FERNALD CLEANUP PROGRESS BRIEFING
JULY 2001

ENVIRONMENTAL MONITORING
2000 PROGRAM SUMMARY

Opening Remarks	Kathi Nickel
Surface Water Monitoring	Frank Johnston
Groundwater Monitoring	Bill Hertel
On-Site Disposal Facility	Bill Hertel
Air Monitoring	John Byrne
Natural Resources Monitoring	Eric Woods
Question and Answer Session	

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INTEGRATED ENVIRONMENTAL MONITORING PROGRAM

- Ensure protection of public health
- Ensure compliance with regulatory limits
- Provide assessment and continual feedback to remedial projects

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REPORTING

- Quarterly Reports – Available in Public Environmental Information Center (PEIC)
- Cleanup Progress Briefings
- Integrated Site Environmental Report –
  - Widely distributed and available in PEIC
  - Available on Internet

    (www.fernald.gov, under Environmental Monitoring)

INTEGRATED SITE ENVIRONMENTAL REPORT

Contents

- Executive Summary
- Site History and Background
- Remediation Status
- Monitoring Results
  - Groundwater
  - OSDF
  - Surface Water
  - Air Particulate
  - Radon
  - Produce
  - Dose Assessment
  - Natural Resources

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PROGRAM HIGHLIGHTS

- Decreasing uranium concentrations in groundwater
- OSDF performing as designed
- No exceedances of uranium surface water Final Remediation Levels (FRL)
- Increased air particulate emissions compared to 1999

PROGRAM HIGHLIGHTS (cont.)

- Dose from air particulates – 1.1 millirem
  - Similar dose expected for year 2001
- Radon levels well below 3 pCi/L fenceline limit
- Produce sample indicate no significant impact from Fernald emissions
- All pathway year 2000 dose – 11.2 at nearest receptor living in the west – southwest direction
  - Similar dose expected for year 2001

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Controlled Surface Water Areas and Uncontrolled Runoff Flow Directions

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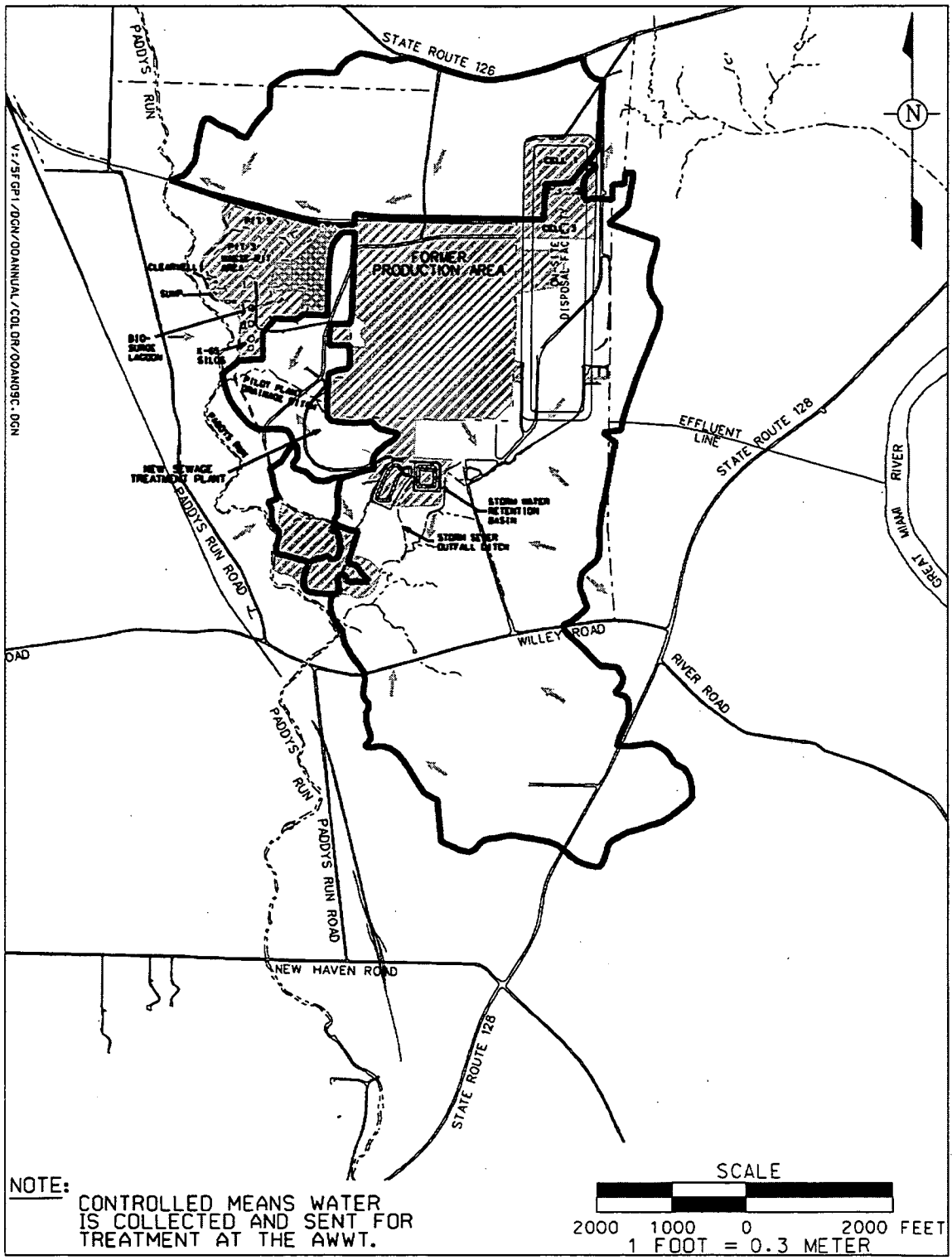

NOTE: CONTROLLED MEANS WATER IS COLLECTED AND SENT FOR TREATMENT AT THE AWWT.

LEGEND:

- FEMP BOUNDARY
- DRAINAGE BASIN BOUNDARY
- UNCONTROLLED RUNOFF FLOW DIRECTION
- CONTROLLED AREA
- WATER TREATED IF TOTAL URANIUM RESULT IS >20 $\mu g/L$

1

SURFACE WATER/TREATED EFFLUENT

Uranium Released

- 1998: 521 pounds
- 1999: 419 pounds
  - Change in loading term
  - Decreased rainfall
  - Increased volume of extracted groundwater
- 2000: 376 pounds
  - 252 via treated effluent to Great Miami River
  - 116 via uncontrolled runoff to Paddys Run
  - 8 via Storm Water Retention Basin (SWRB) overflow

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Surface Water and Treated Effluent Sampling Locations

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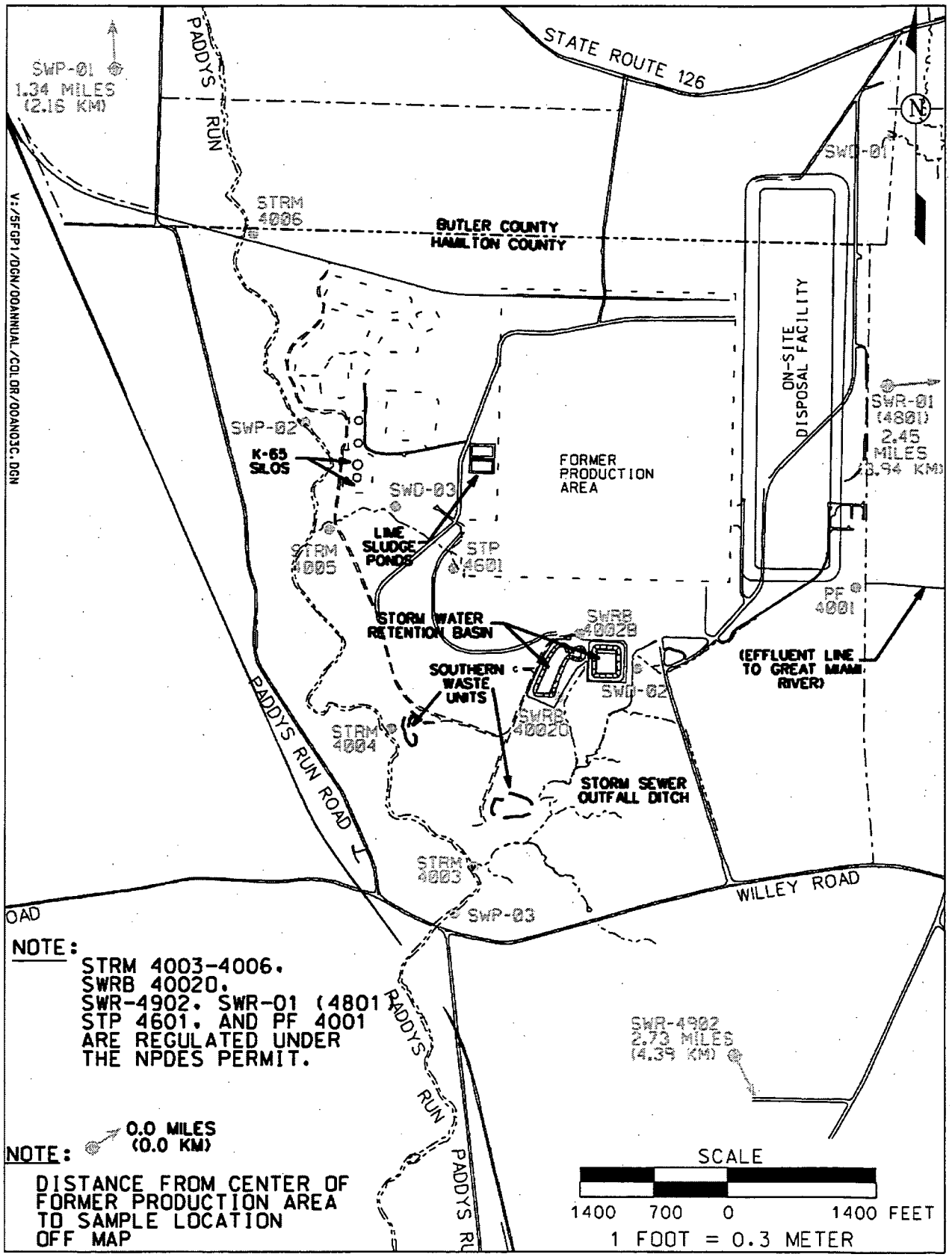

NOTE:
STRM 4003-4006,
SWRB 40020,
SWR-4902, SWR-01 (4801
STP 4601, AND PF 4001
ARE REGULATED UNDER
THE NPDES PERMIT.

