5-106.36

INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR SECOND QUARTER 1998

1743

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

INFORMATION ONLY

SEPTEMBER 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

000001

51350-PL-0002
REV. 0
FINAL

1743

INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR SECOND QUARTER 1998

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

SEPTEMBER 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

000002

FINAL

TABLE OF CONTENTS

1743

	Page
List of Acronyms	v
List of Figures	ii
List of Tables	iv
Foreword	F.1
1.0 Groundwater Monitoring Update	1-1
1.1 Introduction	1-1
1.2 Findings	1-1
2.0 Surface Water and Treated Effluent Update	2-1
2.1 Introduction	2-1
2.2 Findings	2-1
3.0 Air Monitoring Update	3-1
3.1 Introduction	3-1
3.2 Findings	3-1
4.0 Natural Resources Update	4-1
References	R-1

LIST OF FIGURES

1743

Figure 1-1 Groundwater Sampling Activities Covered in this Quarterly Report
Figure 1-2 IEMP Water Quality Monitoring Wells and Extraction Wells
Figure 1-3 IEMP Groundwater Elevation Monitoring Wells for 1997 and 1998
Figure 1-4 Daily Average Pumping Rates for South Plume Extraction Well 3924 (RW-1), 4/98 - 6/98
Figure 1-5 Daily Average Pumping Rates for South Plume Extraction Well 3925 (RW-2), 4/98 - 6/98
Figure 1-6 Daily Average Pumping Rates for South Plume Extraction Well 3926 (RW-3), 4/98 - 6/98
Figure 1-7 Daily Average Pumping Rates for South Plume Extraction Well 3927 (RW-4), 4/98 - 6/98
Figure 1-8 Total Uranium Concentration vs. Time Plot for Extraction Well 3924 (RW-1)
Figure 1-9 Total Uranium Concentration vs. Time Plot for Extraction Well 3925 (RW-2)
Figure 1-10 Total Uranium Concentration vs. Time Plot for Extraction Well 3926 (RW-3)
Figure 1-11 Total Uranium Concentration vs. Time Plot for Extraction Well 3927 (RW-4)
Figure 1-12 Daily Total Uranium Concentrations in Extracted South Plume Groundwater, 4/98 - 6/98
Figure 1-13 Monthly Average Total Uranium Concentrations in Extracted South Plume Groundwater, 8/93 - 6/98
Figure 1-14 Cumulative Total Uranium Removed vs. Cumulative Water Pumped from South Plume Module, 8/93 - 6/98
Figure 1-15 Total Groundwater Pumped vs. Groundwater Treated for Second Quarter 1998
Figure 1-16 Location of Near-Term Aquifer Restoration Modules
Figure 1-17 Maximum Total Uranium Plume Map, First Quarter 1998
Figure 1-18 Groundwater Elevations for Type 2 Wells, April 1998
Figure 1-19 Groundwater Elevations for Type 3 Wells, April 1998
Figure 1-20 Detailed Groundwater Elevations in South Plume Area for Type 2 Wells, April 1998
Figure 1-21 Detailed Groundwater Elevations in South Plume Area for Type 3 Wells, April 1998
Figure 1-22 Hydraulic Capture Zone and Colloidal Borescope Flow Vectors for the South Plume Extraction Module, Second Quarter 1998
Figure 1-23 Modeled Versus Actual Groundwater Flow Directions
Figure 1-24 Non-Uranium Constituents with First Quarter 1998 Results above Final Remediation Levels
Figure 1-25 OSDF Well Locations
Figure 1-26 Groundwater Sampling Activities Covered in the next Quarterly Report

Figure 2-1 Surface Water and Treated Effluent Sampling Activities Covered in this Quarterly Report
Figure 2-2 Surface Water and Treated Effluent Sample Locations
Figure 2-3 Pounds of Uranium Discharged to the Great Miami River from the Parshall Flume (PF 4001) in 1998
Figure 2-4 1998 FEMP Monthly Precipitation Data
Figure 2-5 1998 Monthly Average Total Uranium Concentration in Water Discharged from the Parshall Flume (PF 4001) to the Great Miami River
Figure 2-6 Controlled Surface Water Areas and Uncontrolled Flow Directions for Second Quarter 1998
Figure 2-7 Total Uranium Concentrations in Paddys Run at Willey Road (SWP-03) Sample Location
Figure 2-8 Surface Water and Treated Effluent Sampling Activities Covered in the next Quarterly Report

000004

LIST OF FIGURES
(Continued)

1743

Figure 3-1 Air Sampling Activities Covered in this Quarterly Report
Figure 3-2 IEMP Radiological Air Monitoring Program
Figure 3-3 Second Quarter 1998 Wind Rose Data, 10-Meter Height
Figure 3-4 Total Uranium Particulate Concentrations in Air (AMS-2, AMS-3, AMS-4, and AMS-5)
Figure 3-5 Total Uranium Particulate Concentrations in Air (AMS-6, AMS-7, AMS-8A, and AMS-9C)
Figure 3-6 Total Uranium Particulate Concentrations in Air (AMS-22, AMS-23, AMS-24, and AMS-25)
Figure 3-7 Total Uranium Particulate Concentrations in Air (AMS-26, AMS-27, AMS-28, and AMS-29)
Figure 3-8 Total Uranium Particulate Concentrations in Air (AMS-12 and AMS-16)
Figure 3-9 Total Particulate Concentrations in Air (AMS-2, AMS-3, AMS-4, and AMS-5)
Figure 3-10 Total Particulate Concentrations in Air (AMS-6, AMS-7, AMS-8A, and AMS-9C)
Figure 3-11 Total Particulate Concentrations in Air (AMS-22, AMS-23, AMS-24, and AMS-25)
Figure 3-12 Total Particulate Concentrations in Air (AMS-26, AMS-27, AMS-28, and AMS-29)
Figure 3-13 Total Particulate Concentrations in Air (AMS-12 and AMS-16)
Figure 3-14 Radon Monitoring - Continuous Alpha Scintillation Locations
Figure 3-15 Quarterly K-65 Silo Head Space Radon Concentrations, 1992-1998
Figure 3-16 Radon Monitoring - Alpha Track-Etch Cup Locations
Figure 3-17 Direct Radiation (Thermoluminescent Dosimeters) Monitoring Locations
Figure 3-18 Quarterly Direct Radiation (TLD) Measurements, 1992-1998
Figure 3-19 NESHAP Stack Emission Monitoring Locations
Figure 3-20 Air Sampling Activities Covered in the next Quarterly Report

000005

LIST OF TABLES

1743

		Page
Table 1-1	Extraction Well 3924 (RW-1) Operational Summary Sheet for Second Quarter (April through June) 1998	1-8
Table 1-2	Extraction Well 3925 (RW-2) Operational Summary Sheet for Second Quarter (April through June) 1998	1-9
Table 1-3	Extraction Well 3926 (RW-3) Operational Summary Sheet for Second Quarter (April through June) 1998	1-10
Table 1-4	Extraction Well 3927 (RW-4) Operational Summary Sheet for Second Quarter (April through June) 1998	1-11
Table 1-5	South Plume Module Operational Summary Sheet for Second Quarter (April through June) 1998	1-12
Table 1-6	Paddys Run Road Site Groundwater Summary Statistics	1-13
Table 1-7	Second Quarter 1998 Flow Direction Data from Borescope Observations	1-16
Table 1-8	Non-Uranium Constituents with First Quarter 1998 Results above Final Remediation Levels	1-17
Table 1-9	OSDF Cell 2 Monitoring Well Data with Detections from Inception through First Quarter 1998 (June 1997 through March 1998)	1-18
Table 2-1	1998 Storm Water Overflows and Treatment Bypass Events	2-5
Table 2-2	Surface Water Locations with Results above the FRL, Including Summary Statistics	2-6
Table 2-3	Surface Water Locations with Results above the BTV, Including Summary Statistics	2-7
Table 3-1	Total Uranium Particulate Concentrations in Air	3-6
Table 3-2	Total Particulate Concentrations in Air	3-7
Table 3-3	Second Quarter Tracking - NESHAP Compliance Report Perimeter Air Monitors	3-8
Table 3-4	Continuous Environmental Radon Monitoring Monthly Average Concentrations	3-9
Table 3-5	Radon Head Space Concentrations	3-10
Table 3-6	Radon Monitoring - Alpha Track-Etch Cups, Concentration Data for First Half 1998	3-11
Table 3-7	Direct Radiation (TLD) Measurements	3-13
Table 3-8	NESHAP Stack Emission Monitoring Results	3-15

000006

LIST OF ACRONYMS

1743

AMS	air monitoring station
AMSL	feet above mean sea level
AWWT	Advanced Waste Water Treatment
BTV	benchmark toxicity value
DOE	U.S. Department of Energy
FEMP	Fernald Environmental Management Project
FFCA	Federal Facilities Compliance Agreement
FRL	final remediation level
gpm	gallons per minute
IEMP	Integrated Environmental Monitoring Plan
lbs	pounds
M gal	million gallons
MDC	minimum detectable concentration
mg/L	milligrams per liter
Mgal/day	million gallons per day
mrem	millirem
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
OSDF	on-site disposal facility
pCi/L	picoCuries per liter
pCi/m^3	picoCuries per cubic meter
PRRS	Paddys Run Road Site
SWRB	Storm Water Retention Basin
TLD	thermoluminescent dosimeter
$\mu g/L$	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter

000007

FOREWORD

1743

The U.S. Department of Energy (DOE) has prepared this report to meet the quarterly reporting obligation defined in the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997a) for the Fernald Environmental Management Project. It provides an incremental assessment of the environmental data collected under the routine monitoring programs defined in the IEMP and includes selected project-specific information as necessary to support a comprehensive data evaluation. The report is organized around the principal environmental media and contaminant migration pathways routinely monitored under the IEMP including groundwater, surface water and treated effluent, and air, as well as natural resources. The format is designed to provide a summary level presentation of data utilizing figures and tables to highlight key performance indicators and significant findings associated with each environmental medium.

Environmental and operational data available through the second quarter of 1998 are highlighted in this report. However, the data sets provided for each media-specific monitoring program will vary based on program sampling schedules and analytical complexity. The specific data sets included in this report for each environmental media are defined within the corresponding section. Data sets to be included in the next quarterly status report due to be issued in December 1998 are also defined within this report.

Comments received from the United States Environmental Protection Agency and Ohio Environmental Protection Agency on the Integrated Environmental Monitoring Status Report for First Quarter 1998 (DOE 1998b) have been incorporated into the content of this report, as appropriate. It is expected that the content and format of future quarterly status reports will continue to evolve as additional stakeholder input is received and incorporated. To facilitate this process, DOE will continue to provide a written response to all comments received. Actions resulting from the comments which require a change to the report or reporting format will continue to be incorporated into subsequent reports.

000008

1.0 GROUNDWATER MONITORING UPDATE

1743

1.1 INTRODUCTION

This section provides a summary of the second quarter 1998 operational data for the aquifer remedy and first quarter 1998 analytical data from groundwater monitoring. This section's contents are consistent with the groundwater reporting requirements presented in the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997a) groundwater monitoring program.

Figure 1-1 identifies the data included for this reporting period. Figure 1-2 identifies the IEMP groundwater monitoring wells by module/monitoring activity and Figure 1-3 shows the IEMP routine water-level (groundwater elevation) monitoring wells.

1.2 FINDINGS

The principal findings from the reporting period are summarized below:

Operational Summary

- The South Plume Module was operated in the four-well, 1500 gallons per minute (gpm) target pumping configuration during the entire second quarter of 1998. The system will continue to operate at the 1500 gpm pumping rate until after the South Field Extraction (Phase 1), South Plume Optimization, and Re-Injection Demonstration Modules become operational later in 1998. After these additional extraction/ re-injection modules are operational, the resulting capture zone will be evaluated and changes in pumping rates of the South Plume Module may be made to optimize the aquifer remedy performance while maintaining plume capture.

- Significant system outages were experienced during the second quarter of 1998 due to construction activities associated with the pipeline distribution system for the South Plume Optimization and South Field Extraction (Phase 1) Modules. The South Plume Extraction Module was taken out of service for tie-ins and while pressure testing was being conducted on the combined South Plume/South Plume Optimization and South Field Extraction Module pipelines and the South Plume bypass/treatment headers.

- During the second quarter of 1998, 120.8 million gallons of groundwater were pumped and 18.4 pounds of uranium were removed from the Great Miami Aquifer. Since pumping began in August 1993, over three billion gallons of water have been pumped, resulting in a removal of 441.0 pounds of uranium.

  (Refer to Figures 1-4 through 1-15 and Tables 1-1 through 1-5.)

000009

Remedy Construction/Module Start-Ups

- By the end of June 1998, all construction activity was complete on the South Field Extraction (Phase 1), South Plume Optimization, and Re-Injection Demonstration Modules. System operability testing was completed for the South Field Extraction (Phase 1) Module and operability testing was scheduled in July and August for the South Plume Optimization and Re-Injection Demonstration Modules, respectively.

- Sampling specified in the Start-Up Monitoring Plan for the South Field Extraction and South Plume Optimization Modules (DOE 1998e) was initiated during the second quarter of 1998. Following completion of the start-up monitoring activities outlined in the Start-Up Monitoring Plan, the IEMP may need to be revised to incorporate lessons learned.

- Sampling specified in the Re-Injection Demonstration Test Plan (DOE 1998c) was initiated during the second quarter of 1998. Following completion of the re-injection demonstration, the IEMP may need to be revised to incorporate lessons learned.

- Summaries of the data collected during start-up of the modules will be presented in the IEMP quarterly status reports beginning with the next quarterly status report due in December 1998.

(Figure 1-16 shows the location of these near-term aquifer restoration modules.)

Total Uranium Plume

- Figure 1-17 depicts the maximum total uranium plume updated with data from the first quarter of 1998. Total uranium concentration data from the South Plume, South Field, RCRA Property Boundary, and the Private Well Monitoring Modules were used to update this map. All total uranium concentrations above the 20 micrograms per liter (μg/L) final remediation level (FRL) are within the currently projected 10-year, uranium-based restoration footprint.

