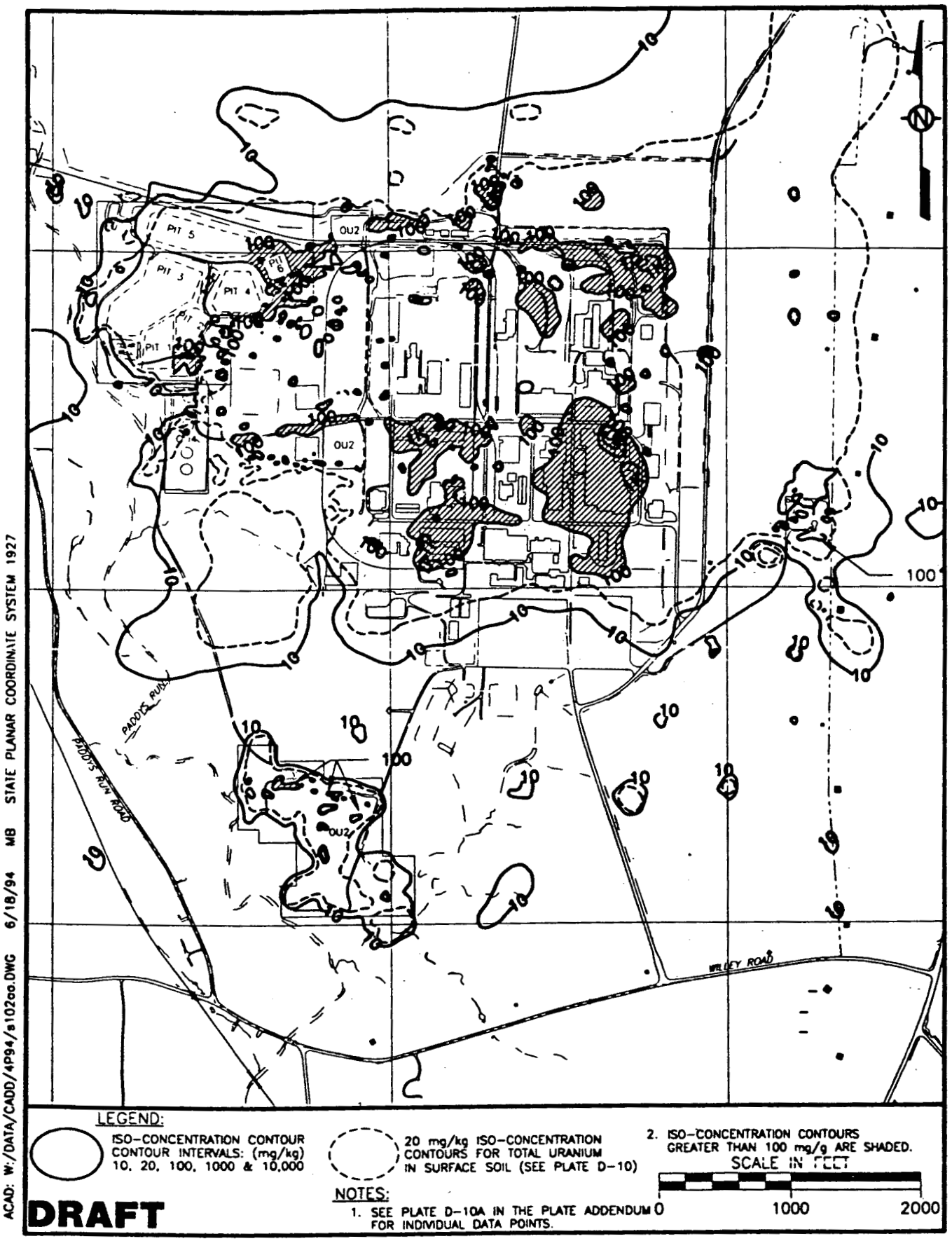


FIGURE 4-20 . VALIDATED TOTAL URANIUM, SURFACE SOIL, 0-0.5 FOOT

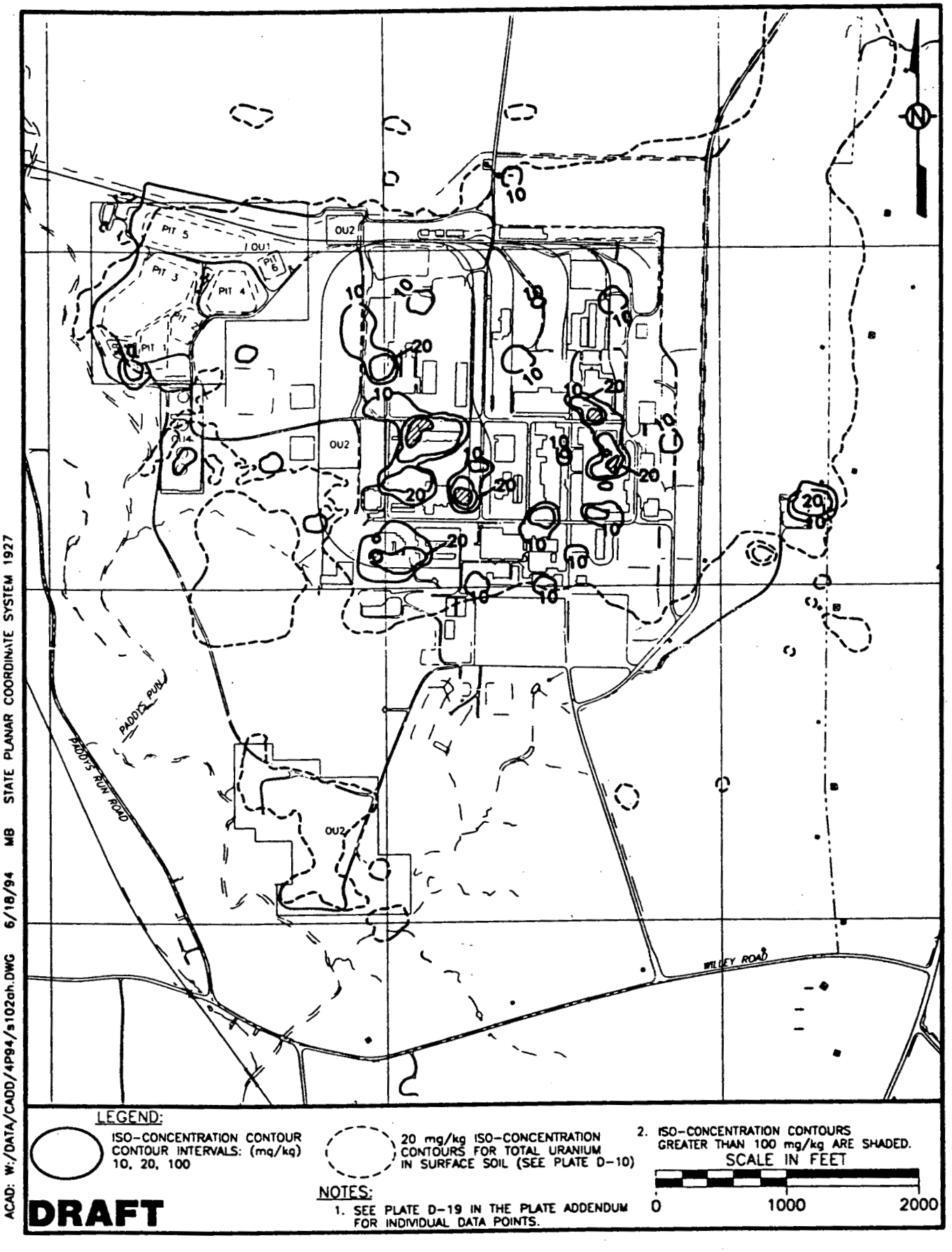


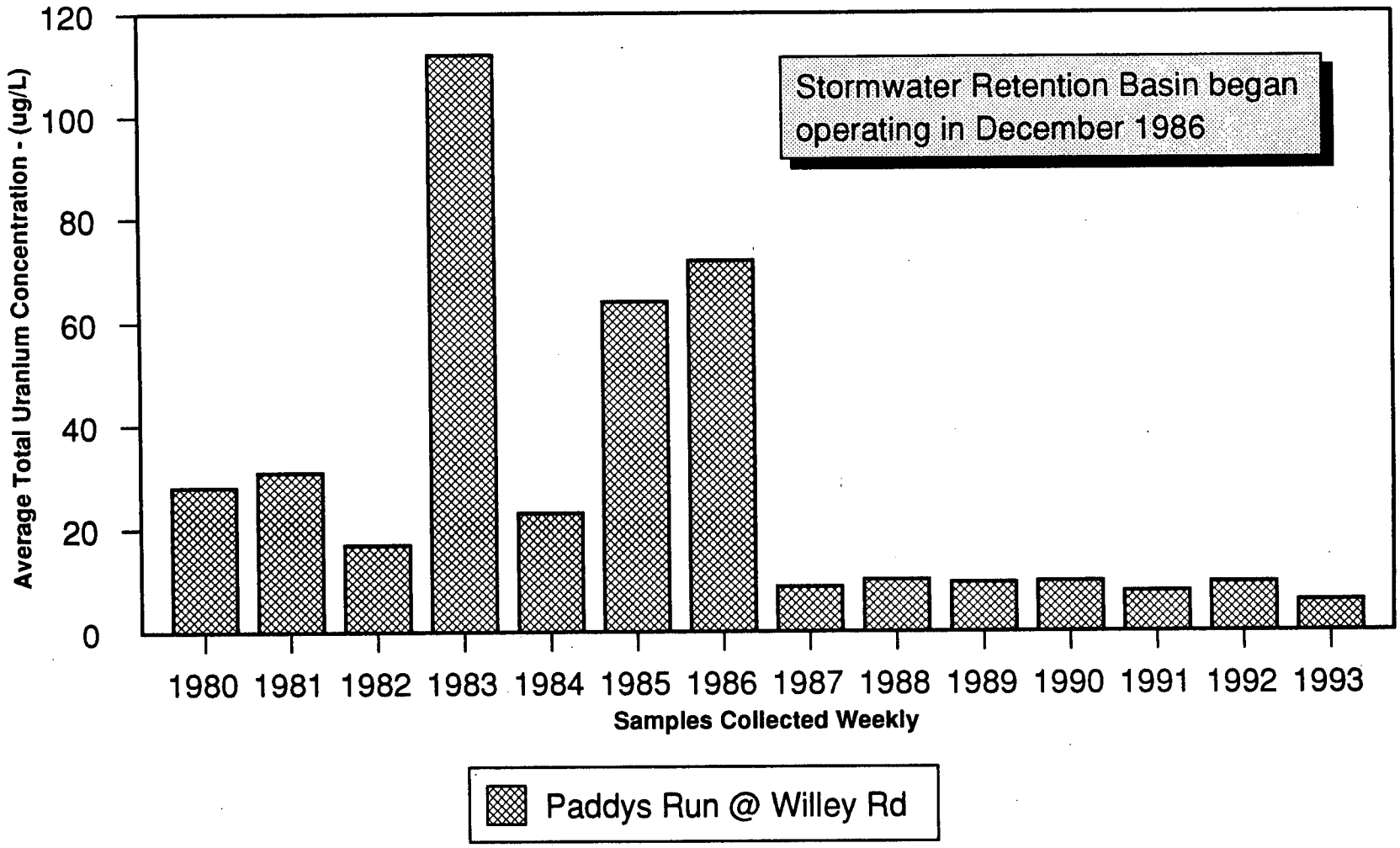
FIGURE 4-27. TOTAL URANIUM, SUBSURFACE SOIL, 15.0-20.0 FEET

Surface Water — Controlled

- Surface water runoff from the most contaminated areas of the property is controlled (production and waste storage areas)
  - Stormwater Retention Basin
  - Removal Action 16
  - Plant 1 Pad Runoff Control Project
  - Waste Pit Perimeter Runoff Control Removal Action
  - Best Management Practices

Environmental Monitoring Data

Average Total Uranium Concentrations (ug/L)