NOTE: 0.0 MILES (0.0 KM)
DISTANCE FROM CENTER OF
FORMER PRODUCTION AREA
TO SAMPLE LOCATION
OFF MAP

LEGEND:

FEMP BOUNDARY

SAMPLE LOCATION

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SURFACE WATER/TREATED EFFLUENT
Final Remediation Level Exceedances

	1998	1999	**2000**
Surface Water FRL Exceedances for all Constituents	12	2	**9**
Surface Water Benchmark Toxicity Value Exceedances for all Constituents	3	0	**1**
Surface Water Exceedances of Groundwater Total Uranium FRL	7	2	**15**

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SURFACE WATER/TREATED EFFLUENT
National Pollutant Discharge Elimination System (NPDES) Compliance

- 1998 Compliance Rate: 98.5 percent
- 1999 Compliance Rate: 99.5 percent
- 2000 Compliance Rate: 99.8 percent
  - 3 at location 4001 (Parshall Flume)
  - 1 at location 40020 (SWRB Overflow)
  - 6 at location 4601 (Sewage Treatment Plant Effluent)

CHANGES FOR 2001 AND 2002

Surface Water Monitoring

- Prepare for the NPDES permit renewal application due in May 2002
- Review background data to determine if surface water background concentrations should be revised

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GROUNDWATER MONITORING
2000 Program Changes

- Began operating two new extraction wells in the South Field (11 total)
- Increased pumping rates of key extraction wells
- Adopted groundwater re-injection as part of the remedy
- Significantly revised the designs for aquifer restoration modules in the waste storage area and Plant 6 area

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GROUNDWATER MONITORING
Operational Summary

	1999		2000	
	Planned	Actual	Planned	Actual
Gallons Pumped from Great Miami Aquifer	1,787M	1,700M	1,787M	1,879M
Gallons Re-injected	526M	433M	526M	299M
Uranium Removed from Great Miami Aquifer	776 lbs	698 lbs	792 lbs	845 lbs

Graphics # 7074.12 7/01

Current Extraction and Re-Injection Wells for the Enhanced Groundwater Remedy

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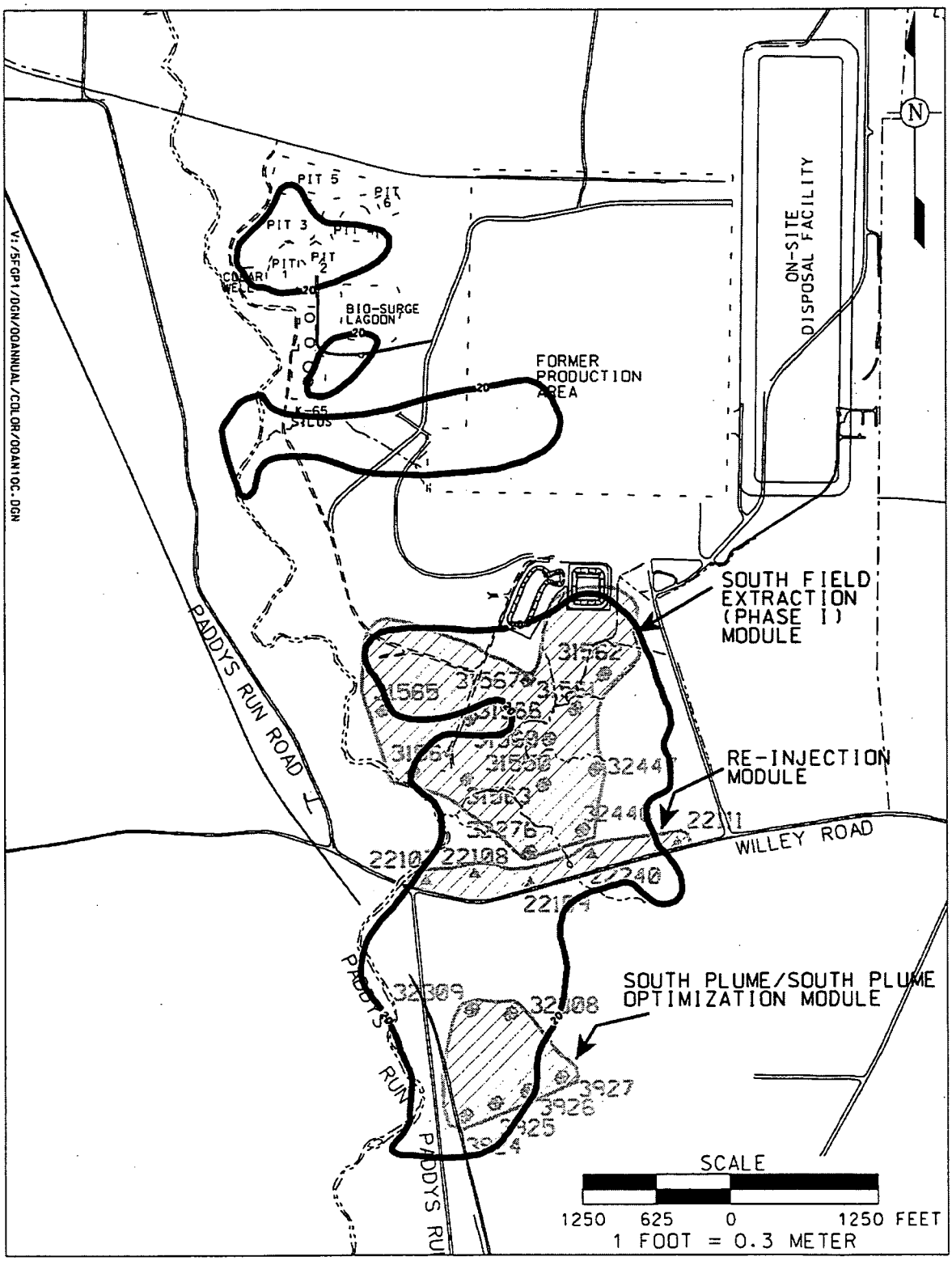

LEGEND:

- FEMP BOUNDARY
- EXTRACTION WELL
- RE-INJECTION WELL
- CURRENT ACTIVE MODULE AREA
- 20 $\mu g/L$ TOTAL URANIUM PLUME

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GROUNDWATER MONITORING

Changes to Plume Interpretation

- Beneath the former inactive flyash pile uranium concentrations continue to decrease due to:
  - Surface source removal
  - Infiltrating surface water
  - Pumping extraction wells

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Total Uranium Plume, Third Quarter 2000

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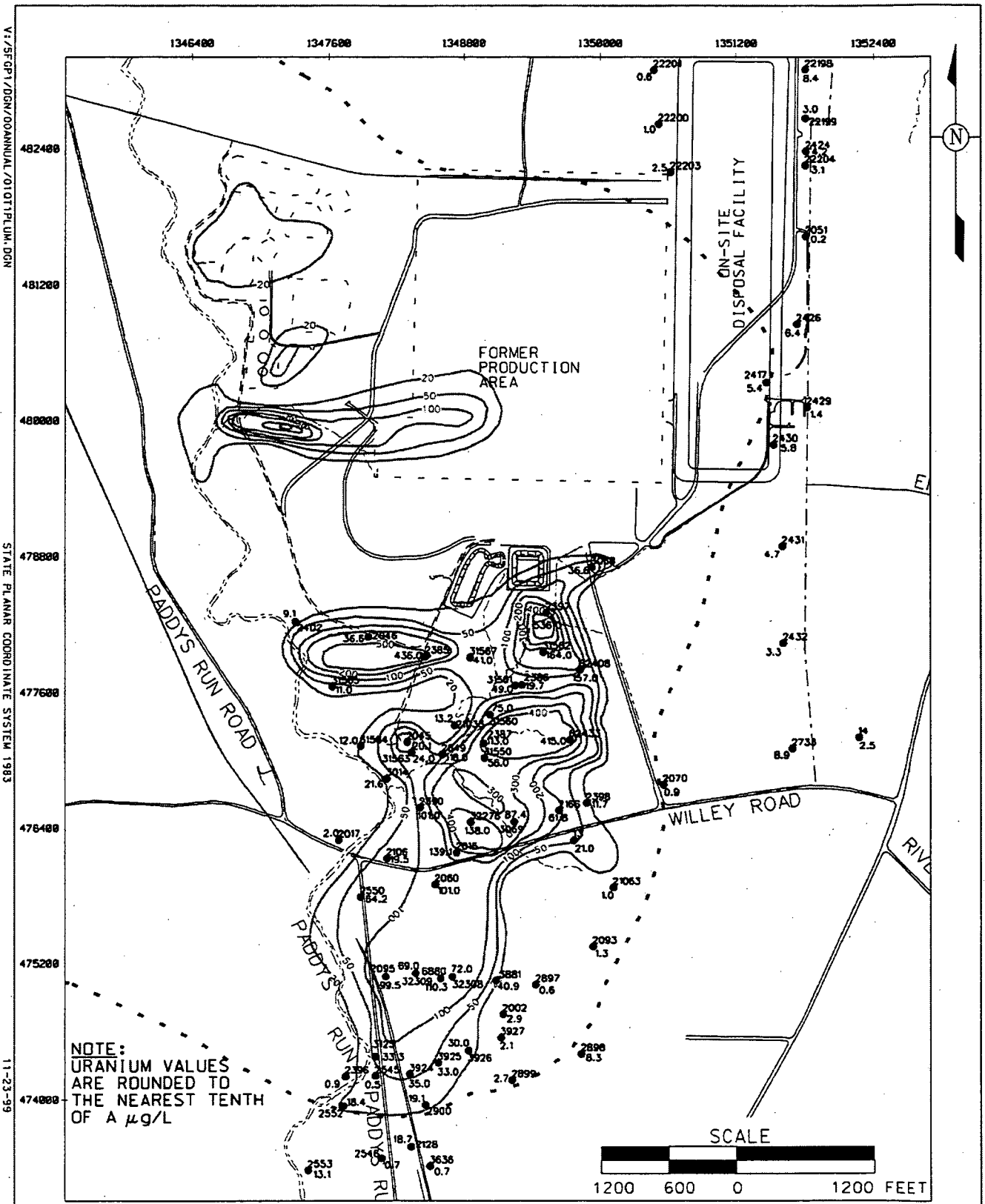

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Total Uranium Plume, Fourth Quarter 2000