Groundwater Elevation Data and Capture Assessment

- Capture of the main portion of the South Plume (north of the Paddys Run Road Site [PRRS] and above the 20 μg/L total uranium FRL) continued during the second quarter of 1998 due to pumping of the South Plume Module. A review of the first quarter 1998 analyses of PRRS indicator constituents (arsenic, phosphorus, potassium, and sodium) indicates that capture of the total uranium plume is having a negligible influence on the PRRS plume. As shown in Table 1-6, PRRS indicator constituent concentrations were within the historical minimum-maximum range and were, in most cases, close to the statistical averages. During the first quarter of 1998, no volatile organic compounds were detected in the monitoring wells utilized to evaluate for impacts to the PRRS plume.

000010

- Groundwater elevation data collected from Type 2 and Type 3 monitoring wells in April 1998 are presented in Figures 1-18 and 1-19, respectively. The general location of important flow divides, the capture zone produced by the South Plume Module, and the 20 μg/L total uranium concentration contour from the first quarter 1998 sampling event are also shown in the figures. The contoured low on the eastern side of the Fernald Environmental Management Project (FEMP) is believed to be due to the increased recharge from Paddys Run to the west concurrent with flooding of the Great Miami River to the east due to the unusually high precipitation received in this area during the spring months of 1998. (Figures 1-20 and 1-21 are detailed water elevation maps of the South Plume area.)

- Groundwater flow direction measurements were taken in three areas with the colloidal borescope during the second quarter of 1998: south of the South Plume Module, in the area of the northeastern lobe of the total uranium plume, and at Monitoring Well 2551 immediately west of Paddys Run and northwest of the South Plume Module.

  Groundwater flow directions measured with the colloidal borescope are not always in agreement with flow directions interpreted from groundwater elevation data because the borescope measures flow on a point-by-point basis. Flow directions inferred from groundwater elevation data, on the other hand, represent average flow directions over an area.

  Groundwater flow directions measured with the borescope in monitoring wells south of the South Plume Module were generally consistent with first quarter 1998 flow directions reported in the Integrated Environmental Monitoring Status Report for First Quarter 1998 (DOE 1998b). Flow directions were observed to the southeast and southwest away from the extraction wells in Monitoring Wells 2898, 3898, 2899, and 3899 indicating that these monitoring wells are outside the capture zone of the module. Flow directions to the northeast and to the north were observed at Monitoring Wells 2552 and 3552, respectively, indicating that they were probably within the capture zone of the South Plume Extraction Module. Flow directions to the northwest were observed at Monitoring Wells 2900 and 3900 also indicating that they were probably within the capture zone of the South Plume Module.

  Borescope observations during the second quarter of 1998 in the area of the northeastern lobe of the total uranium plume were also consistent with flow directions reported for the first quarter of 1998. Groundwater flow was observed to be southwest in Monitoring Wells 22303 and 2093 and to the southeast in Monitoring Well 21063.

  In response to an Ohio Environmental Protection Agency (OEPA) request, groundwater flow directions were measured in Monitoring Well 2551 for the first time during the second quarter of 1998. Groundwater flow direction in this well, which is immediately south of Willey Road and west of Paddys Run, was 89.58 degrees or due east. This flow direction is to be expected as regional groundwater flow in this area is to the east and southeast.

(Table 1-7 and Figure 1-22 are summaries of the flow direction data from borescope observations taken during the second quarter of 1998.)

- Figure 1-23 depicts groundwater elevation contours with predicted particle tracks from SWIFT groundwater modeling and flow direction measurements from the colloidal borescope. As discussed in previous IEMP quarterly status reports, groundwater flow directions inferred from elevation measurements agree with predicted flow directions from the groundwater model except in the area of the northeastern lobe of the total uranium plume.

  This discrepancy between observed and predicted groundwater flow directions is being addressed with the groundwater model upgrade project. When the VAM3DF groundwater model is available, this portion of the model will be re-calibrated to bring model predictions more in line with observed flow.

Non-Uranium Final Remediation Level (FRL) Exceedances

- With the exception of total uranium, no radiological constituent FRL exceedances were observed during the first quarter of 1998. Of the remaining 41 non-radiological constituents with FRLs from the Record of Decision for Remedial Actions at Operable Unit 5 (DOE 1996), occasional exceedances for three constituents (arsenic, manganese, and zinc) occurred in three monitoring wells located outside the projected 10-year, uranium-based restoration footprint (refer to Table 1-8 and Figure 1-24). The exceedances outside the footprint are minimally above their associated FRLs.

  The manganese exceedances outside the restoration footprint were observed in Monitoring Wells 2426, 2430, and 2431 which are all located along the eastern boundary of the FEMP. A zinc exceedance was observed in Monitoring Well 2426.

  Manganese and zinc exceedances at these well locations have been previously observed and were discussed in Appendix A, pages A.4-8 through A.4-13, of the 1997 Integrated Site Environmental Report (DOE 1998a).

  As explained in the referenced report, the FEMP was not a likely source for manganese contamination, and the observed exceedances could be due to manganese and zinc accumulation around the monitoring wells due to biofouling conditions.

  As noted in the 1997 Integrated Site Environmental Report, Monitoring Wells 2426, 2430, and 2431 are being treated for biofouling to determine if the treatment process lowers manganese and zinc concentrations.

  A FRL exceedance for arsenic was observed in Monitoring Well 2426 (located outside the 10-year, uranium-based restoration footprint) during the first quarter of 1998. According to Restoration Area Verification protocol, two consecutive FRL exceedances are required to categorize the exceedance as persistent. Therefore, the persistence of this arsenic exceedance can not be determined until additional sampling results are available.

000012

- Non-uranium FRL exceedances within the 10-year, uranium-based restoration footprint occurred at two wells: 3106 (zinc) and 2398 (total chromium and nickel). An FRL exceedance for zinc has been previously detected in Monitoring Well 2106. Third quarter 1998 sampling results will be used to judge the persistence of the exceedance in Monitoring Well 3106. Chromium and nickel FRL exceedances at Monitoring Well 2398 have been previously observed and were discussed in Appendix A, page A.4-4, of the 1997 Integrated Site Environmental Report.

On-Site Disposal Facility Sampling

Status for Cell 1:

- The Draft Technical Memorandum for the On-Site Disposal Facility Cell 1 Baseline Groundwater Conditions is being issued concurrent with this quarterly status report. Baseline sampling was completed for the Great Miami Aquifer and horizontal till well during the fourth quarter of 1997, prior to waste placement.

- After placement of waste was initiated in Cell 1, sampling is to be conducted on a quarterly basis as specified in the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan (DOE 1997b). February 1998 was the first time post-baseline samples were collected from the Great Miami Aquifer, horizontal till well, leachate collection system, and leak detection system for Cell 1. Figure 1-25 identifies the well locations.

  Results from this sampling indicate one exceedance of the interim control limits established from baseline conditions. These limits are considered interim based on the discussion provided in the technical memorandum and described below. This exceedance was in the horizontal till well (12338) for total uranium. The concentration in February was 19 μg/L and the respective interim Shewhart control limit calculated from baseline concentrations is 11.3 μg/L. The value of the exceedance was compared with total uranium concentrations for the first quarter from the leachate collection system and the leak detection system which were 49.3 and 1.5 μg/L, respectively (also discussed below). This comparison suggests that the exceedance is not the result of a release from the on-site disposal facility. More likely, the exceedance suggests that the baseline condition for total uranium was not adequately defined during the baseline sampling period. The sample result collected in second quarter (May 1998) along with leachate collection system and leak detection system data will be evaluated against the baseline and the first quarter result in order to determine if any action is necessary. Additionally, within the technical memorandum, the on-site disposal facility pre-design groundwater data have been reviewed to ascertain if the baseline data for perched water are representative. This review revealed that numerous perched water samples collected during pre-design also exceed the interim control limits calculated from the baseline data set. The number of control limit exceedances suggests that the baseline data set used to calculate the interim control limits may not be representative of existing conditions in the overburden. Consistent with protocol outlined in the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan, a modification to the approach for evaluating the baseline condition is described in the Technical

Memorandum for the On-Site Disposal Facility Cell 1 Baseline Groundwater Conditions.

Concentrations from the leachate collection system (12338C) during the first quarter of 1998 were all non-detectable with the exception of total uranium, technetium-99, and boron which had concentrations of 49.3 μg/L, 12 picoCuries per liter (pCi/L), and 0.0642 milligrams per liter (mg/L), respectively. Trend analysis will be performed annually on the data collected from this system and will be provided in the annual integrated site environmental reports. Leachate volumes, required to be collected monthly from the leachate collection system, for the first quarter of 1998 are as follows: January - 531,198 gallons, February - 618,922 gallons, and March - 102,028 gallons.

Concentrations from the leak detection system (12338D) during the first quarter of 1998 were all non-detectable with the exception of total uranium and boron which had concentrations of 1.5 μg/L and 0.0296 mg/L, respectively. Trend analysis will be performed annually on the data collected from this system and will be provided in the annual integrated site environmental reports. Volumes of liquid in the leak detection system manhole, required to be collected weekly, are summarized for each month of the first quarter of 1998 as follows: January - 695 gallons, February - 365 gallons, and March - 200 gallons.

Status for Cell 2:

- For the first quarter of 1998, three baseline aquifer sampling events were completed for Cell 2 . As identified in Table 1-9, four of the 16 constituents sampled were detected in the Great Miami Aquifer. All concentrations were below their associated FRLs. Figure 1-25 identifies the well locations.

- Baseline sampling of the Great Miami Aquifer for Cell 2 continued during the second quarter of 1998. Two aquifer baseline samples were collected during the second quarter for a total of 12 baseline samples. The data will be provided in the next quarterly status report.

- Installation of the horizontal till well was completed during the second quarter of 1998 and baseline sampling was initiated after installation and development. It is anticipated that waste placement will begin during the fourth quarter of 1998.

Status for Cell 3:

- Installation of aquifer wells and horizontal till well will be completed during the third quarter of 1998. Baseline sampling will be initiated during the third quarter of 1998.

000014

The next IEMP quarterly status report, to be issued in December 1998, will include new information pertaining to the three new groundwater restoration modules coming on-line during the third quarter of 1998. Figure 1-26 identifies the groundwater information to be included in the next IEMP quarterly

status report. Note that this figure has been modified to better reflect the site's modular approach to aquifer restoration since the three new modules are coming on-line. In general, each active module is comprised of extraction or re-injection wells and associated monitoring wells. In future reports, data pertaining to module specific operations and aquifer conditions will be provided for the active modules. Reporting related to inactive modules (e.g., waste storage area and Plant 6 area) will only contain information pertaining to aquifer conditions. Operational data pertains to the operational performance of the individual modules and the associated extraction/re-injection wells contained within the module. Data used to determine aquifer conditions are derived from the monitoring wells associated with a particular module.

The December 1998 report will contain operational data and the plume capture assessment for the modules that will be operational during the third quarter of 1998 (i.e., the South Plume/South Plume Optimization, South Field (Phase 1), and Re-Injection Demonstration Modules). The report will also contain analytical data from the second quarter of 1998 to be used for determining aquifer conditions.

TABLE 1-1

EXTRACTION WELL 3924 (RW-1) OPERATIONAL SUMMARY SHEET FOR SECOND QUARTER (APRIL THROUGH JUNE) 1998

Reference Elevation (feet above mean sea level [AMSL]) - 531.9 (top of casing)
Northing Coordinate ('83) - 474,190.37
Easting Coordinate ('83) - 1,379,783.13

Hours in reporting period - 2,184 Hours pumped - 1,202 Target pumping rate - 300 gpm
Hours not pumped - 982 Operational percent - 55.0

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Monthly Average Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
4/98[a]	127	5.5	40.4	0.34
5/98[a,b,c,d]	156	7.0	36.5	0.30
6/98[a,b]	196	8.5	34.8	0.29
	Quarterly Average 160	Total 21.0	Quarterly Average 37.2	Quarterly Average 0.31

[a]Extraction well was out of service for 17 days in April, eight days in May, and three days in June due to construction and connection activities on the pipeline distribution system for the South Plume Optimization and South Field Extraction (Phase 1) Modules.
[b]Extraction well was out of service for two days in May and five days in June due to malfunctioning flow controller and flow indicator/transmitter.
[c]Extraction well was out of service for three days due to a storm related electrical outage.
[d]Extraction well was out of service for two days due to electrical malfunction.

000016

TABLE 1-2

EXTRACTION WELL 3925 (RW-2)
OPERATIONAL SUMMARY SHEET
FOR SECOND QUARTER (APRIL THROUGH JUNE) 1998

Reference Elevation (feet AMSL) - 540.3 (top of casing)
Northing Coordinate ('83) - 474,290.32
Easting Coordinate ('83) - 1,380,034.28

Hours in reporting period - 2,184 Hours pumped - 1,385 Target pumping rate - 300 gpm
Hours not pumped - 799 Operational percent - 63.4

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Monthly Average Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
4/98[a]	130	5.6	32.6	0.27
5/98[a,b]	193	8.6	30.3	0.25
6/98[a,b,c]	242	10.4	33.1	0.28
Quarterly Average	188	Total 24.6	Quarterly Average 32.0	Quarterly Average 0.27

[a]Extraction well was out of service for 17 days in April, eight days in May, and three days in June due to construction and connection activities on the pipeline distribution system for the South Plume Optimization and South Field Extraction (Phase 1) Modules.
[b]Extraction well was out of service for three days in May and one day in June due to storm related electrical outages.
[c]Extraction well was out of service for one day in June due to replacement of a flow meter.

000017

TABLE 1-3

EXTRACTION WELL 3926 (RW-3)
OPERATIONAL SUMMARY SHEET
FOR SECOND QUARTER (APRIL THROUGH JUNE) 1998

Reference Elevation (feet AMSL) - 585.0 (top of casing)
Northing Coordinate ('83) - 474,399.22
Easting Coordinate ('83) - 1,380,306.40

Hours in reporting period - 2,184 Hours pumped - 1,351 Target pumping rate - 400 gpm
Hours not pumped - 833 Operational percent - 61.9

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Monthly Average Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
4/98[a]	175	7.6	16.1	0.13
5/98[a,b]	260	11.6	14.8	0.12
6/98[a,b,c]	319	13.8	16.3	0.14
	Quarterly Average 251	Total 33.0	Quarterly Average 15.7	Quarterly Average 0.13

[a]Extraction well was out of service for 16 days in April, eight days in May, and three days in June due to construction and connection activities on the pipeline distribution system for the South Plume Optimization and South Field Extraction (Phase 1) Modules.
[b]Extraction well was out of service for three days in May and one day in June due to storm related electrical outages.
[c]Extraction well was out of service for two days in June due to pressure indicator/transmitter malfunction.