Surface Water — Uncontrolled

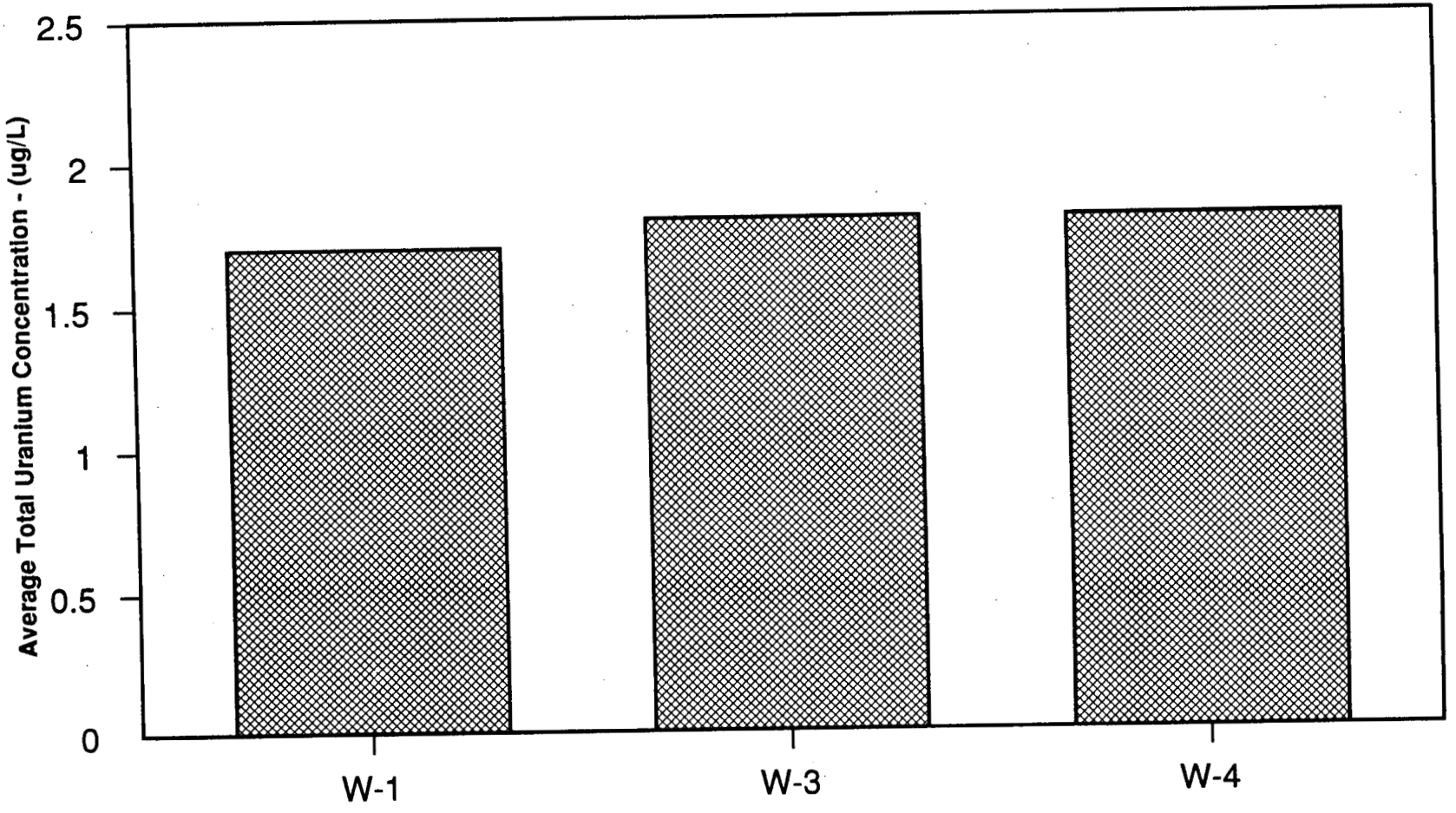
- Nearly all uncontrolled runoff is to Paddys Run — these drainages are being investigated as part of the RI/FS
- RI data, supported by Environmental Monitoring data, are used to determine nature and extent of surface water contamination
- Surface Water Model included as part of Fate and Transport Modelling efforts

Great Miami River and Paddys Run Sampling

- Characterization of Background Water Quality Report completed in May 1994
- Total uranium concentrations in the GMR slightly higher downstream of the FEMP outfall (1.8 ppb @ New Baltimore versus 1.7 ppb @ Ross (EM data for 1993, 52 weekly samples; RI data are 1.4 ppb @ Ross and 2.1 ppb near confluence of Paddys Run and the GMR)
- RI and EM total uranium data show ongoing impacts to Paddys Run from uncontrolled runoff

Great Miami River Surface Water Sampling

Average of 52 Weekly Samples Collected During 1993 - Environmental Monitoring Data