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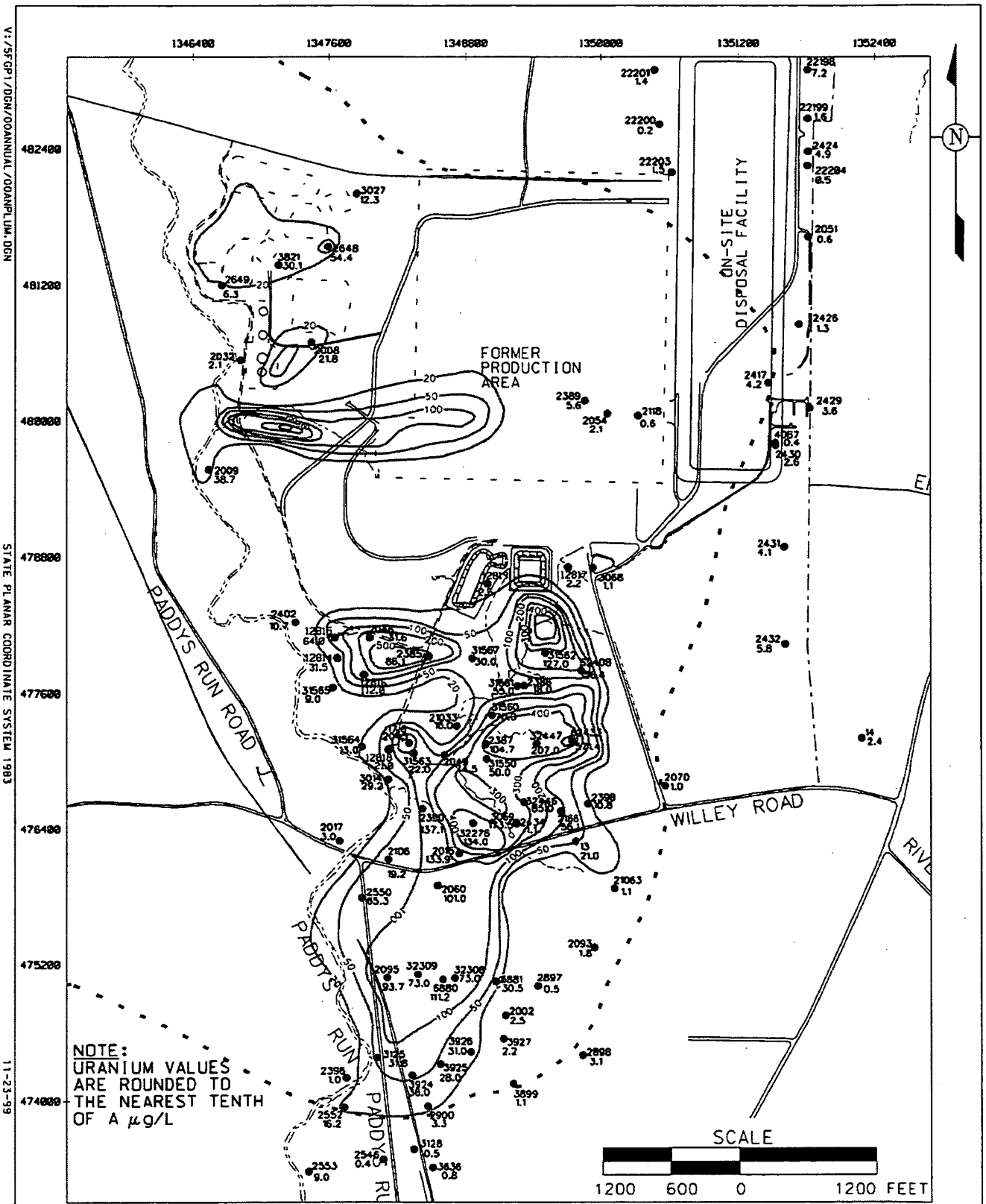

LEGEND:

2553● MONITORING WELL OR GEOPROBE LOCATION

5.1 TOTAL URANIUM CONCENTRATION MEASURED IN FOURTH QUARTER 2000

CONTOUR CHANGES BASED ON NEW MAXIMUM FOURTH QUARTER 2000 DATA

FEMP BOUNDARY

50 MAX TOTAL URANIUM CONTOUR IN µg/L FROM BASELINE MODIFIED QUARTERLY

10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT (BRSR 1997)

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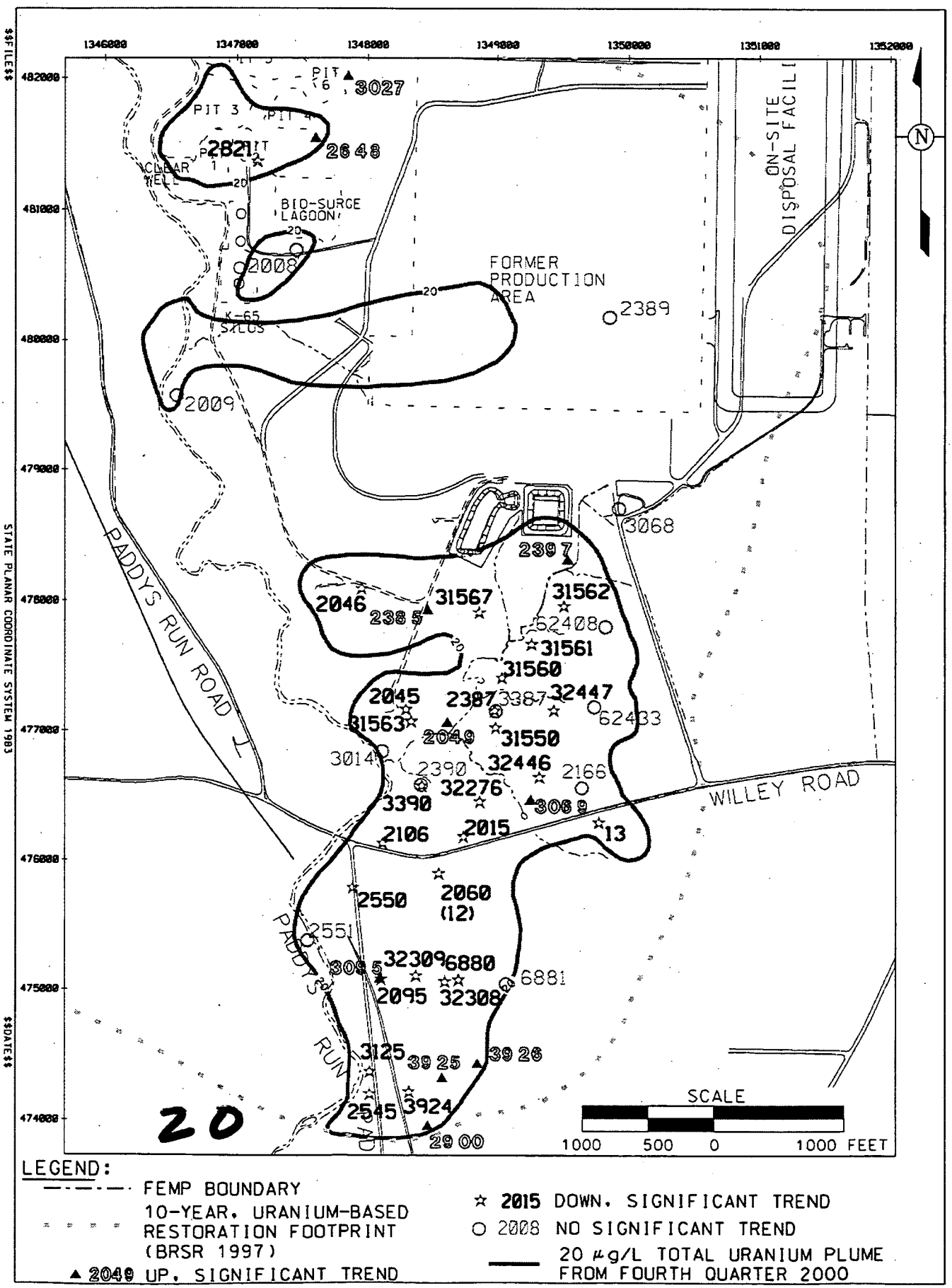
GROUNDWATER MONITORING
Changes to Plume Interpretation (cont.)

- Remediation response along eastern edge of South Field plume:
  - Less than expected
- Need for an additional extraction well in the South Field

Graphics # 7074.14 7/01

Wells with 2000 FRL Exceedances for Total Uranium



LEGEND:

- FEMP BOUNDARY
- 10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT (BRSR 1997)
- ▲ 2049 UP, SIGNIFICANT TREND
- ☆ 2015 DOWN, SIGNIFICANT TREND
- ○ 2008 NO SIGNIFICANT TREND
- 20 μg/L TOTAL URANIUM PLUME FROM FOURTH QUARTER 2000

GROUNDWATER MONITORING
Groundwater Re-Injection

- June of 2000: Residual plugging of individual re-injection wells began to increase more rapidly
- Second half of 2000: Individual well treatments became more aggressive to counter the increased rate of residual plugging
- Currently: Four of five wells are down due to residual plugging
  - Outside experts and site personnel are evaluating the situation

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GROUNDWATER MONITORING

Changes for 2002 and 2003 Groundwater Monitoring

- Conduct additional direct-push sampling
  - South Field Phase II Module – pre-design
  - Remedy performance monitoring
- Install additional monitoring wells
- Update monitoring to reflect any new FRL exceedances
- Remove wells that have been plugged and abandoned from monitoring list

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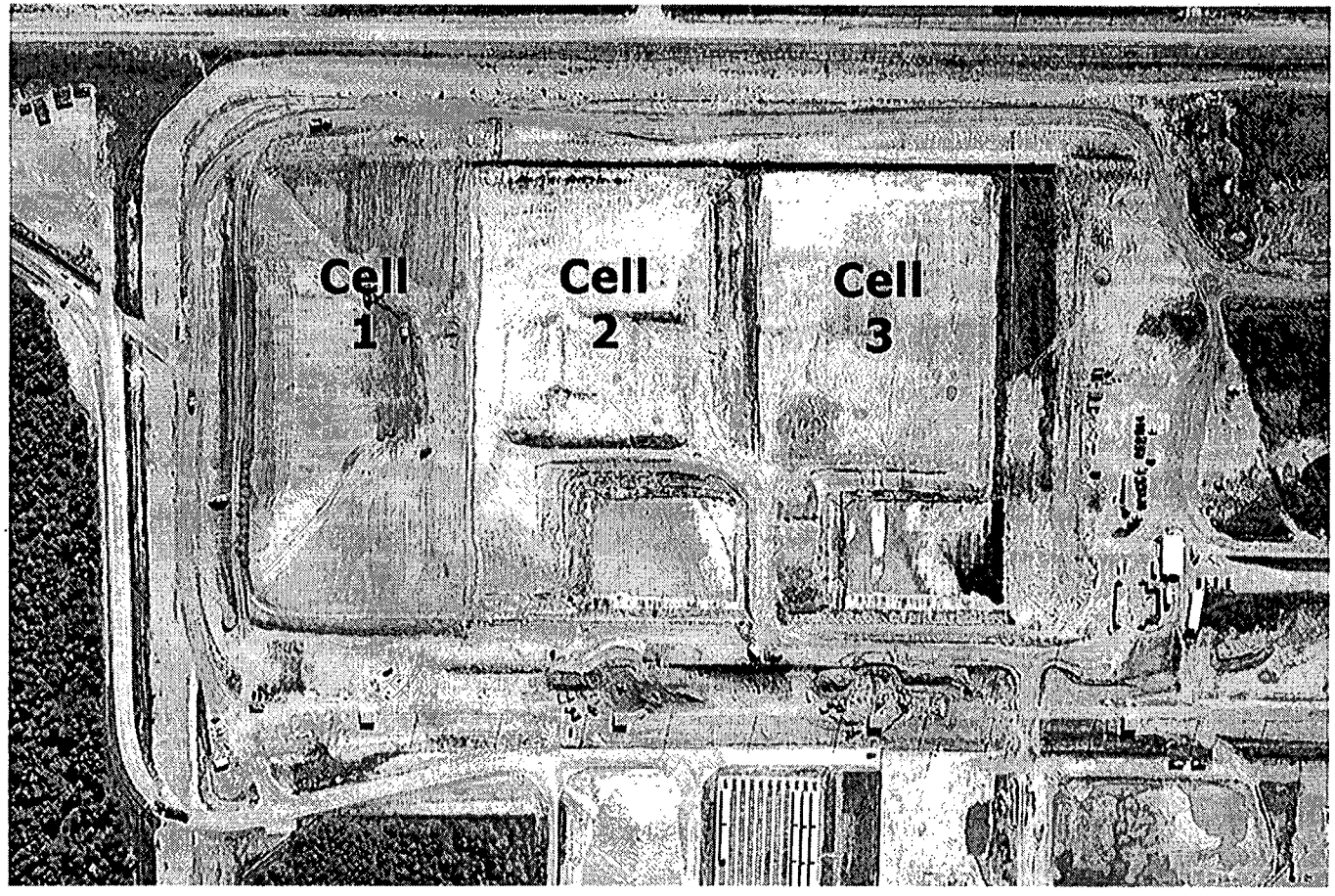
ON-SITE DISPOSAL FACILITY