000018

1743

TABLE 1-4

EXTRACTION WELL 3927 (RW-4)
OPERATIONAL SUMMARY SHEET
FOR SECOND QUARTER (APRIL THROUGH JUNE) 1998

Reference Elevation (feet AMSL) - 589.0 (top of casing)
Northing Coordinate ('83) - 474,512.49
Easting Coordinate ('83) - 1,380,596.15

Hours in reporting period - 2,184 Hours pumped - 1,391 Target pumping rate - 500 gpm
Hours not pumped - 793 Operational percent - 63.7

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Monthly Average Uranium Concentration (µg/L)	Well Efficiency (lbs/M gal)
4/98[a]	214	9.2	0.8	0.01
5/98[a,b]	327	14.6	1.2	0.01
6/98[a,b]	425	18.4	1.3	0.01
	Quarterly Average 322	Total 42.2	Quarterly Average 1.1	Quarterly Average 0.01

[a]Extraction well was out of service for 17 days in April, eight days in May, and three days in June due to construction and connection activities on the pipeline distribution system for the South Plume Optimization and South Field Extraction (Phase 1) Modules.
[b]Extraction well was out of service for three days in May and one day in June due to storm related electrical outages.

000019

TABLE 1-5

SOUTH PLUME MODULE OPERATIONAL SUMMARY SHEET FOR SECOND QUARTER (APRIL THROUGH JUNE) 1998

Total gallons pumped for this reporting period (M gal) - 120.8
Total uranium removed for this reporting period (lbs) - 18.4
Average system efficiency for this reporting period (lbs/M gal) - 0.15
Gallons pumped from August 1993 to June 1998 (billion gal) - 3.1
Total uranium removed from August 1993 to June 1998 (lbs) - 441.0
System efficiency from August 1993 to June 1998 (lbs/M gal) - 0.14

Monthly Measurements at Storm Water Retention Basin Valve House for Second Quarter (April through June) 1998

Month	Monthly Average Well Pumping Rates (gpm) 3924 RW-1	3925 RW-2	3926 RW-3	3927 RW-4	Monthly Average System Pumping Rate (gpm)	Water Pumped from Extraction Wells (M gal)	Water Treated from Extraction Wells (M gal)	Percent Treated[a]	Total Uranium Concentration from South Plume Extraction Module[b,c] (µg/L) Min.	Max.	Avg.
4/98	127	130	175	214	646	27.9	10.5	37.6	14.6	23.7	19.3
5/98	156	193	260	327	936	41.8	29.3	70.1	12.5	23.2	16.4
6/98	196	242	319	425	1182	51.0	35.9	70.3	13.8	20.5	17.2
					Quarterly Average 921.3	Total 121	Total 75.7	Quarterly Average 59.3			

[a]The amount of groundwater treated per month is variable based on site storm water treatment needs. In general, during months with low amounts of precipitation, more groundwater is treated. During months with higher precipitation, less groundwater is treated.
[b]These concentrations represent both the concentrations of the water sent to treatment and the water directly sent to the Parshall Flume.
[c]Monthly averages are flow-weighted calculations of daily grab samples of extracted South Plume groundwater.

TABLE 1-6

PADDYS RUN ROAD SITE GROUNDWATER SUMMARY STATISTICS

	Sampling Period								
	August 27, 1993 - December 31, 1997						Validated Results with Detections for First Quarter 1998		
	Monitoring Well	Number of Samples[a,b,c]	Min.[a,b,c,d] (mg/L)	Max.[a,b,c,d] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b,c,d] (mg/L)	Sample Result[e] (mg/L)	Validation Qualifier	Date Sampled
Arsenic									
	2128	193	0.0006	0.19	0.014	0.023	0.0013	U	2/25/98
	2548	103	0.00065	0.35	0.027	0.040	NS		
	2625	185	0.005	0.05	0.01	0.009	0.011	-	2/25/98
	2636	158	0.01	0.1	0.04	0.02	0.0712	-	2/25/98
	2898	19	0.00035	0.0063	0.0016	0.0014	0.0013	U	2/3/98
	2899	18	0.00035	0.003	0.001	0.0008	0.0013	U	2/3/98
	2900	191	0.0007	0.0548	0.005	0.005	0.0025	U	2/3/98
	3128	21	0.00085	0.234	0.014	0.051	0.0071	U	2/25/98
	3636	20	0.0009	0.014	0.002	0.003	0.0015	U	2/25/98
	3898	18	0.00095	0.0062	0.0023	0.0013	0.003	U	2/3/98
	3899	19	0.00035	0.003	0.001	0.009	0.0013	U	2/3/98
	3900	19	0.0012	0.0045	0.0025	0.00099	0.0035	U	2/3/98
Phosphorus									
	2128	29	0.090	16	2.3	3.3	0.457	-	2/25/98
	2548	12	0.0855	5.4	1.7	1.5	NS		
	2625	19	0.307	12.3	2.98	3.31	2.87	-	2/25/98
	2636	18	9.6	170	92	51	129	-	2/25/98
	2898	20	0.005	1.05	0.097	0.23	0.05	U	2/3/98
	2899	17	0.005	0.11	0.04	0.03	0.05	U	2/3/98
	2900	19	0.07	0.96	0.5	0.3	0.315	-	2/3/98
	3128	28	0.005	13	0.5	2	0.0792	-	2/25/98
	3636	19	0.02	1.1	0.12	0.24	0.05	U	2/25/98

TABLE 1-6
(Continued)

	Sampling Period								
	August 27, 1993 - December 31, 1997						Validated Results with Detections for First Quarter 1998		
	Monitoring Well	Number of Samples[a,b,c]	Min.[a,b,c,d] (mg/L)	Max.[a,b,c,d] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b,c,d] (mg/L)	Sample Result[e] (mg/L)	Validation Qualifier	Date Sampled
Phosphorus (Cont'd.)									
	3898	18	0.02	1.24	0.2	0.3	0.05	U	2/3/98
	3899	19	0.025	0.83	0.16	0.19	0.05	U	2/3/98
	3900	19	0.005	1.26	0.1	0.3	0.05	U	2/3/98
Potassium									
	2128	21	1.69	18	4.7	5.2	2.18	U	2/25/98
	2548	12	1.36	40	10.1	10.4	NS		
	2625	19	0.64	6.26	3.3	1.8	2.71	-	2/25/98
	2636	18	8.51	218	86.8	58.4	83.7	-	2/25/98
	2898	20	2.5	5.05	3.8	0.61	2.58	-	2/3/98
	2899	18	1.36	4.42	3.49	0.675	3.54	-	2/3/98
	2900	19	0.711	6	1.8	1.1	2.18	U	2/3/98
	3128	21	1.79	3.7	2.6	0.56	2.18	U	2/25/98
	3636	19	1.38	3.32	2.58	0.407	2.18	U	2/25/98
	3898	18	1.34	3.93	2.35	0.595	3.35	-	2/3/98
	3899	19	1.34	3.22	2.46	0.368	2.3	-	2/3/98
	3900	19	0.975	3.19	1.86	0.555	2.79	-	2/3/98
Sodium									
	2128	21	22.9	75.2	38.3	13.6	39.4	-	2/25/98
	2548	12	18.2	35	25	5.1	NS		
	2625	19	16.5	50.7	34.5	8.57	27.7	-	2/25/98
	2636	18	28.3	79.9	52.5	14.2	36.9	-	2/25/98
	2898	20	16	29.2	20	3.7	14.2	-	2/3/98
	2899	18	11.2	22.9	17.3	3.64	16.8	-	2/3/98

000082

TABLE 1-6
(Continued)

	Sampling Period								
	August 27, 1993 - December 31, 1997						Validated Results with Detections for First Quarter 1998		
	Monitoring Well	Number of Samples[a,b,c]	Min.[a,b,c,d] (mg/L)	Max.[a,b,c,d] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b,c,d] (mg/L)	Sample Result[e] (mg/L)	Validation Qualifier	Date Sampled
Sodium (Cont'd.)									
	2900	19	18.1	43.3	30.9	7.99	24.2	-	2/3/98
	3128	21	4.32	13.4	7.65	3.34	4.25	-	2/25/98
	3636	19	5.42	13	9.2	2.6	4.99	-	2/25/98
	3898	18	7.29	14.6	9.04	1.83	7.71	-	2/3/98
	3899	19	6.24	12.1	8.90	1.58	7.76	-	2/3/98
	3900	19	4.45	10.8	6.47	2.04	7.65	-	2/3/98

[a]The data are based on unfiltered samples from the Operable Unit 5 remedial investigation/feasibility study data set (1988 through 1993) and 1994 through 1997 groundwater data.
[b]If more than one sample is collected per well per day (e.g., duplicate), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for determining the summary statistics (minimum, maximum, average, and standard deviation [SD]).
[c]Rejected data qualified with either a R or Z were not included in this count or the summary statistics.
[d]For results where the concentrations are below the detection limit, the results used in the summary statistics are each set at half the detection limit.
[e]NS = not sampled; well was not sampled because there is no access agreement with CSX railroad.

TABLE 1-7

SECOND QUARTER 1998 FLOW DIRECTION DATA FROM BORESCOPE OBSERVATIONS

Monitoring Well	Date of Observation	Feet Below Water Level	Average Flow Direction[a,b] (degrees)	Standard Deviation[b] (degrees)
2093	6/4	7.78	218	6.5
21063	6/4	34.48	133.5	22.4
22303	6/4	4.60	194.7	8.9
2551	6/1	6.67	89.6	3.8
2552	6/3	11.98	81.5	10.6
3552	6/3	70.38	2.2	14.7
2898	5/19	4.62	115.2	12.0
3898	5/20	69.78	225.4	12.9
2899	5/20	5.24	151.5	10.5
3899	5/26	70.05	238.6	15.5
2900	5/28	8.90	307.1	4.6
3900	5/28	72.65	276.9	27.6

[a]Average flow direction is measured clockwise in degrees from magnetic north.
[b]Values are calculated after statistical filtering to remove outliers.

000024

TABLE 1-8

NON-URANIUM CONSTITUENTS WITH FIRST QUARTER 1998 RESULTS ABOVE FINAL REMEDIATION LEVELS

Constituent	Monitoring Well	Module/ Monitoring Activity[a]	Number of Validated Samples Since 1988[b,c]	Number of Validated Samples with FRL Exceedances Since 1988[b,c]	Number of Validated Samples with FRL Exceedances for First Quarter 1998[b,c]	FRL[d] (mg/L)	Validated Results with FRL Exceedances for First Quarter 1998		
							Sample Result (mg/L)	Validation Qualifier	Date Sampled
Arsenic						0.050			
	2426	RCRA	19	2	1		0.125	-	1/6/98
Chromium, total						0.022[e]			
	2398	RCRA, So. Plume	20	8	1		0.11	J	1/6/98
Manganese						0.90			
	2426	RCRA	19	5	1		4.55	-	1/6/98
	2430	RCRA	19	4	1		1.69	-	1/6/98
	2431	RCRA	18	4	1		5.52	J	1/6/98
Nickel						0.10			
	2398	RCRA, So. Plume	20	6	1		0.22	-	1/6/98
Zinc						0.021			
	2426	RCRA	19	4	1		0.0446	-	1/6/98
	3106	RCRA, So. Plume	21	2	1		0.0239	J	1/13/98

Note: Highlighting indicates well is outside the 10-year, uranium-based restoration footprint.

[a]From IEMP, Table 3-4
[b]If there was more than one sample result per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[c]Rejected data qualified with either a R or Z were not used in this comparison.
[d]From Operable Unit 5 Record Of Decision, Table 9-4
[e]FRL based on Chromium VI, from Operable Unit 5 Record Of Decision, Table 9-5

TABLE 1-9

OSDF CELL 2 MONITORING WELL DATA WITH DETECTIONS FROM INCEPTION THROUGH FIRST QUARTER 1998 (June 1997 through March 1998)

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with Detections[a,b]	Number of Validated Samples with Detections for First Quarter 1998[a,b]	FRL[c,d]	Validated Results with Detections for First Quarter 1998		
						Sample Result	Validation Qualifier	Date Sampled
Total Organic Carbon					NA	(mg/L)		
	22199	10	9	2		1.22	-	1/26/98
						1.66	-	3/10/98
	22200	10	9	2		1.88	-	3/10/98
						1.1	-	1/26/98
Total Organic Halogens					NA	(mg/L)		
	22199	10	4	2		0.0386	J	1/26/98
	22200	10	6	3		0.0188	-	3/10/98
						0.00735	-	1/26/98
						0.0111	-	2/23/98
						0.0113	-	3/10/98
Boron					0.33 mg/L	(mg/L)		
	22199	10	5	1		0.0401	-	2/17/98
Uranium, Total					20 µg/L	(µg/L)		
	22199	10	10	3		0.479	J	1/26/98
						0.323	J	2/17/98
						0.508	-	3/10/98

[a]If there was more than one sample collected per well per constituent per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[b]Rejected data qualified with either a R or Z were not included in this count.
[c]From Operable Unit 5 Record Of Decision, Table 9-4
[d]NA = not applicable