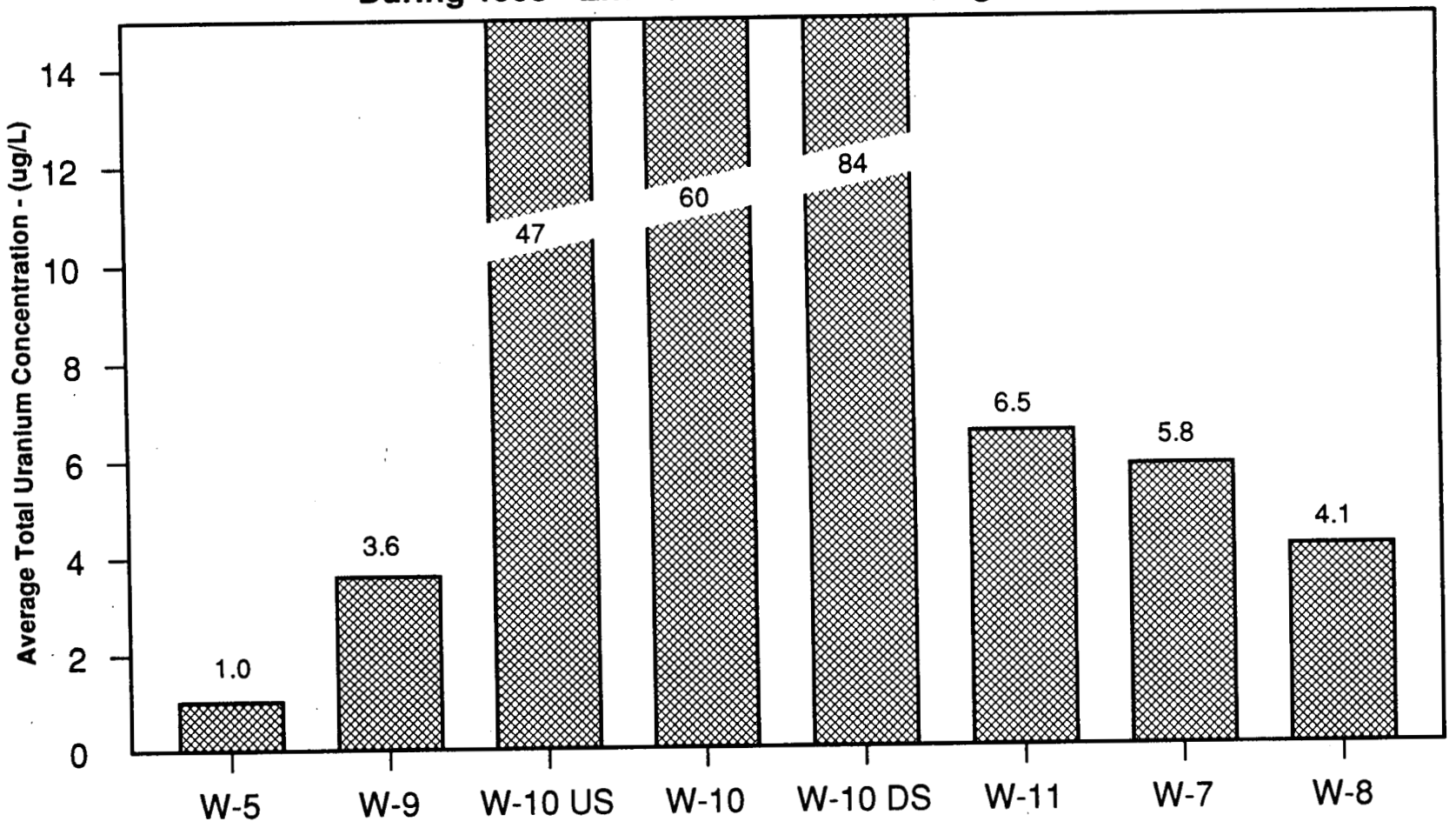
W-1 is the background sampling location.

000055

5919

Paddys Run Surface Water Sampling

Average of Weekly Samples Collected During 1993 - Environmental Monitoring Data



W-5 is the background sampling location.