June 2001

23

Graphics # 7074.17 7/01 Photo # 7619-7

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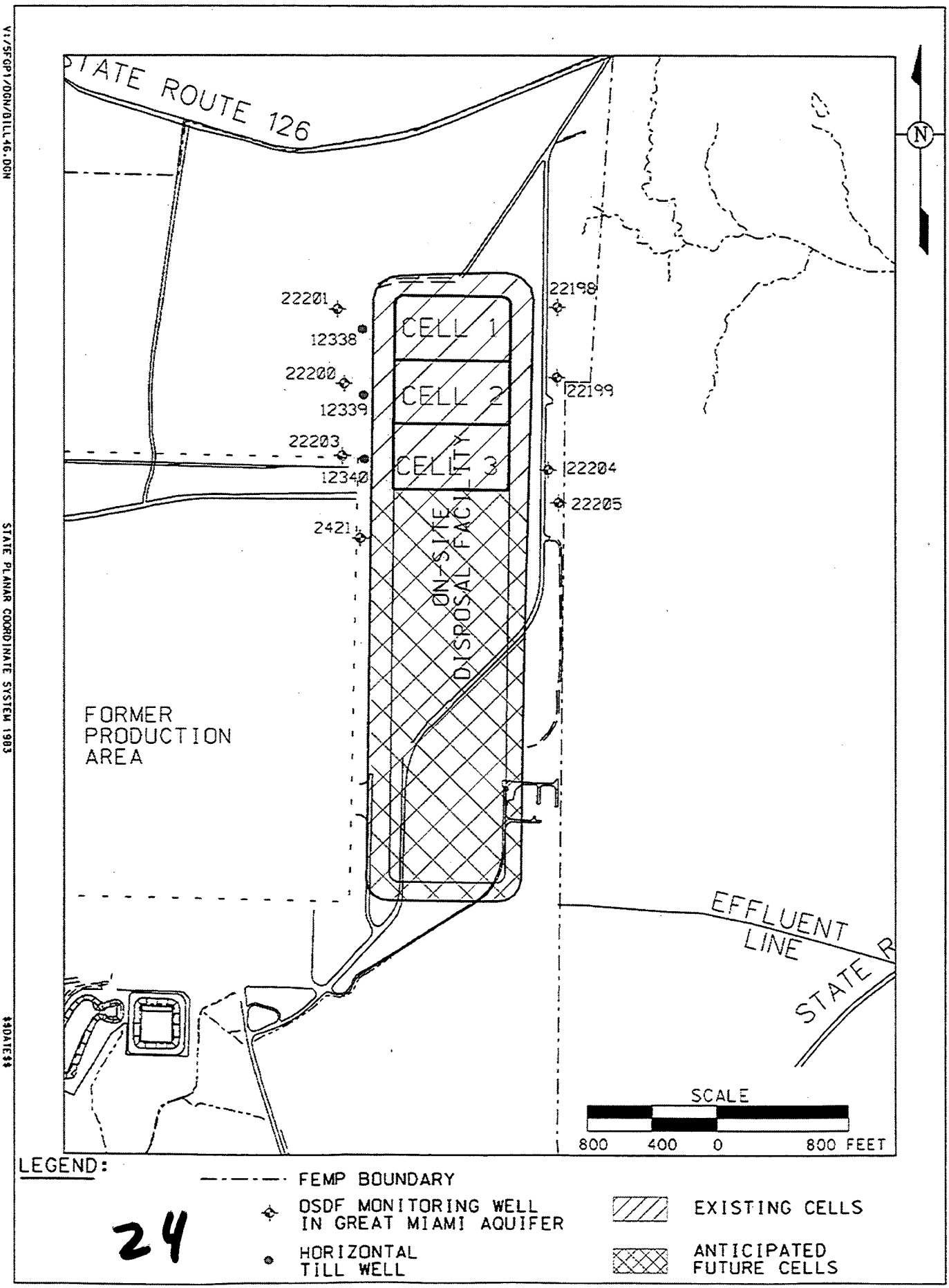
OSDF Footprint and Monitoring Locations



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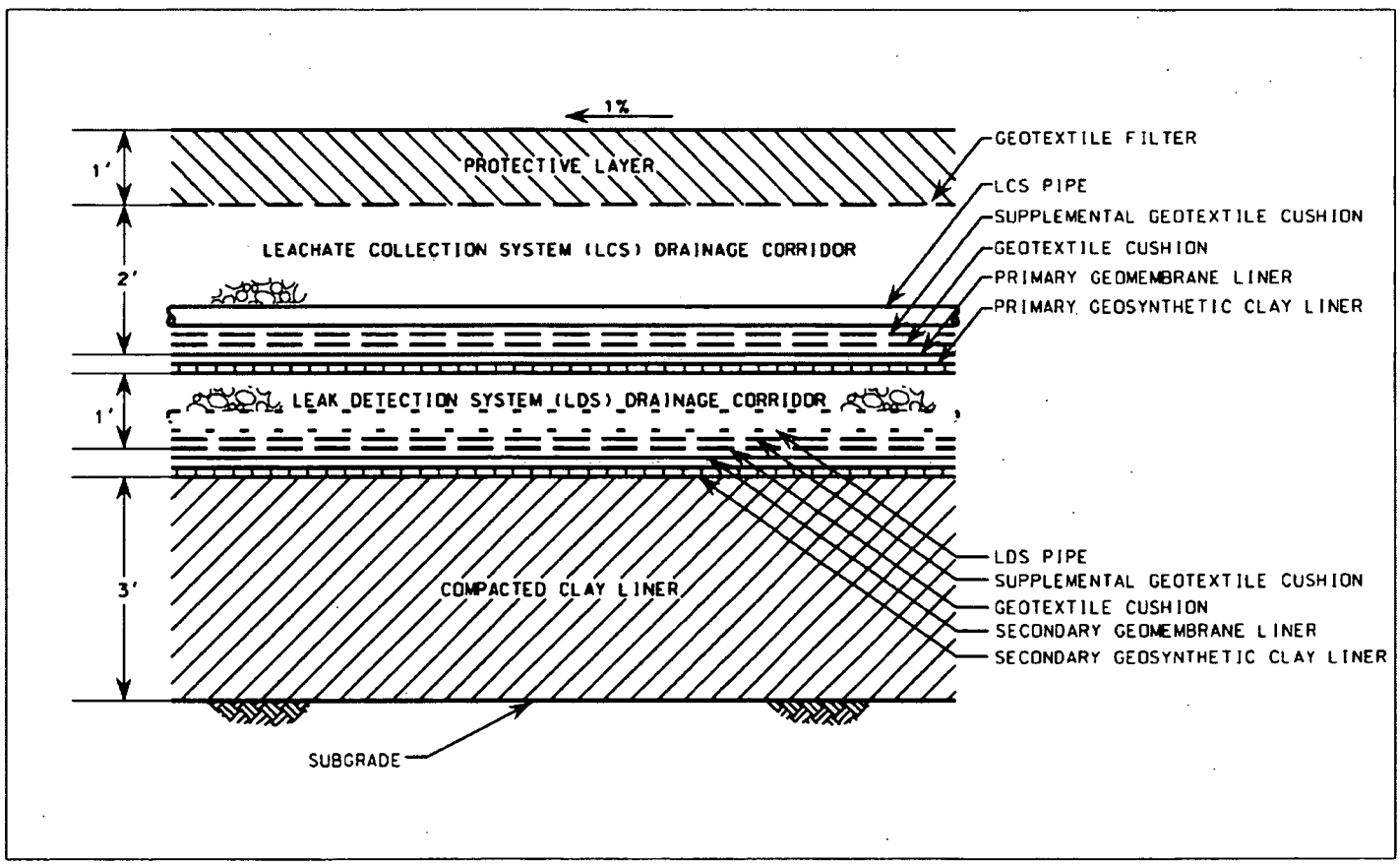
On-Site Disposal Facility Liner System at the Drainage Corridor



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$$DATE$$

25

ON-SITE DISPOSAL FACILITY (OSDF) MONITORING
Cell 1

- 100 percent filled
- Leachate Collection System total uranium concentrations
  - 1998: 47 to 119 parts-per-billion (ppb)
  - 1999: Not detected to 102 ppb
  - 2000: 50 to 106 ppb
- Leak Detection System total uranium concentrations
  - 1998: 1.5 to 13.7 ppb
  - 1999: 11.4 to 20.7 ppb
  - 2000: 6.0 to 15.4 ppb
- Leak Detection System Accumulation Rate (gallons-per-acre-per-day [gpad]):
  - Maximum = 0.57
  - Minimum = 0.01
  - Average = 0.19
- Initial Response Leakage Rate: 20 gpad