000026

FIGURE 1-1

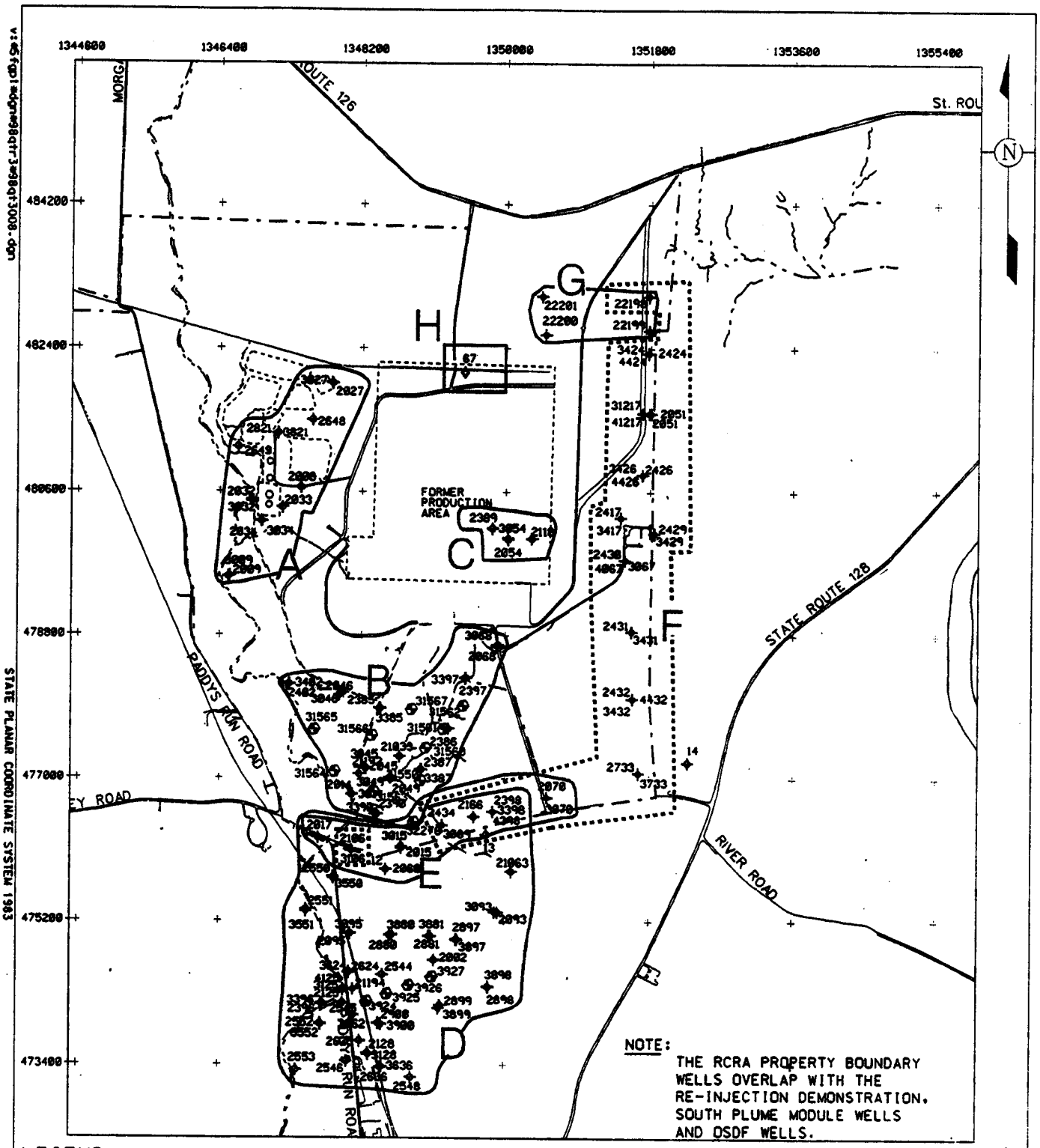
GROUNDWATER SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
SAMPLING ACTIVITIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
South Plume Extraction System (Operational)				♦	♦	♦						
South Plume Module (Restoration)		♦										
South Field Extraction Module			♦									
Waste Storage Area Module												
Plant 6 Area Module												
Routine Water-Level Monitoring				♦								
RCRA Property Boundary	♦											
Private Well Monitoring	♦											
KC-2 Warehouse Monitoring												
OSDF Groundwater Monitoring:												
Post-Baseline (Cell 1)		♦										
Baseline (Cell 2)	♦	♦	♦									

♦ Data summarized/ evaluated in this report

1743

000027



LEGEND:

A - WASTE STORAGE AREA
B - SOUTH FIELD EXTRACTION AREA
C - PLANT 6 AREA
D - SOUTH PLUME AREA
E - RE-INJECTION DEMONSTRATION AREA
F - RCRA PROPERTY BOUNDARY WELLS
G - OSDF MONITORING WELLS
H - KC-2 WAREHOUSE WELL

FEMP BOUNDARY
MONITORING WELL
EXTRACTION WELL

SCALE
1800 900 0 1800 FEET

FIGURE 1-2. IEMP WATER QUALITY MONITORING WELLS AND EXTRACTION WELLS

000028

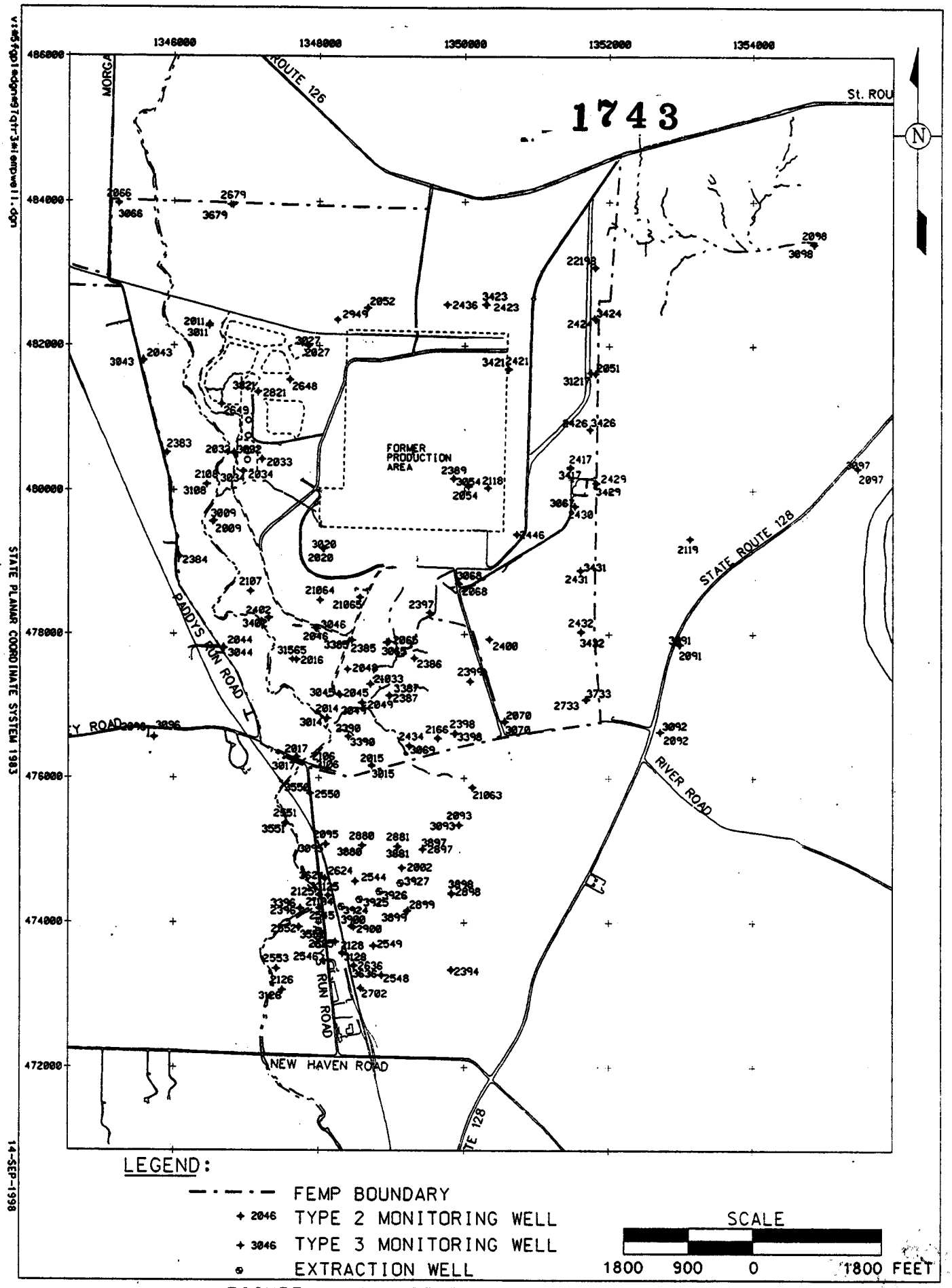


FIGURE 1-3. IEMP GROUNDWATER ELEVATION MONITORING WELLS FOR 1997 AND 1998

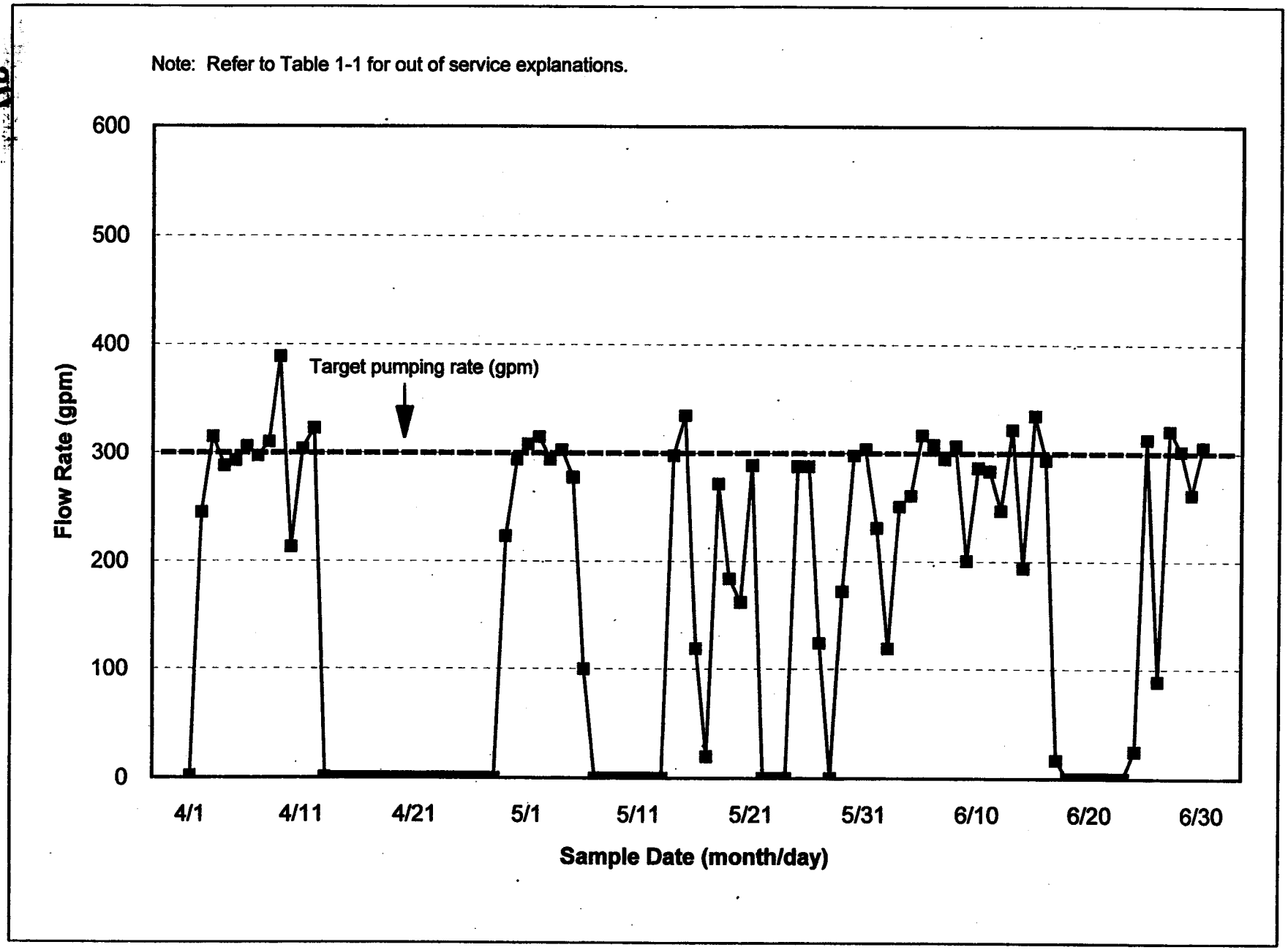


FIGURE 1-4. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3924 (RW-1), 4/98 - 6/98

Note: Refer to Table 1-2 for out of service explanations.

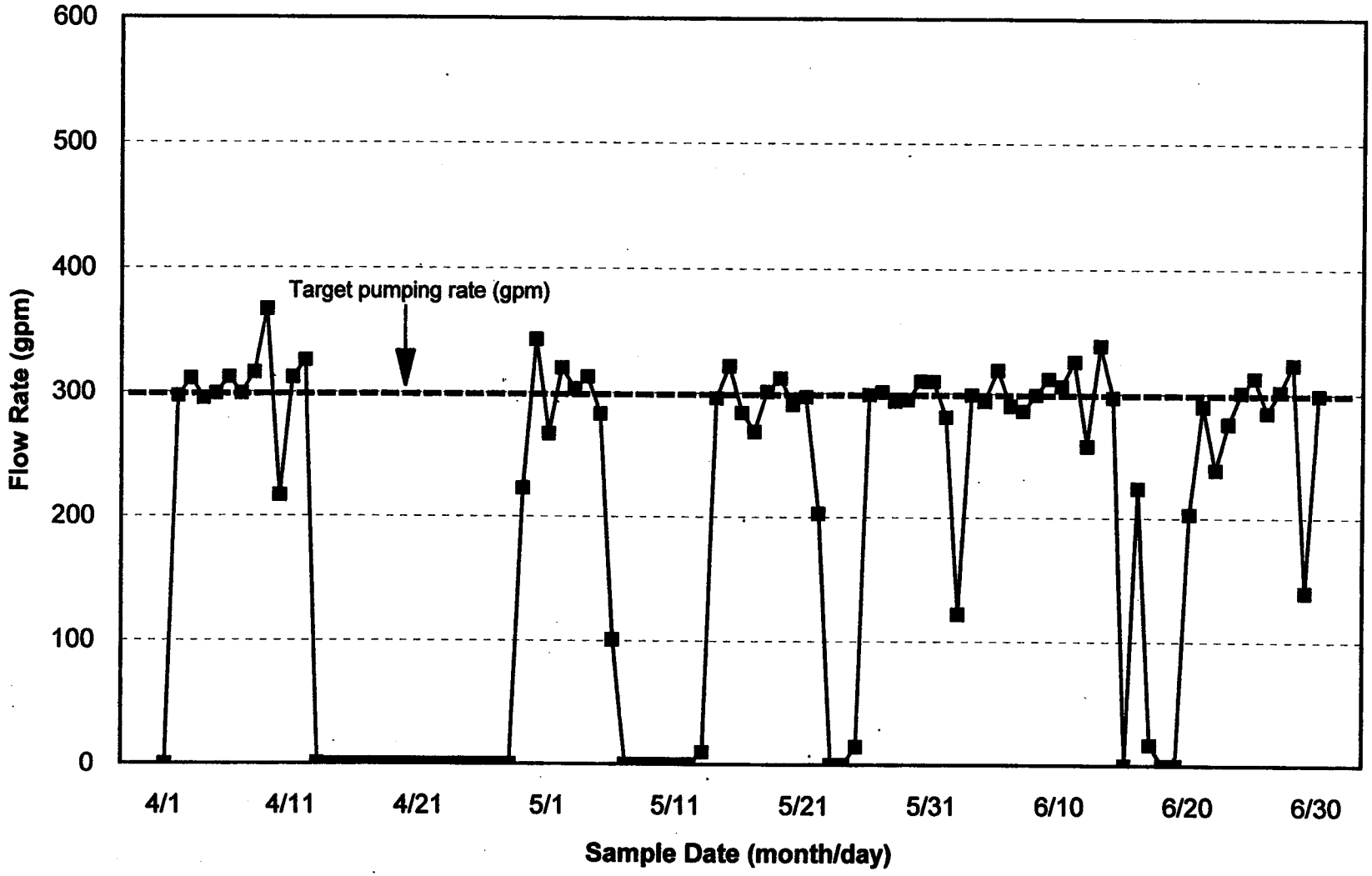


FIGURE 1-5. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3925 (RW-2), 4/98 - 6/98