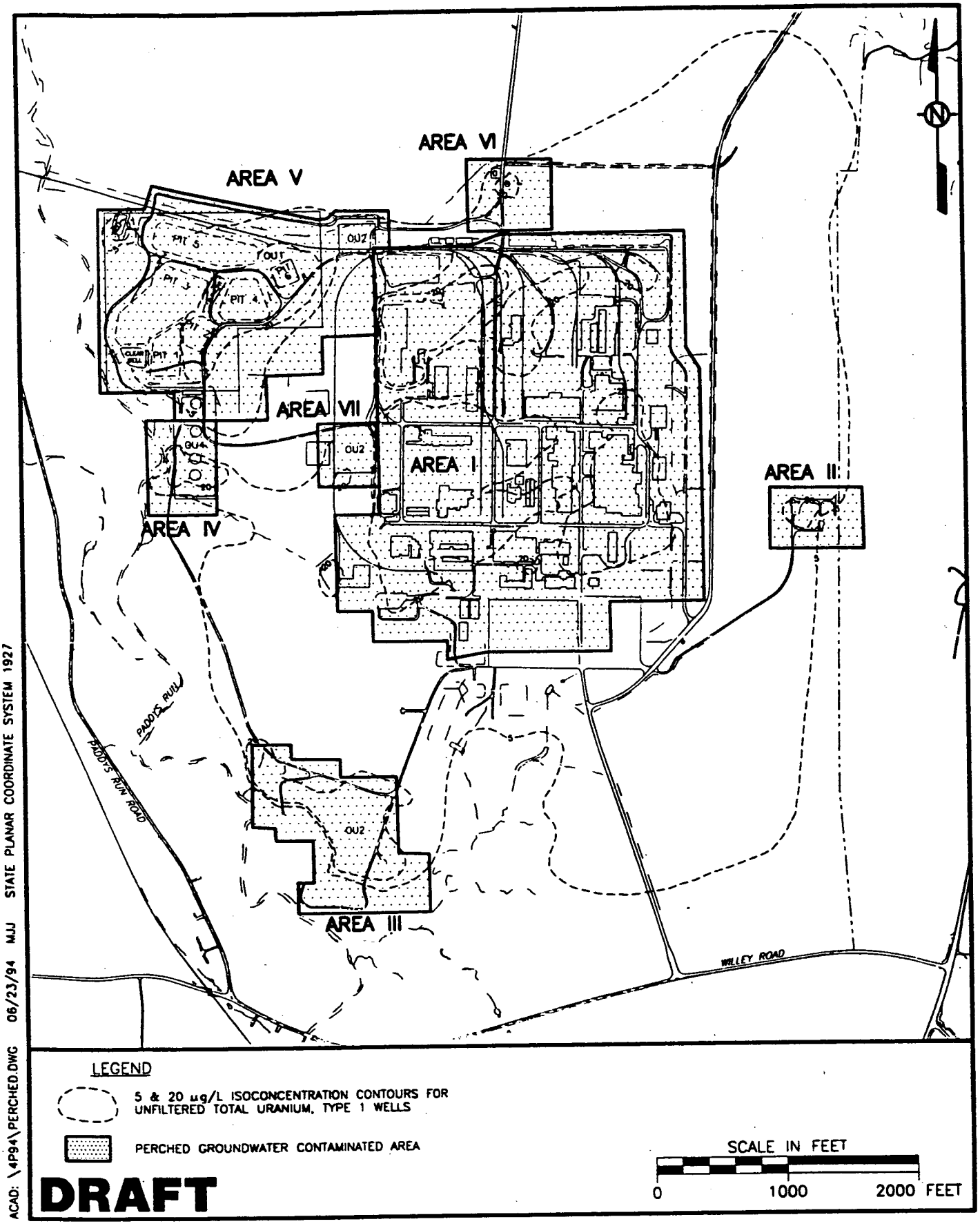


FIGURE 4-92. LOCATIONS OF PERCHED GROUNDWATER CONTAMINATED AREAS

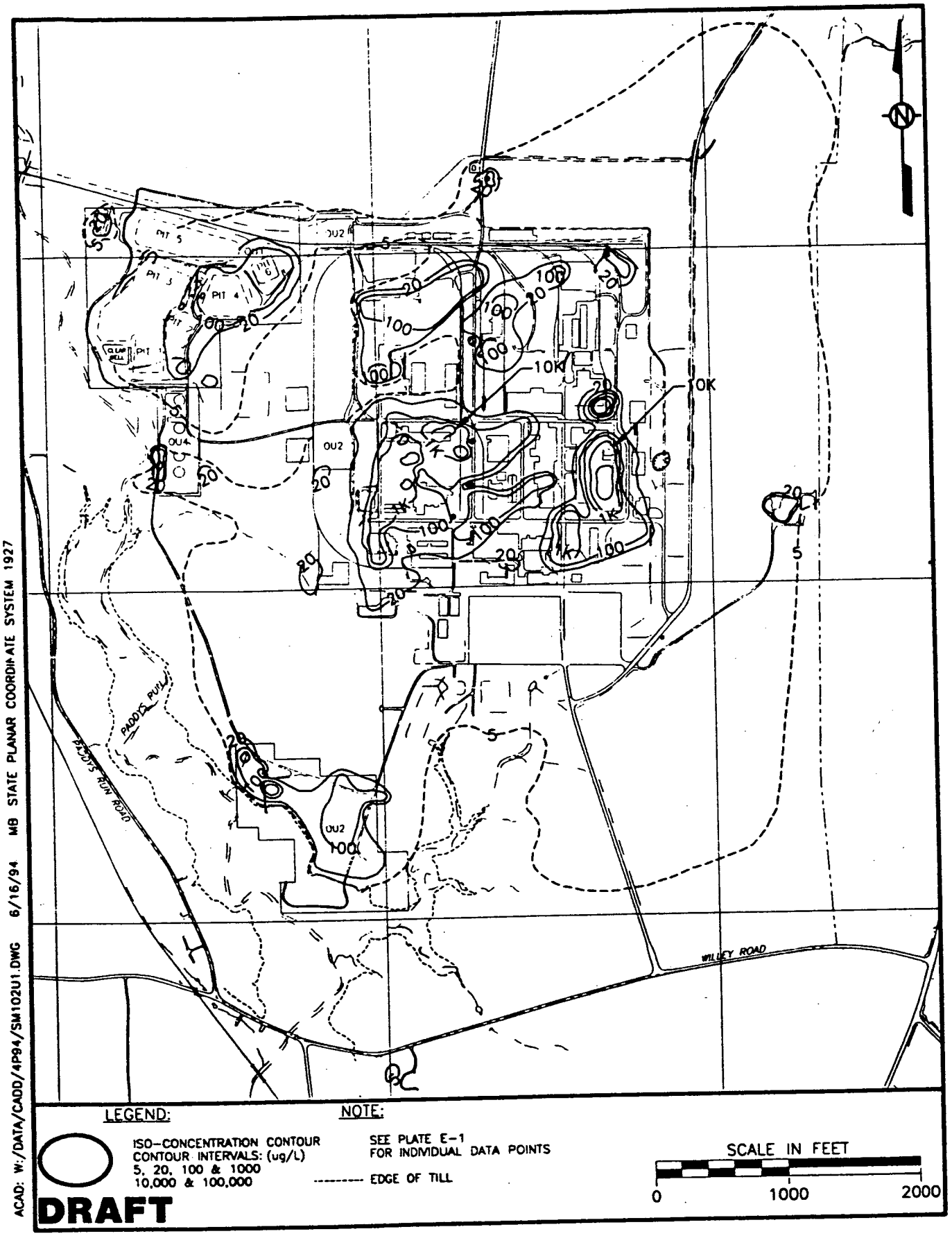


FIGURE 4-79. TOTAL URANIUM (ug/L) CONTAMINATION IN FEMP TYPE 1 WELLS - UNFILTERED SAMPLES, 1993 DATA SET

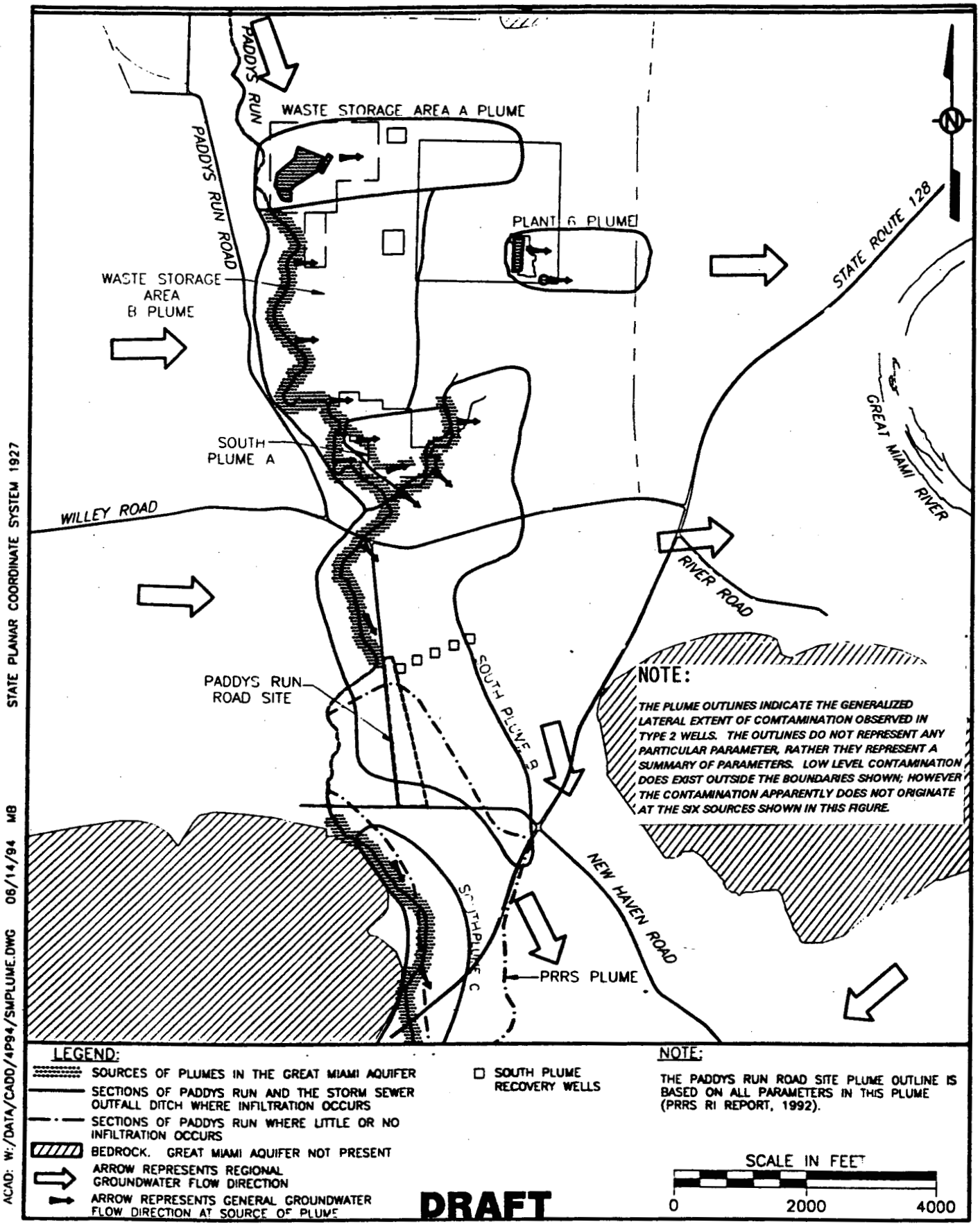