Graphics # 7074.18 7/01

OSDF MONITORING
Cell 2

- 51 percent filled
- Leachate Collection System total uranium concentrations
  - 1998: 17 ppb
  - 1999: 4.5 to 22.7 ppb
  - 2000: 23.8 to 39.3 ppb
- Leak Detection System total uranium concentrations
  - 1998: 71 ppb
  - 1999: 12 to 50 ppb
  - 2000: 9.3 to 24.8 ppb
- Leak Detection System Accumulation Rate:
  - Maximum 2.2 gpad declined to less than 0.2 gpad by October and remained below 0.2 gpad for the remainder of the year
- Initial Response Leakage Rate: 20 gpad

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Graphics # 7074.19 7/01

OSDF MONITORING
Cell 3

- 24 percent filled
- Leachate Collection System total uranium concentrations
  - 1999: 9.3 to 11.5 ppb
  - 2000: 9.3 to 37.9 ppb
- Leak Detection System
  - 1999: dry
  - 2000: dry
- Initial Response Leakage Rate: 20 gpad

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AIR MONITORING PROGRAM

- Particulate
- Produce
- Radon
- Direct Radiation

AIR MONITORING PROGRAM
Particulate Monitoring

- From air particulate emissions: 1.1 mrem (0.29 mrem in 1999)
- Maximum dose at AMS-3 (east fenceline)
- 11 percent of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) limit

Graphics # 7074.22 7/01

AIR MONITORING PROGRAM
Particulate Monitoring

- General increase in Thorium-230 concentrations at fenceline in 2000
- Initiated biweekly thorium analysis at all fenceline locations in October 2000

31

Graphics # 7074.23 7/01

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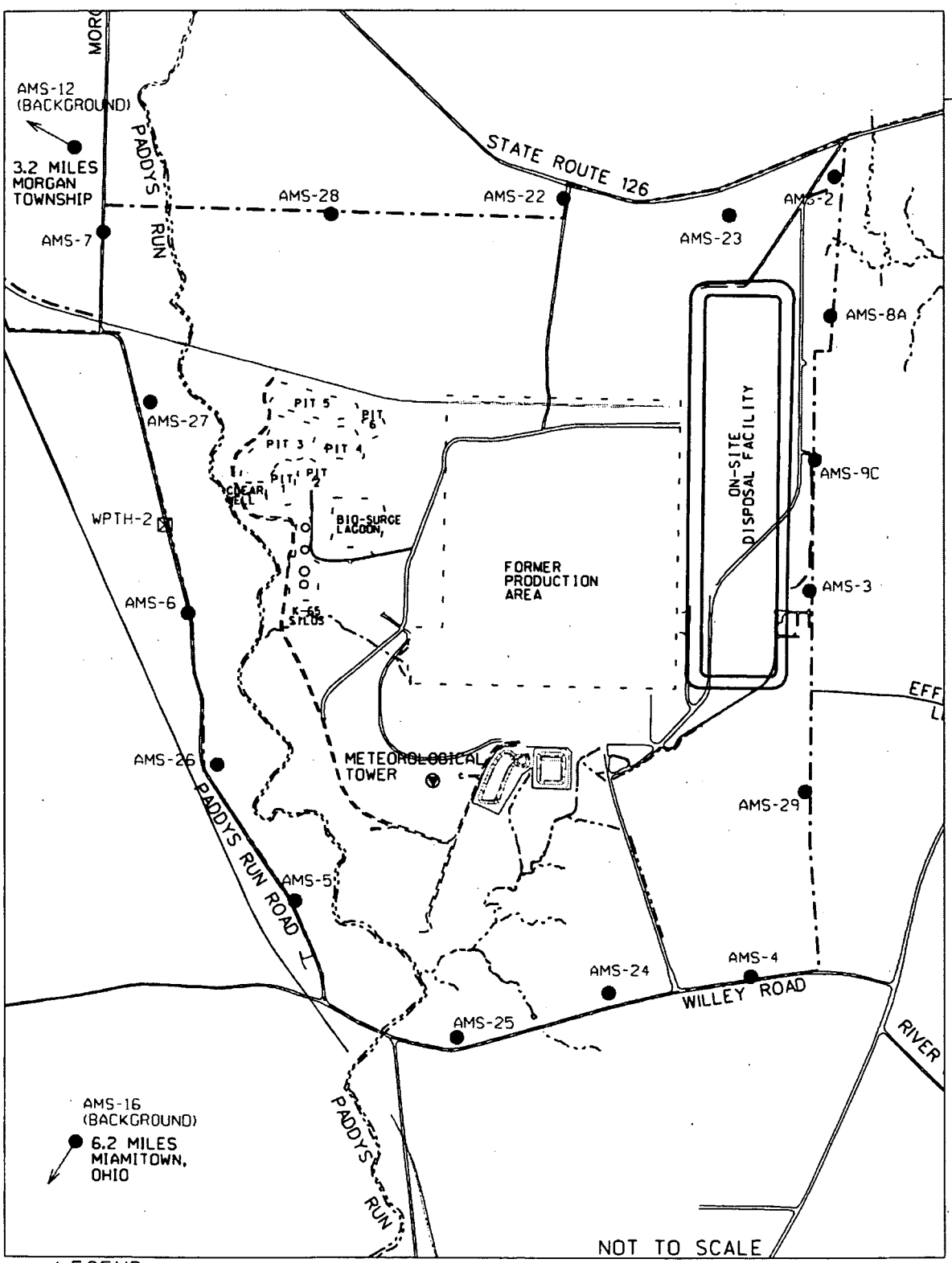
Radiological Air Monitoring Locations



LEGEND:

FEMP BOUNDARY

AMS LOCATION

DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO AMS LOCATION OFF MAP

THORIUM MONITOR LOCATION

32

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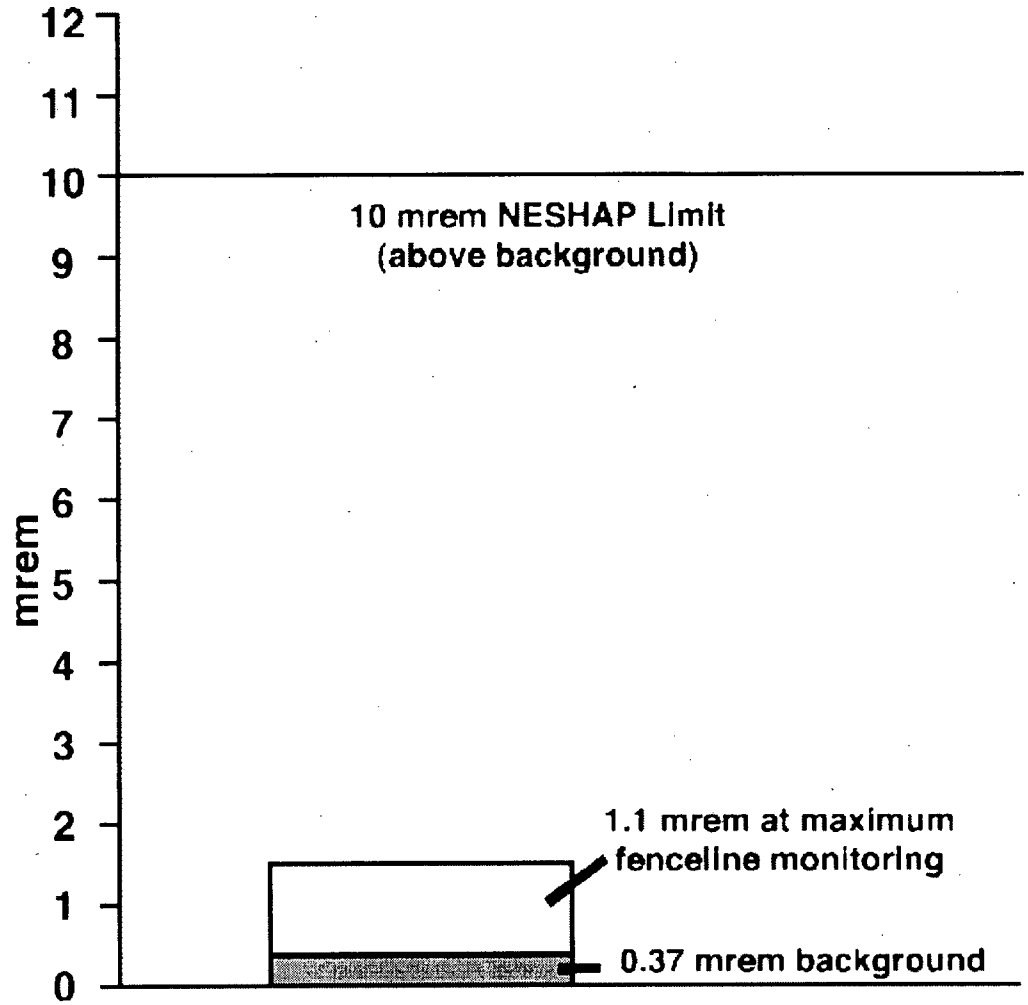
11-24-99

AIR INHALATION DOSE COMPARISON TO LIMIT AND BACKGROUND



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AIR MONITORING PROGRAM
Particulate Monitoring

- Fenceline monitoring results reported to Waste Pits Remedial Action Project (WPRAP)
- Material Handling Building operations is the largest contributor
- WPRAP has implemented operational controls to limit emissions and decrease project impacts at the fenceline
- AMS-3 concentrations, if sustained for the year, could result in a year 2001 dose of approximately 1.0 mrem, or 10 percent of the NESHAP limit

Graphics # 7074.25 7/01

AIR MONITORING PROGRAM
Produce Monitoring

- Monitoring performed once every three years according to the Integrated Environmental Monitoring Program (IEMP)
- Thorium, Radium-226 and Radium-228 added to program in 2000 (in addition to uranium)
- Uranium results were comparable to historical background concentrations
- Radium-226 and Radium-228 were not detected
- Thorium-230 was not consistently detected
- Results suggest that there is no substantial impact on produce from past or current Fernald emissions