000031

000032

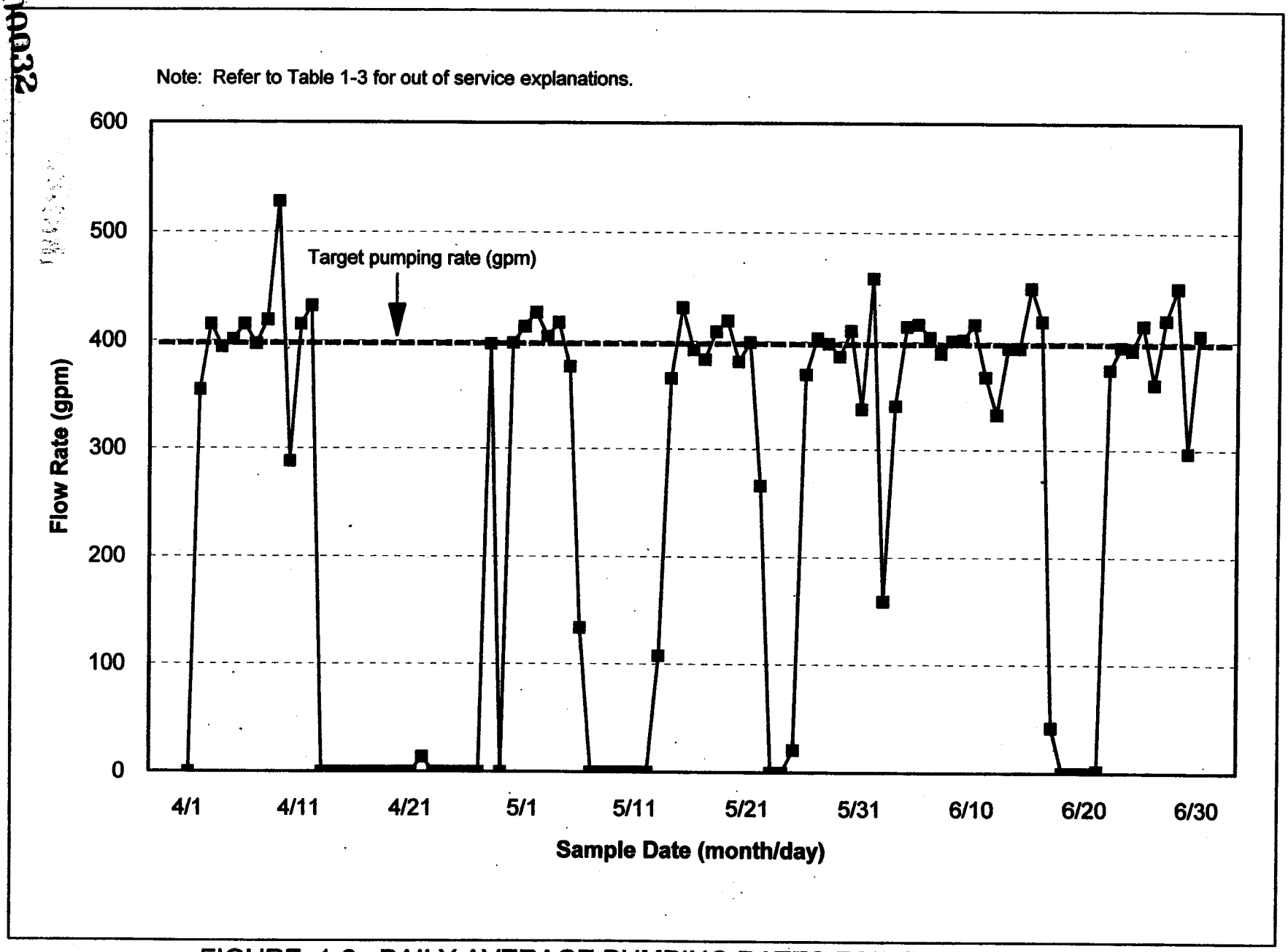


FIGURE 1-6. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3926 (RW-3), 4/98 - 6/98

Note: Refer to Table 1-4 for out of service explanations.

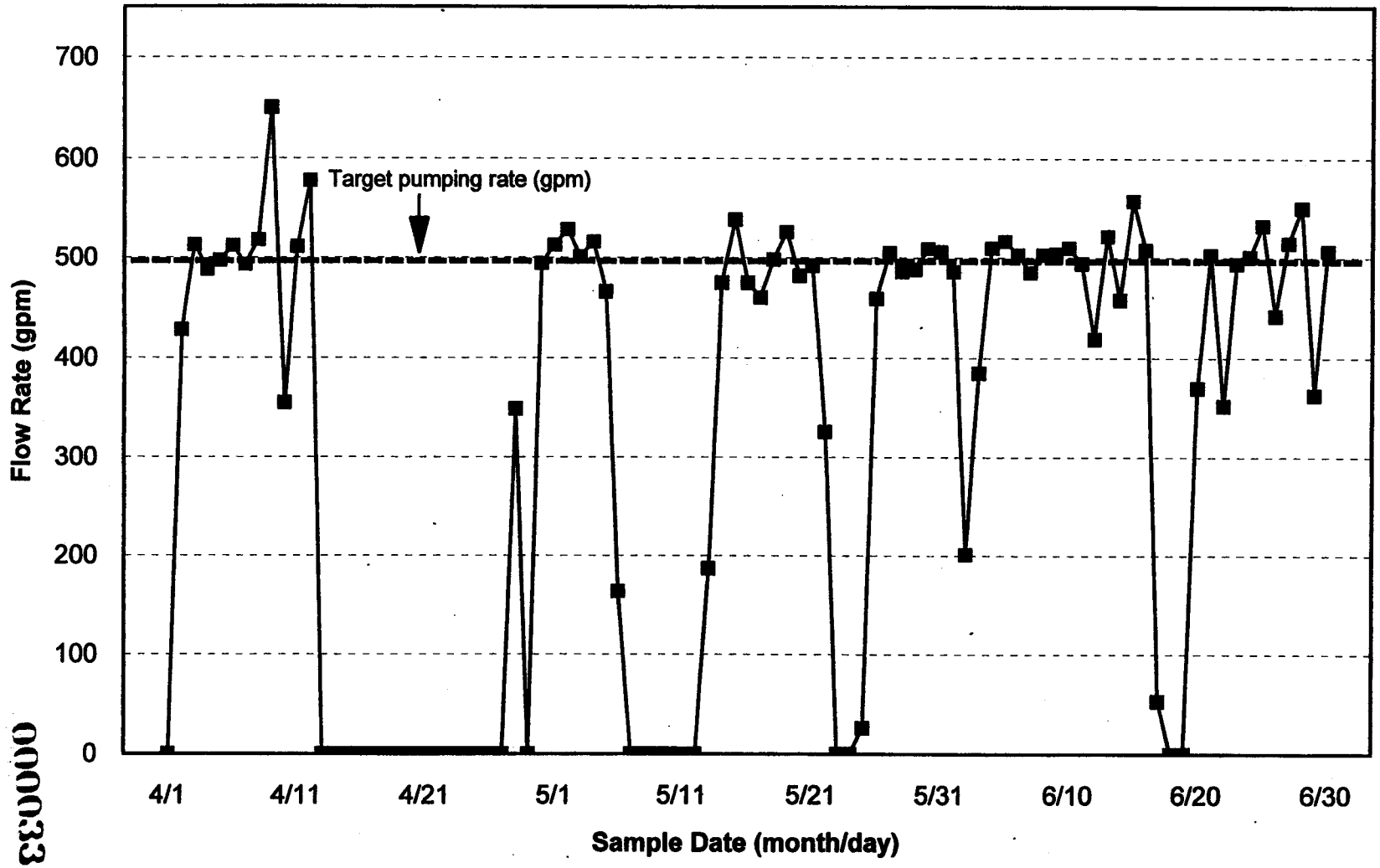


FIGURE 1-7. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3927 (RW-4), 4/98 - 6/98

000034

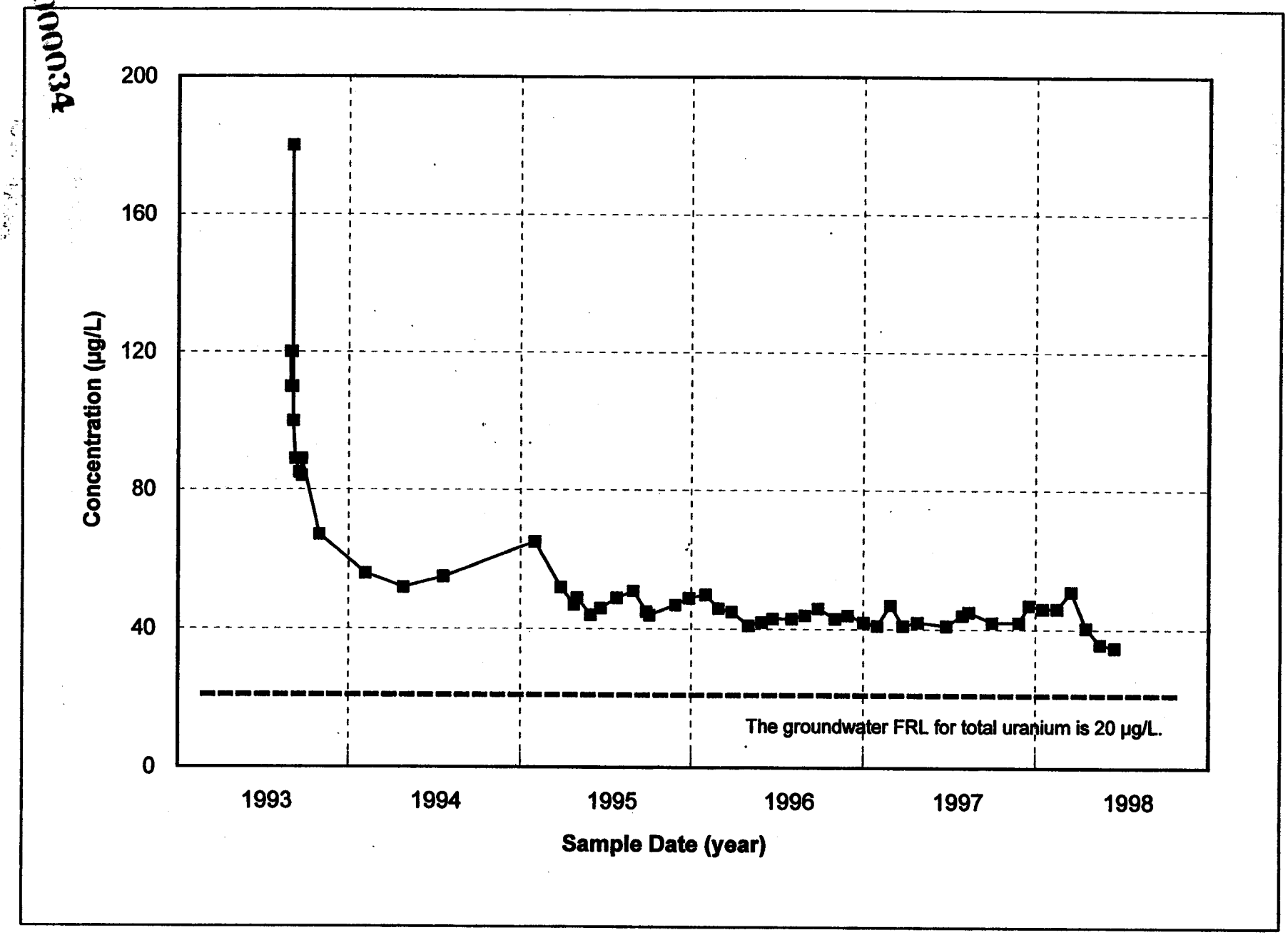


FIGURE 1-8. TOTAL URANIUM CONCENTRATION VS. TIME PLOT FOR EXTRACTION WELL 3924 (RW-1)