FIGURE 4-95 SCHEMATIC DEPICTION OF THE MAJOR FEMP AND PRRS PLUMES IN THE GREAT MIAMI AQUIFER

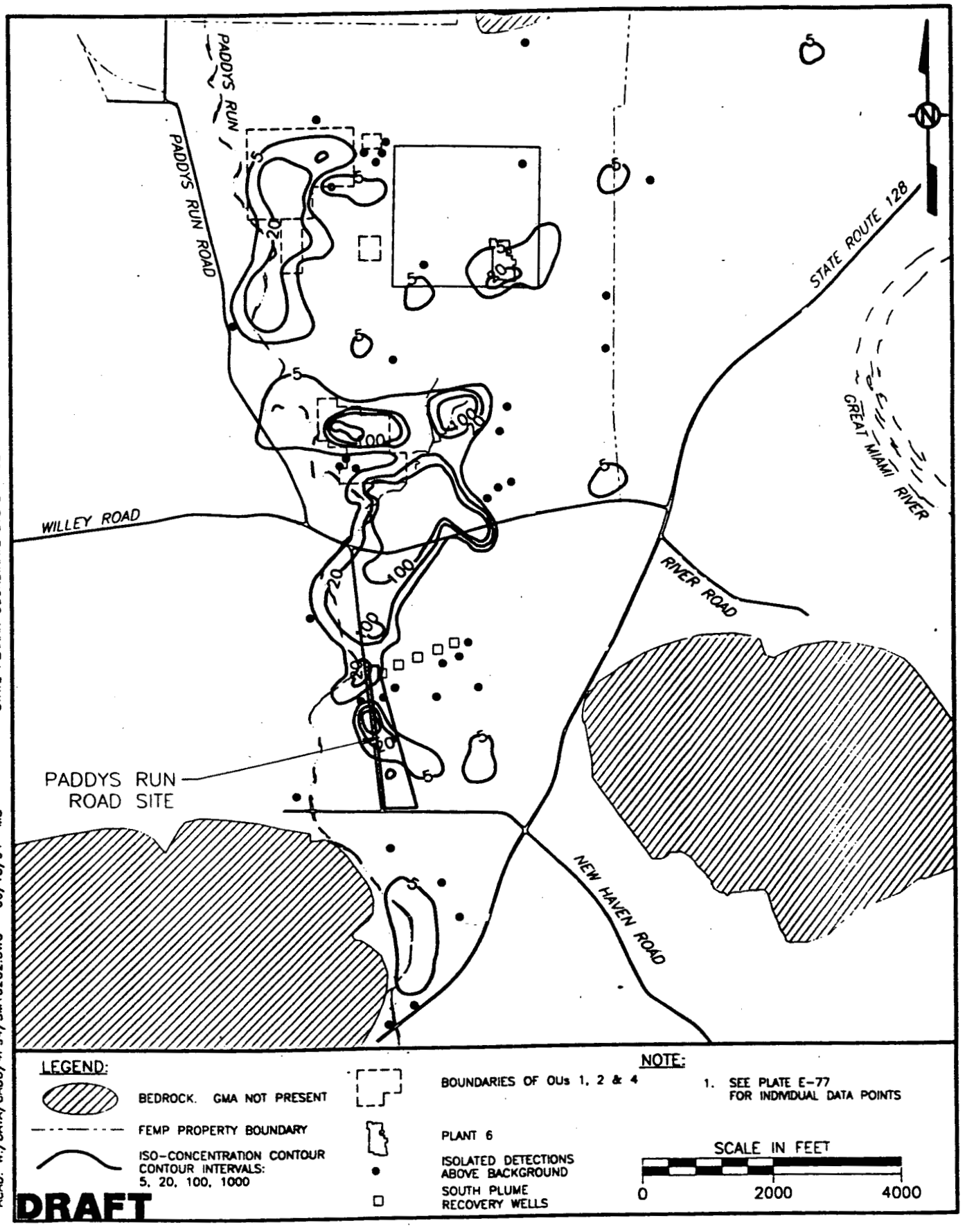


FIGURE 4-93 TOTAL URANIUM CONTAMINATION IN FEMP TYPE 2 WELLS – UNFILTERED SAMPLES, 1993 DATA SET

Status of the Operable Unit 5 RI Report

- Draft submittal to US EPA and Ohio EPA on June 24, 1994
- Comments are expected in early September triggering revision of the report to Draft Final version
- The Operable Unit 5 Draft RI report is available for review at:

  Public Environmental Information Center
  10845 Hamilton-Cleves Highway
  Harrison, OH 45030
  513-738-0164

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