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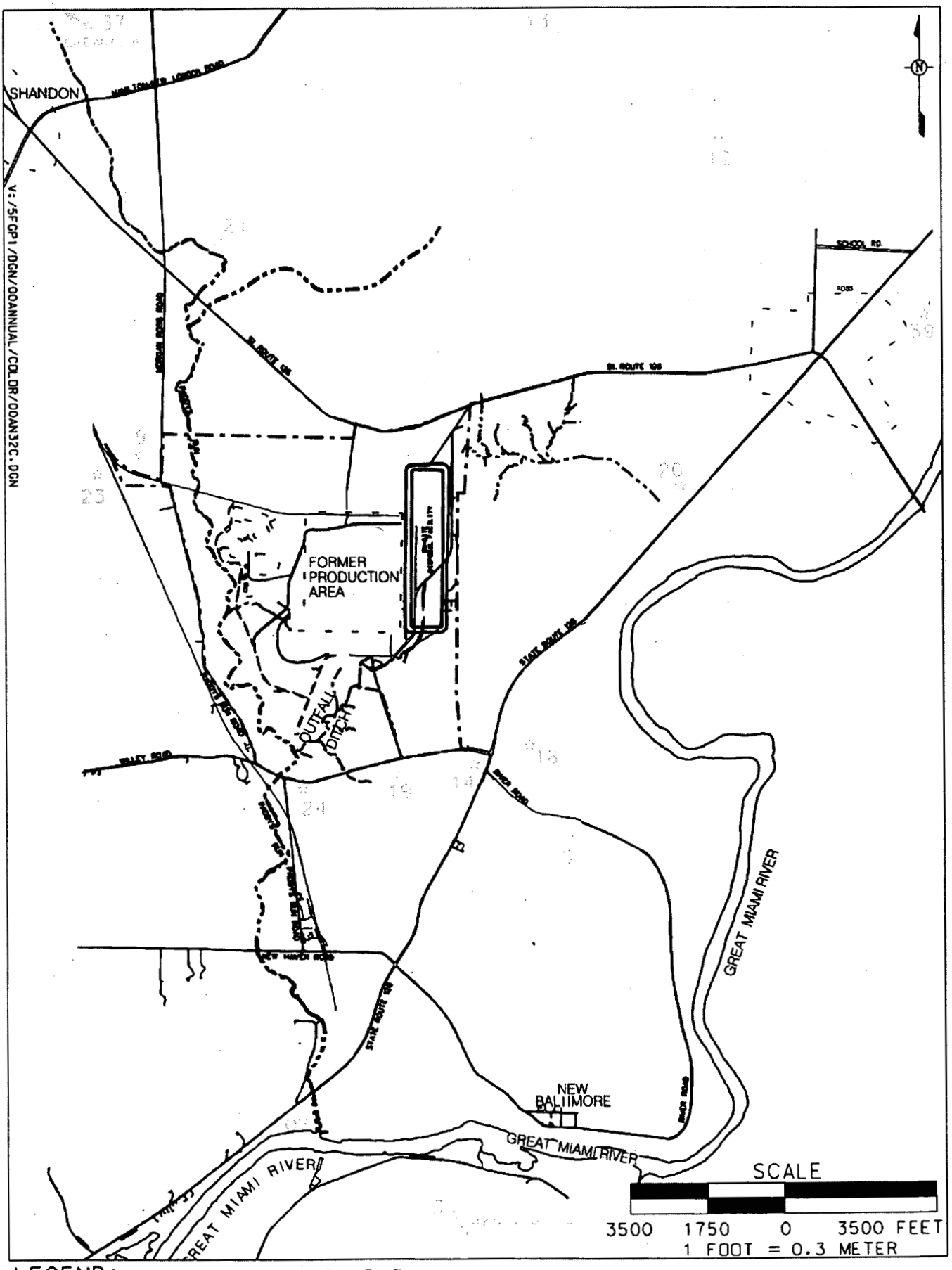
Produce Monitoring Locations



LEGEND: - - - - - - - FEMP BOUNDARY

36 SINGLE MONITORING LOCATION

DISTANCE FROM FORMER PRODUCTION AREA TO MONITORING LOCATIONS OFF MAP

AIR MONITORING PROGRAM
Radon Monitoring

- Utilized continuous radon monitors (34 locations)
- Radon concentrations at Silos project area exhibited lower concentrations than in 1999
- Decrease reflects the resealing of the Silos in June of 1999
- Radon levels inside Silos 1 & 2 continue to increase
- Property line results were well below the DOE standard (3 pCi/L as an annual average above background)
- Radon at property line ranged from 0.2 – 0.6 pCi/L

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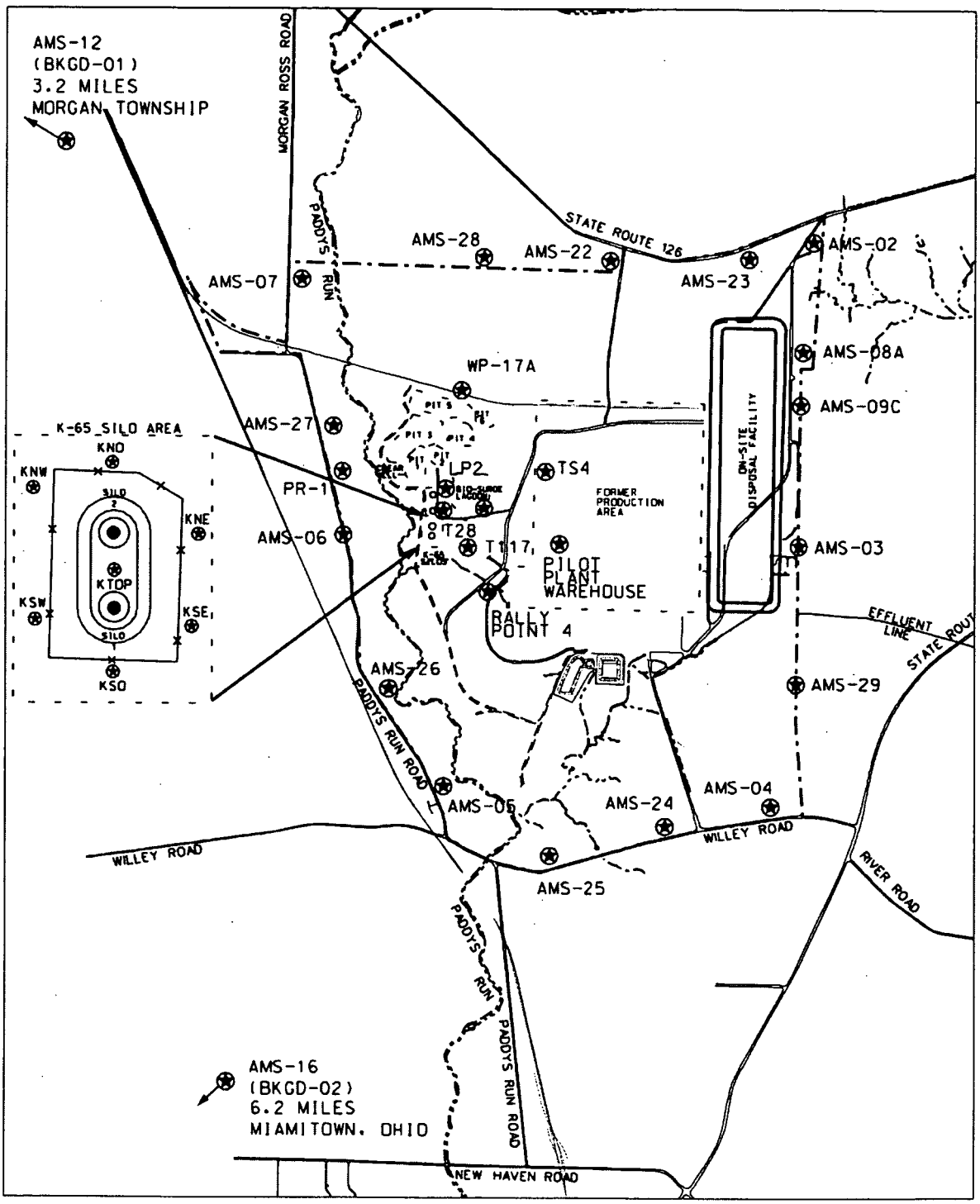
Graphics # 7074.27 7/01

Continuous Alpha Scintillation Locations



LEGEND:

FEMP BOUNDARY

ENVIRONMENTAL RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION

DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO LOCATION OFF MAP

SILO HEAD SPACE RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION

SCALE

2000 1000 0 2000 FEET

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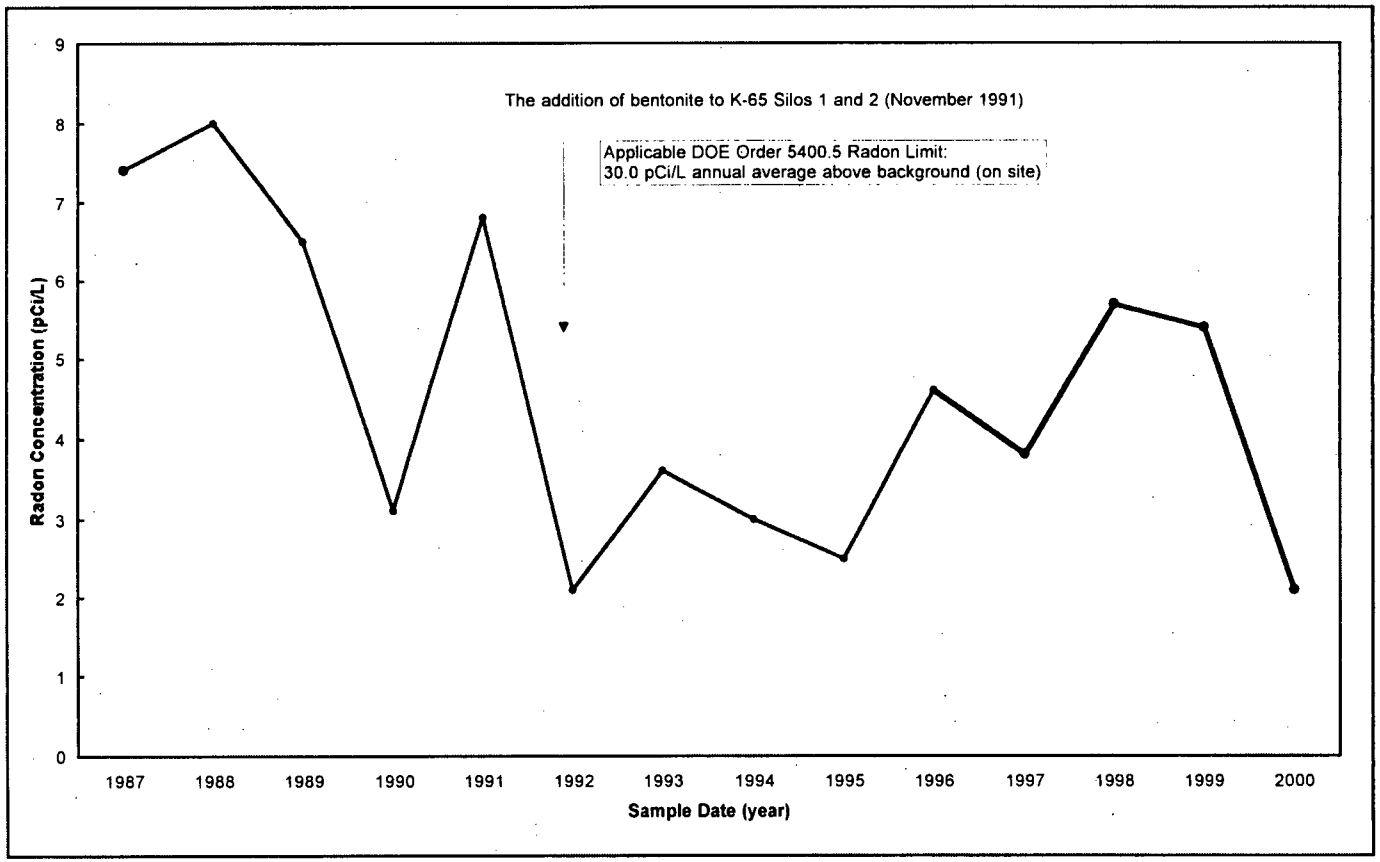
STATE PLANAR COORDINATE SYSTEM 1983