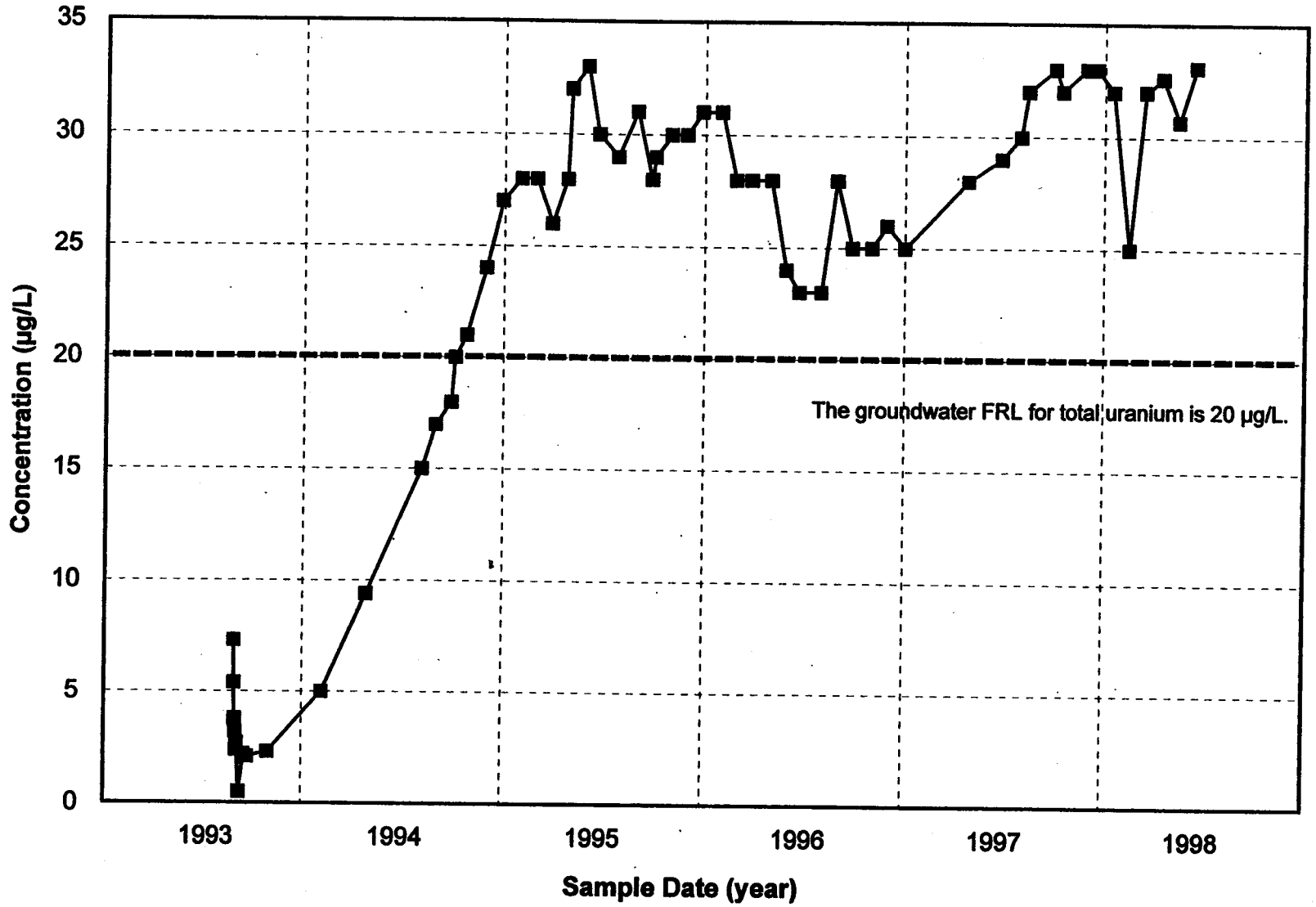


FIGURE 1-9. TOTAL URANIUM CONCENTRATION VS. TIME PLOT FOR EXTRACTION WELL 3925 (RW-2)

000036

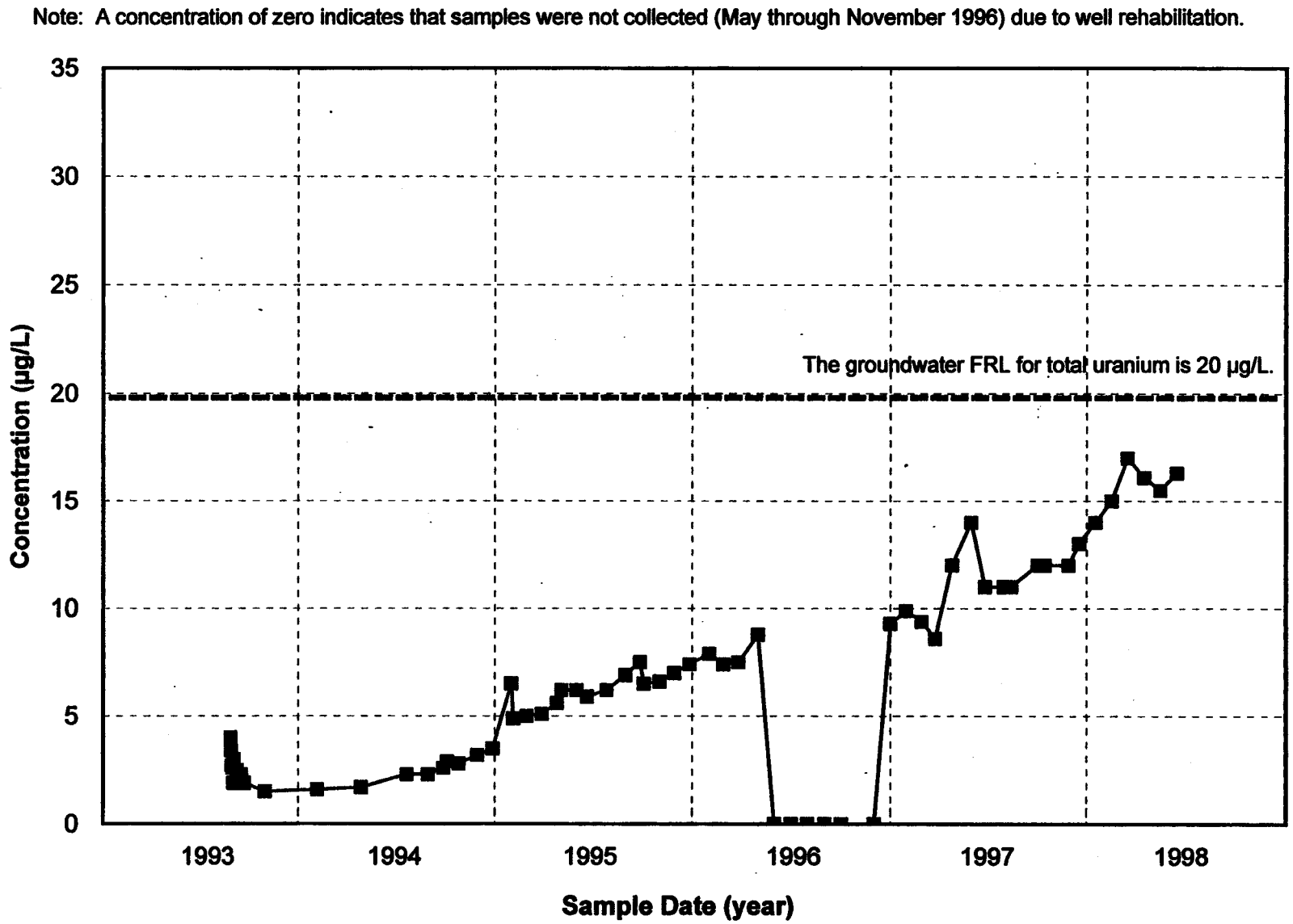


FIGURE 1-10. TOTAL URANIUM CONCENTRATION VS. TIME PLOT FOR EXTRACTION WELL 3926 (RW-3)

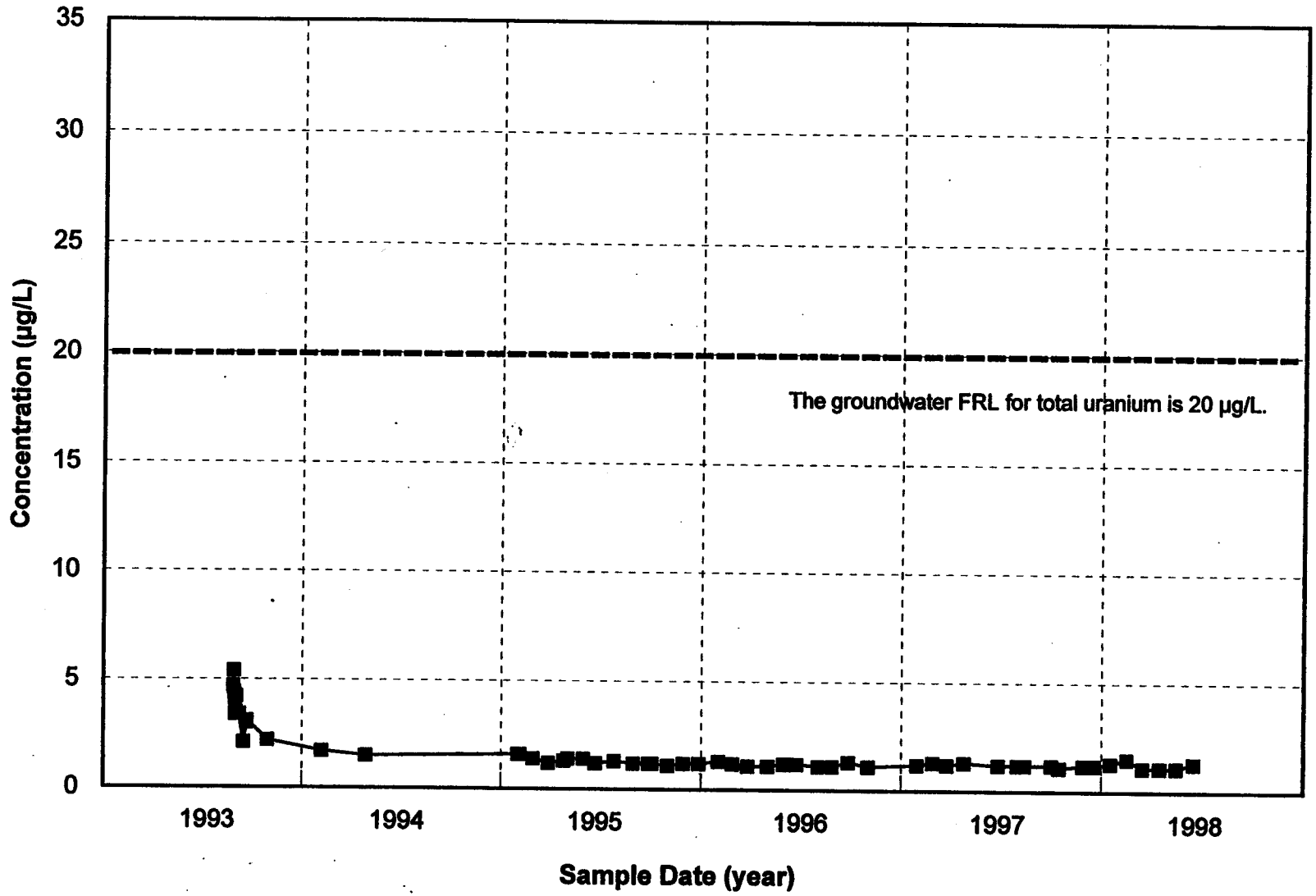


FIGURE 1-11. TOTAL URANIUM CONCENTRATION VS. TIME PLOT FOR EXTRACTION WELL 3927 (RW-4)

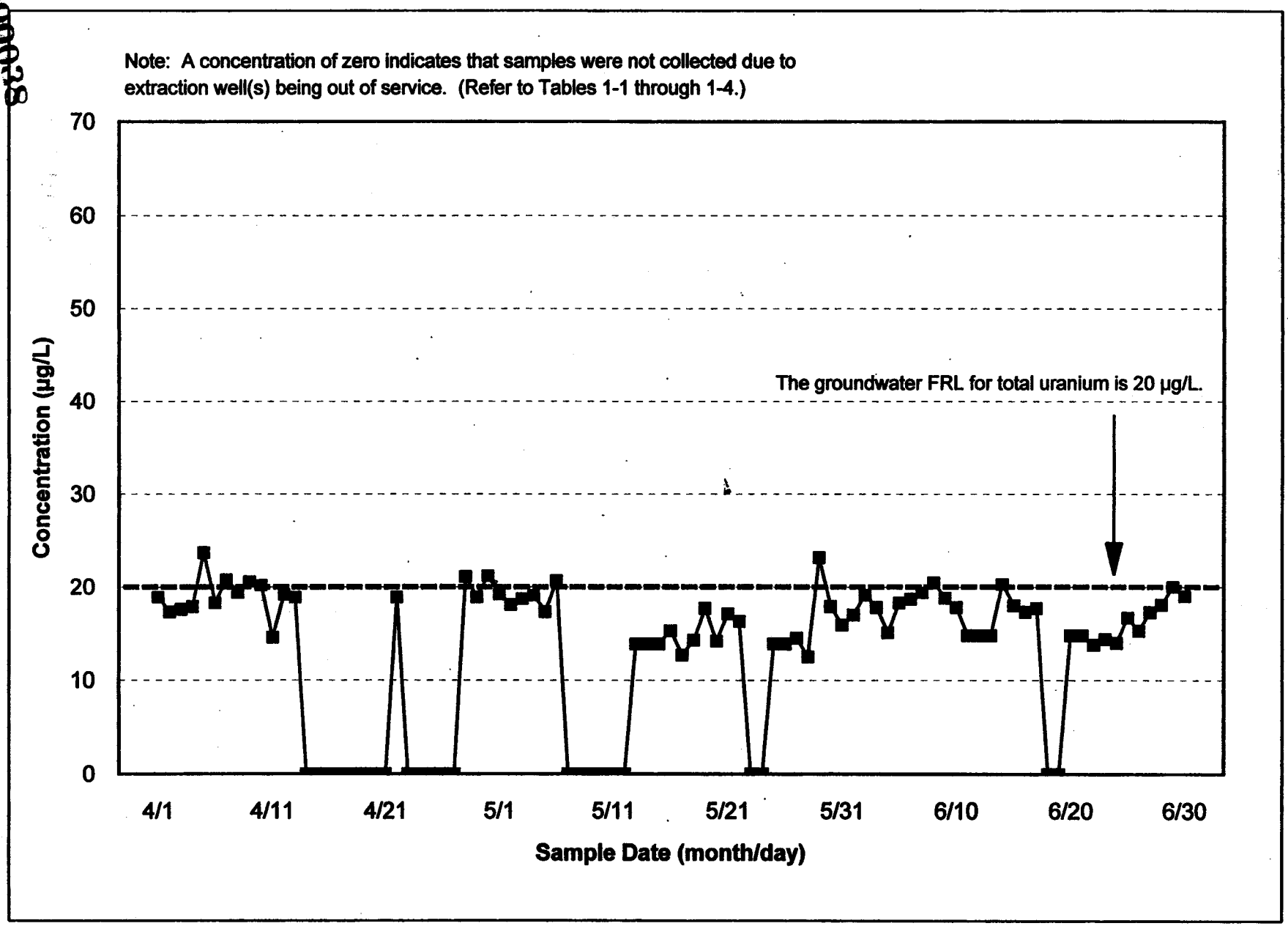


FIGURE 1-12. DAILY TOTAL URANIUM CONCENTRATIONS IN EXTRACTED SOUTH PLUME GROUNDWATER, 4/98 - 6/98

Note: Monthly averages are flow-weighted calculations of daily grab samples collected at the Storm Water Retention Basin valve house from the South Plume groundwater.

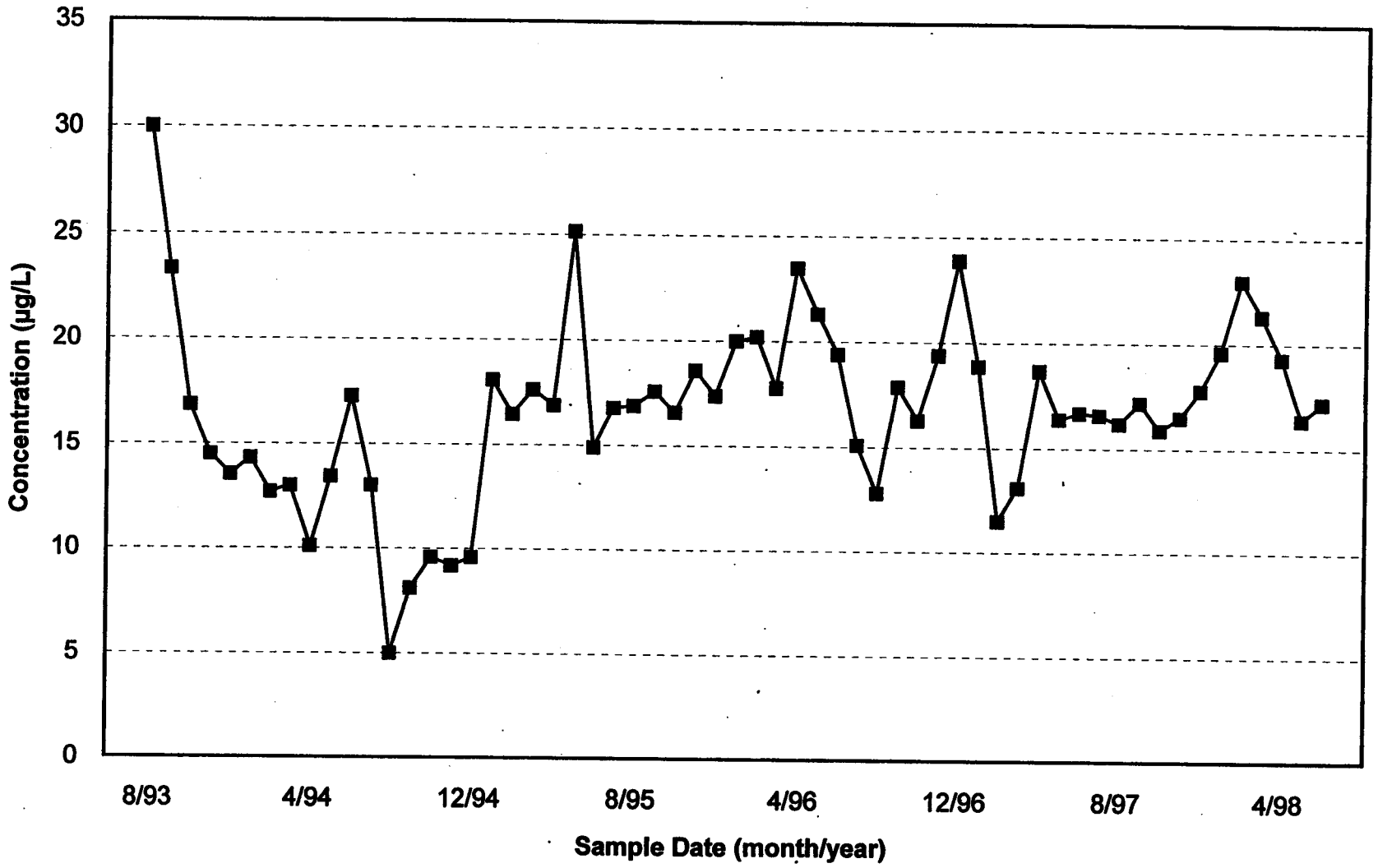


FIGURE 1-13. MONTHLY AVERAGE TOTAL URANIUM CONCENTRATIONS IN EXTRACTED SOUTH PLUME GROUNDWATER, 8/93 - 6/98

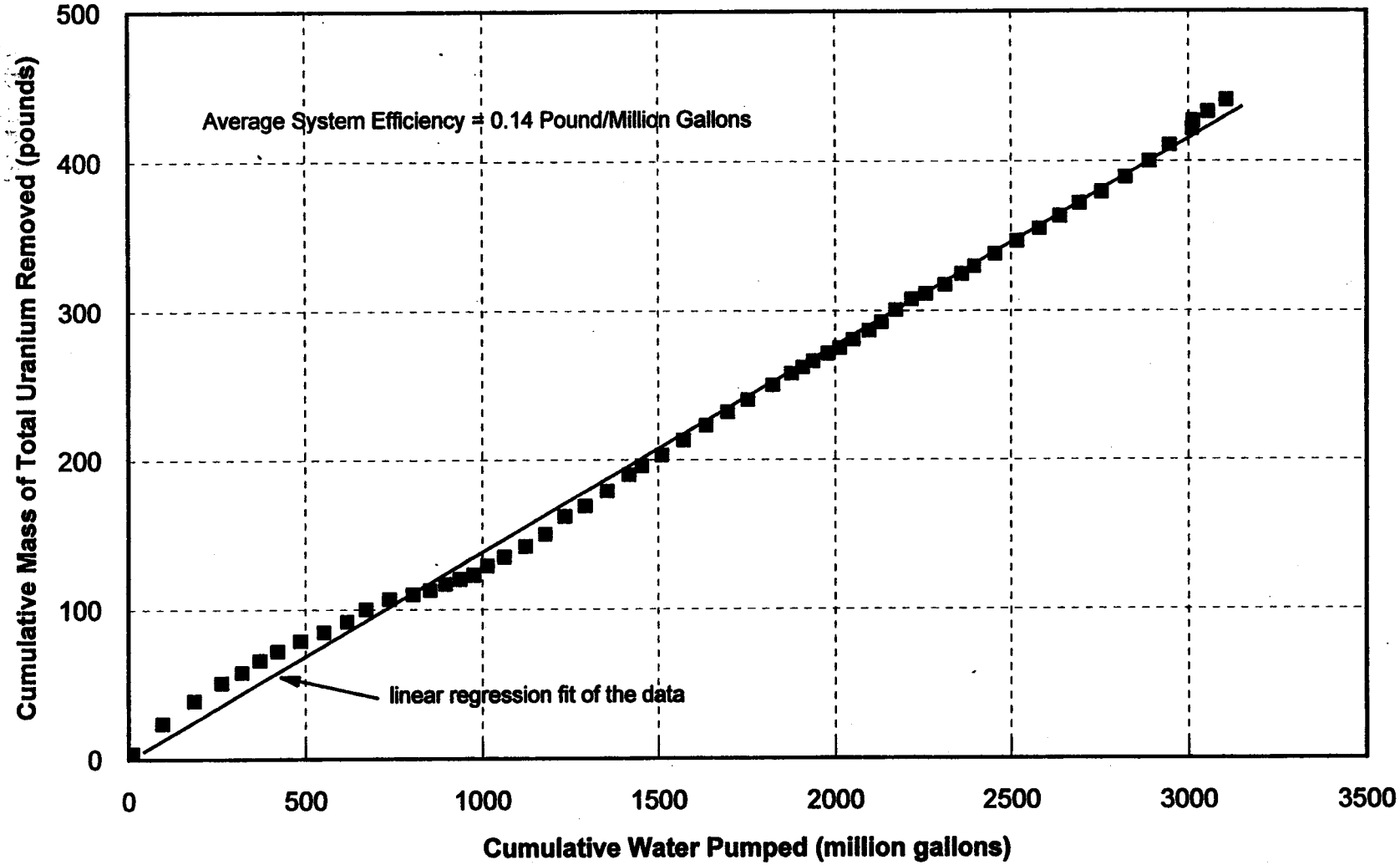


FIGURE 1-14. CUMULATIVE TOTAL URANIUM REMOVED VS. CUMULATIVE WATER PUMPED FROM SOUTH PLUME MODULE, 8/93 - 6/98

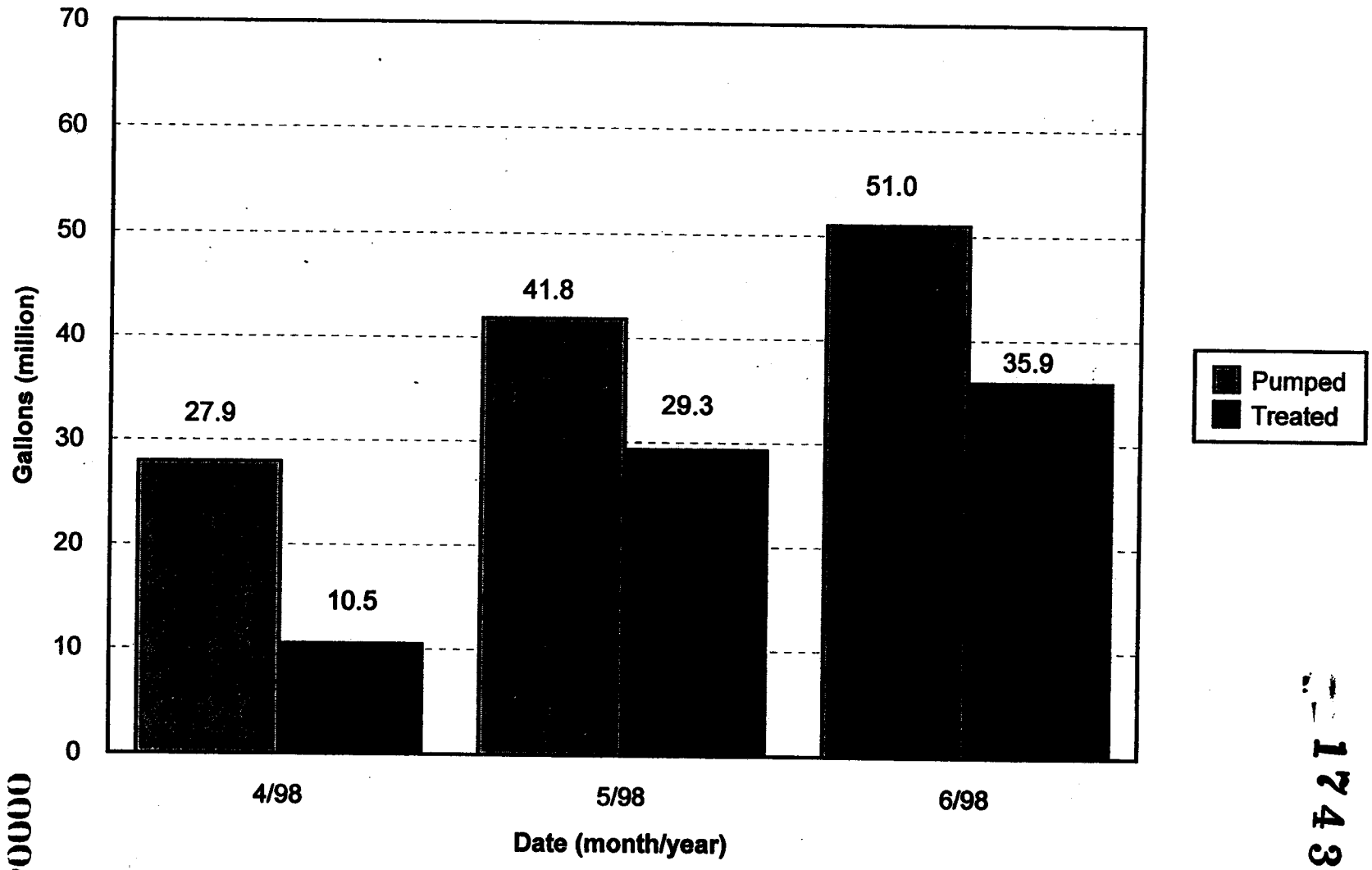


FIGURE 1-15. TOTAL GROUNDWATER PUMPED VS. GROUNDWATER TREATED FOR SECOND QUARTER 1998