12-13-00

ANNUAL AVERAGE RADON CONCENTRATIONS AT K-65 SILOS EXCLUSION FENCE, 1987-2000



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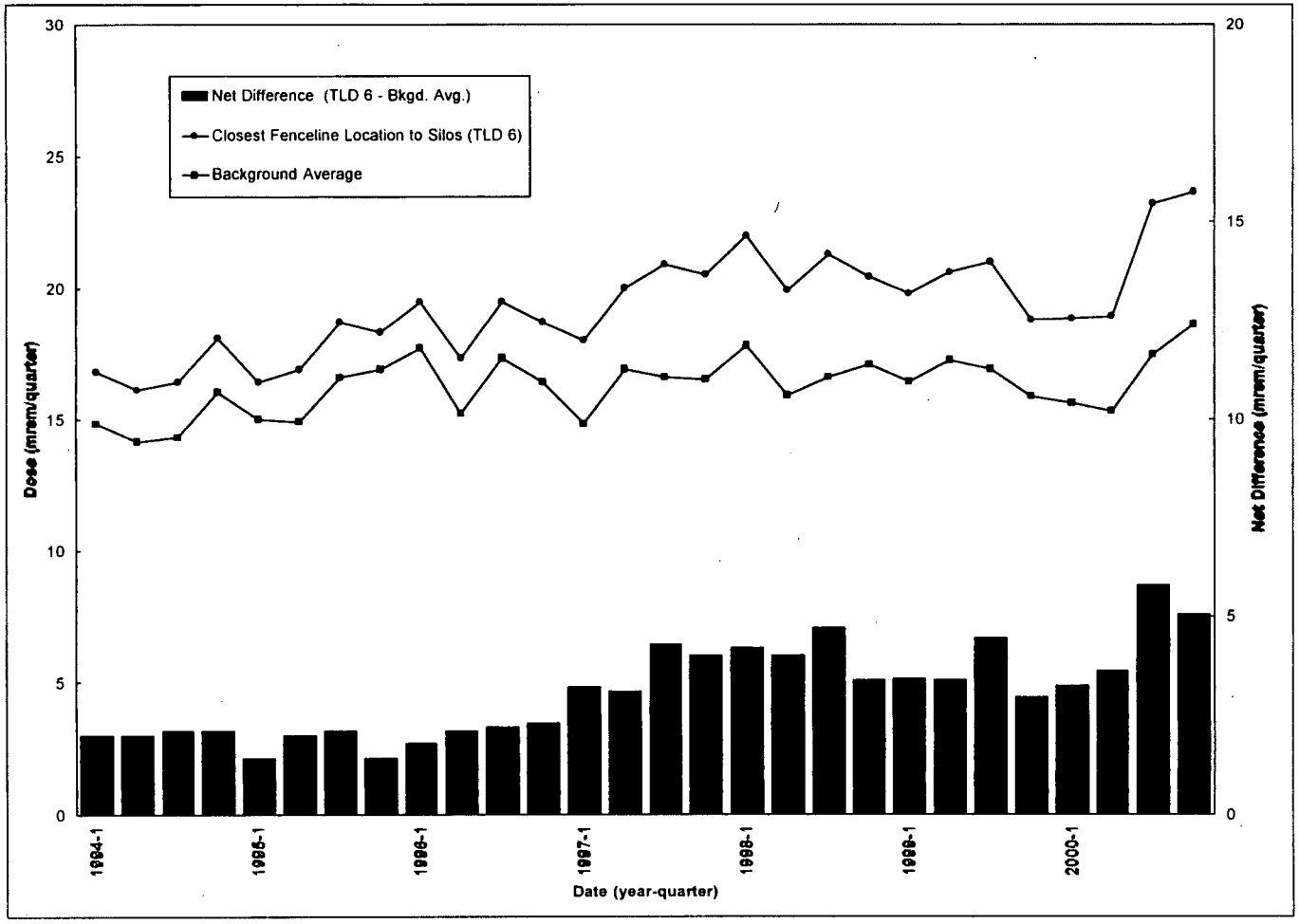
AIR MONITORING PROGRAM
Direct Radiation Measurements

- Direct radiation within Silos Project area (Silos 1 and 2) continues to increase
- Still 53 percent lower than pre-bentonite cap in 1991
- Gradual increase at property line (AMS-6)
- Direct Radiation is largest dose contributor to the maximally exposed individual member of the public.

DIRECT RADIATION (TLD) MEASUREMENTS 1994–2000
(Location 6 versus background average)



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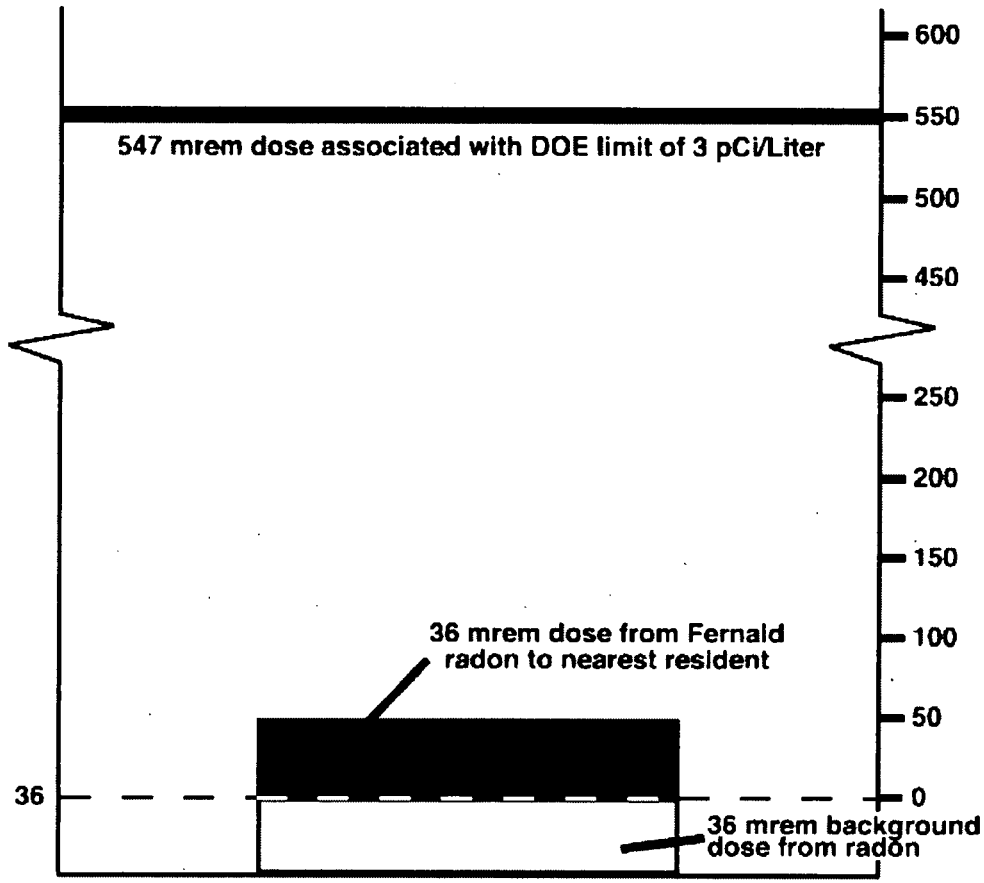
RADON DOSE COMPARISON TO BACKGROUND



Note: The DOE Order limit for radon is 3 pCi/Liter
(This is equivalent to 547 mrem using ICRP 65 method)

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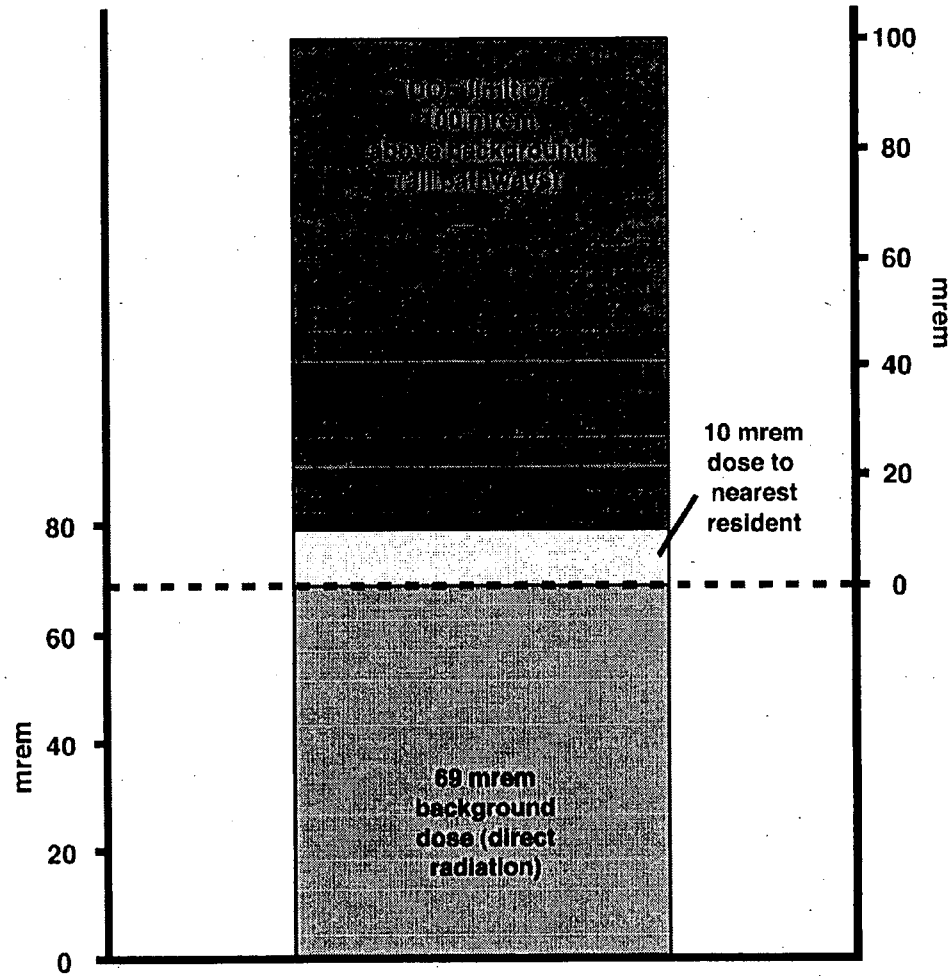
DIRECT RADIATION DOSE COMPARISON TO LIMIT AND BACKGROUND



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Graphics # 7074.32 7/01

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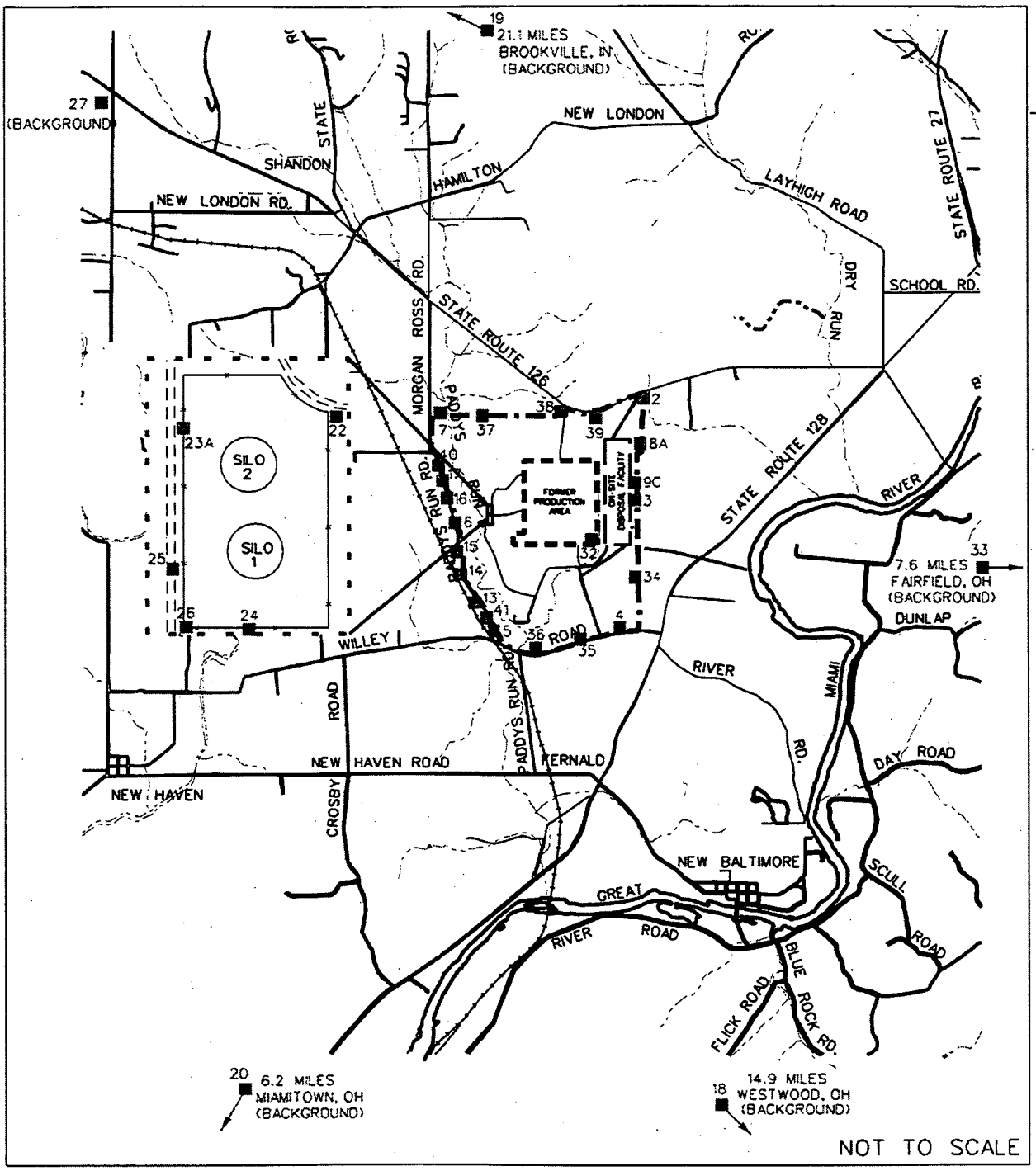
Direct Radiation Monitoring Locations



LEGEND:

DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO SAMPLE LOCATIONS OFF MAP

FEMP BOUNDARY

DIRECT RADIATION (TLD) MONITORING LOCATION

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11-24-99

AIR MONITORING SUMMARY
Dose Comparison (mrem)

	1999 RESULT (Net above bkg.)	2000 RESULT (Net above bkg.)	BACKGROUND
Particulate	0.29	1.1	0.37
Direct Radiation	8.3	10	69
Produce	--	0.9	--
Maximally Exposed Individual	8.4	11.2	~200
Radon (International Commission on Radiological Protection Method 65)	36	36	36

Graphics # 7074.33 7/01

AIR MONITORING
Changes for 2001 and 2002

- Added 5 radon monitors and 4 environmental air particulate monitors in K-65 area in support of the Accelerated Waste Retrieval (AWR) and Silo 3 Projects

- Continue biweekly fenceline air sampling and analysis for Thorium-230

NATURAL RESOURCES
Threatened and Endangered Species

- Federally Endangered Indiana Brown Bat present in northern portion of Paddys Run
- State threatened Sloan's Crayfish also present in northern portion of Paddys Run
- No surveys conducted in 2000
- Sloan's Crayfish Survey scheduled for 2001
- Surveys planned per IEMP in 2002

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NATURAL RESOURCES
Turbidity Monitoring in Paddys Run

- Monitoring drainage channel north of rail road track after rain events
- 2000 results similar to previous years
- Four instances of increased turbidity from the railyard sediment basin into Paddys Run
- Turbidity of short duration
- No impact to Sloan's Crayfish

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Graphics # 7074.36 7/01

NATURAL RESOURCES
Impacted Habitat Areas

- Cleared nine acres of woods and pasture for remedial activities
- Cleared one row of Northern Pines for OSDF access
- Cleared three acres of underbrush for characterization activities

NATURAL RESOURCES
Ecological Restoration Activities

- Area 8, Phase II Forest Demonstration Project near completion in Fall 2000
- Wetland Mitigation Project monitoring
- Conducted maintenance/management activities in restored areas
- Seeded Soil Pile 3

50

Graphics # 7074.38 7/01

NATURAL RESOURCES
Ecological Restoration Research

- Invasive plant control research project with Ohio University
- Area 8, Phase I revegetation research plots project with Miami University
- Prairie plots project with University of Dayton
- American Chestnut project with Miami University

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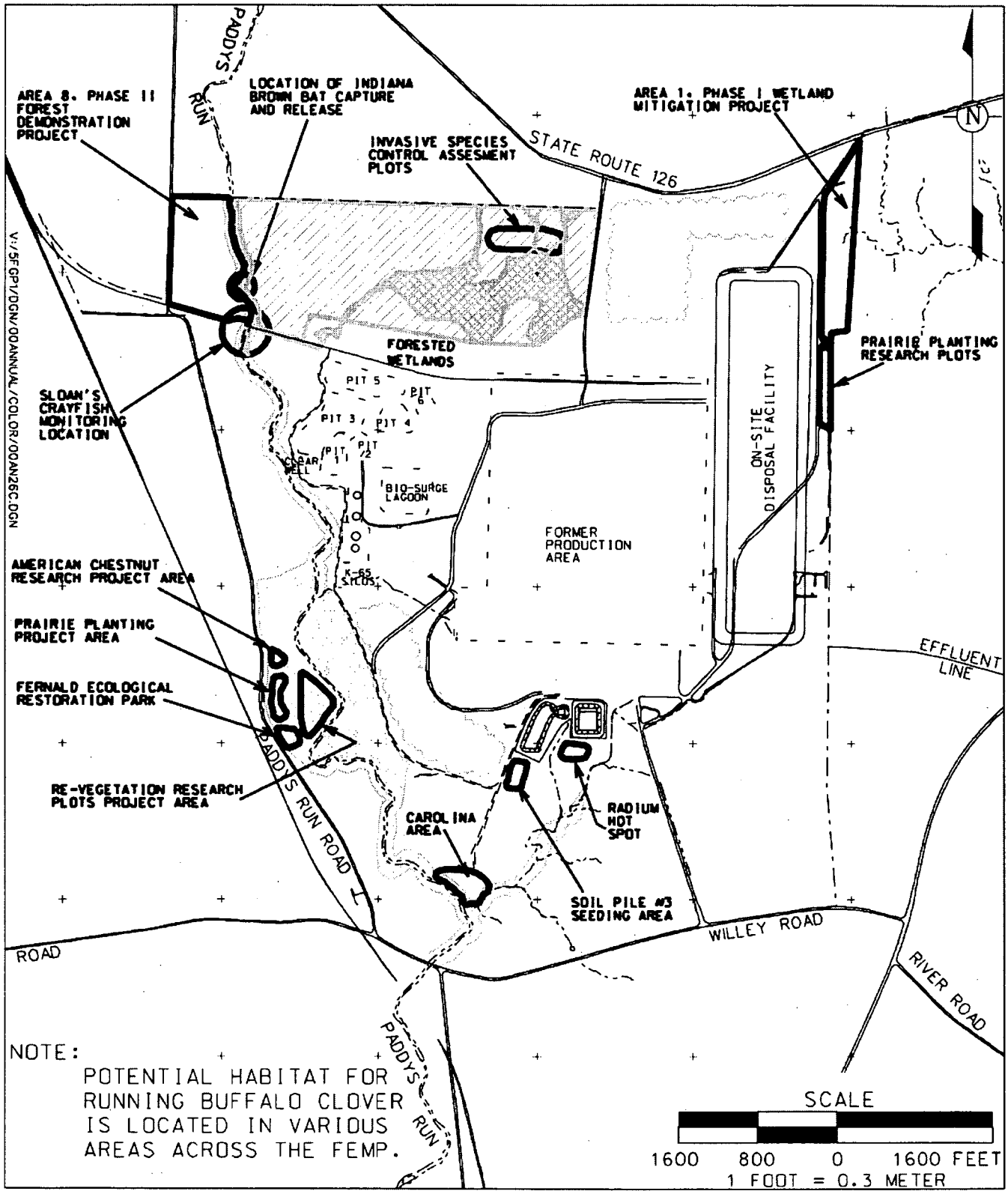
Priority Natural Resource Areas



LEGEND:

- FEMP BOUNDARY
- PADDYS RUN AND TRIBUTARIES RIPARIAN CORRIDOR
- SLOAN'S CRAYFISH AREA
- POTENTIAL INDIANA BROWN BAT HABITAT
- WETLANDS
- NORTHERN WOODLOT AREA AND POTENTIAL AREA FOR SPRING CORAL ROOT
- PINES