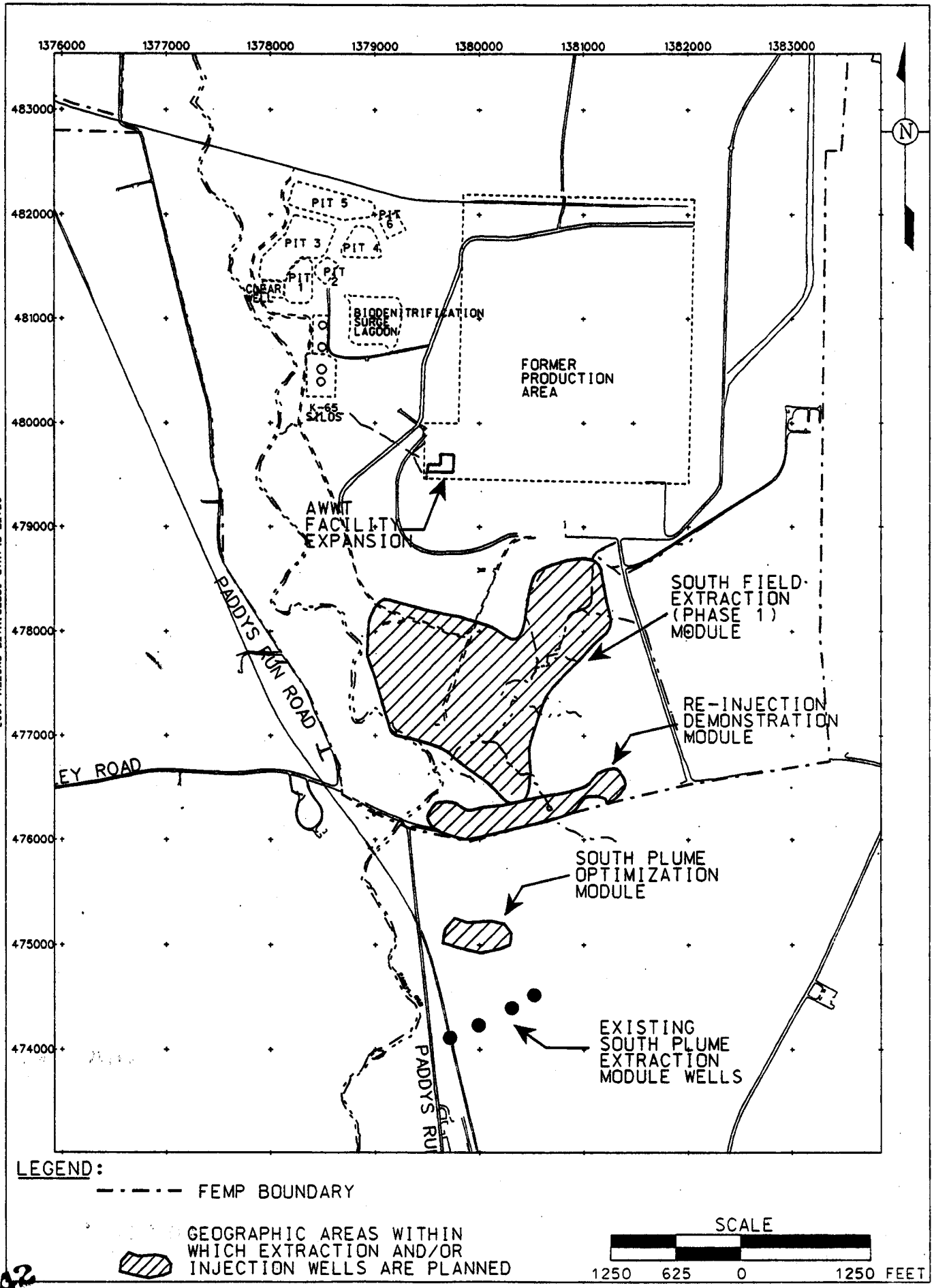


FIGURE 1-16. LOCATION OF NEAR-TERM AQUIFER RESTORATION MODULES

000042

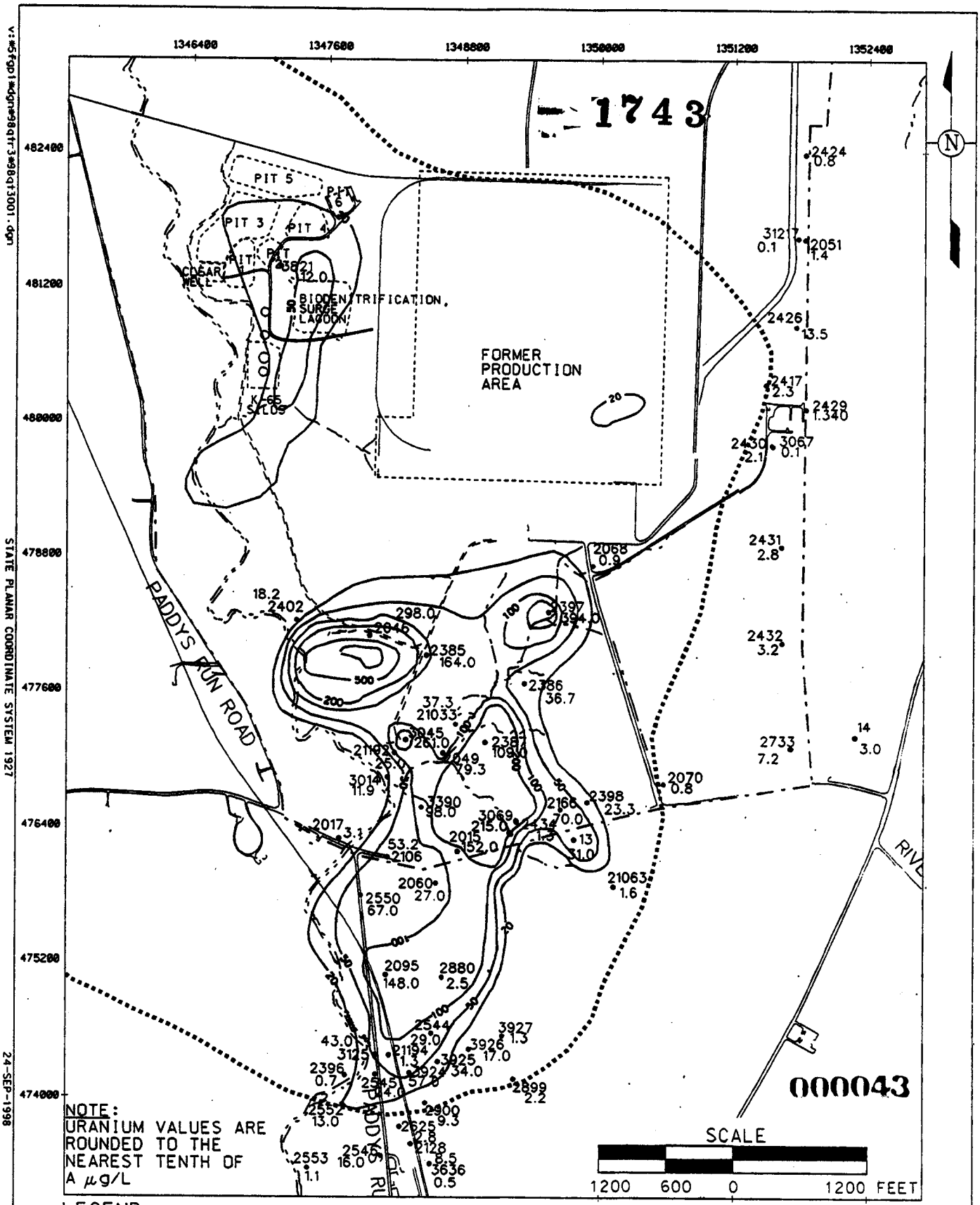
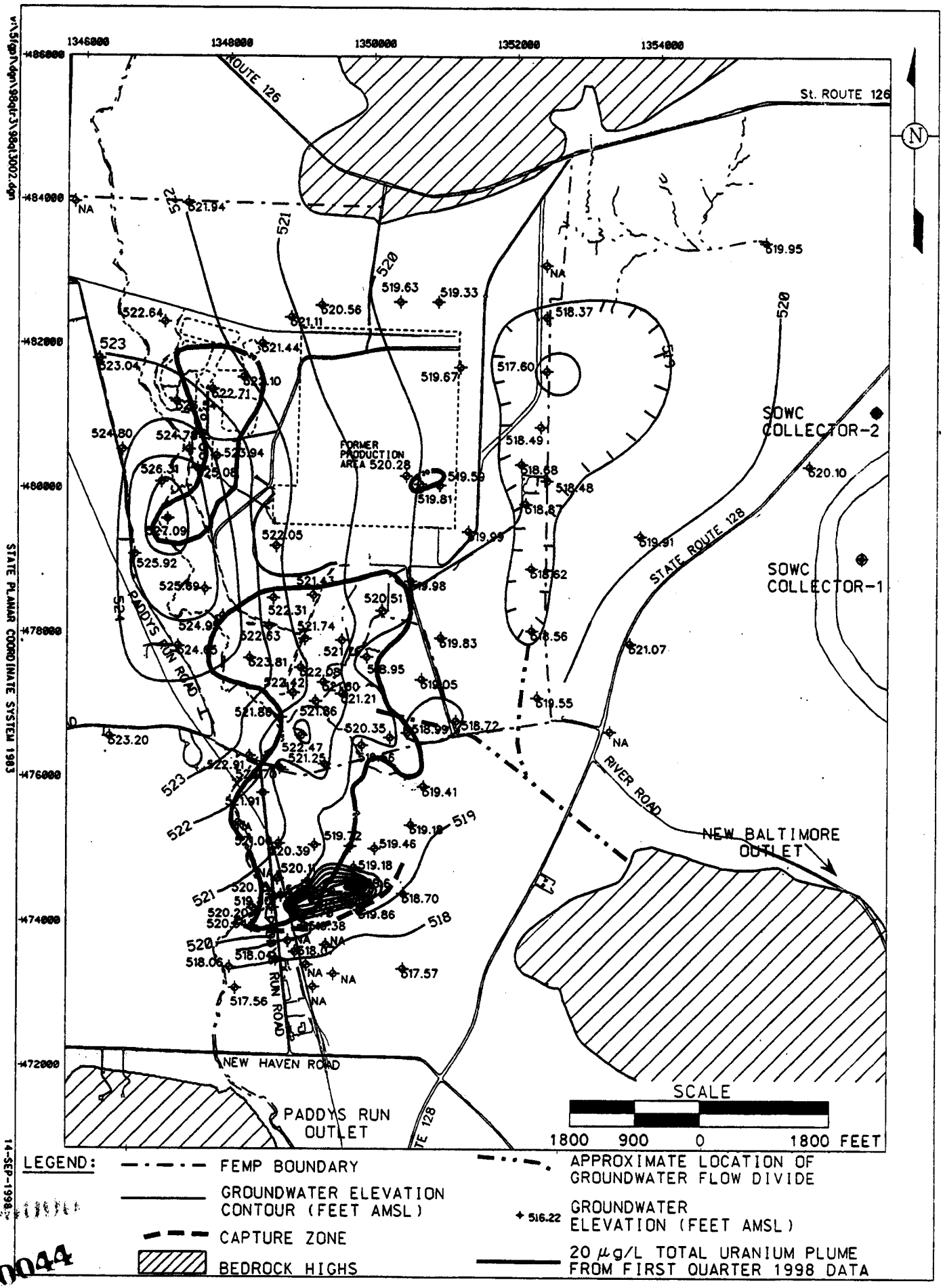


FIGURE 1-17. MAXIMUM TOTAL URANIUM PLUME MAP, FIRST QUARTER 1998



000044

FIGURE 1-18. GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, APRIL 1998

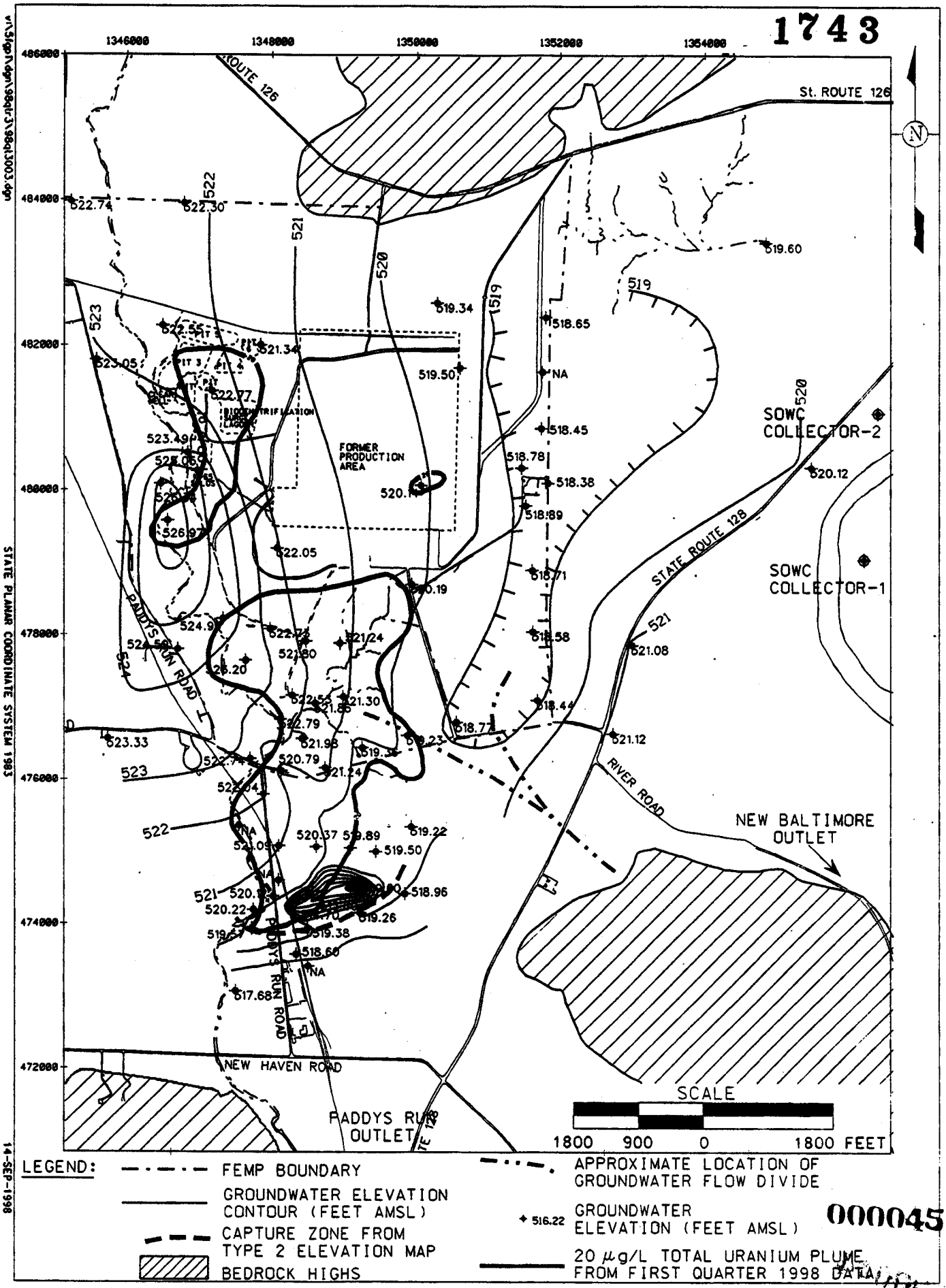
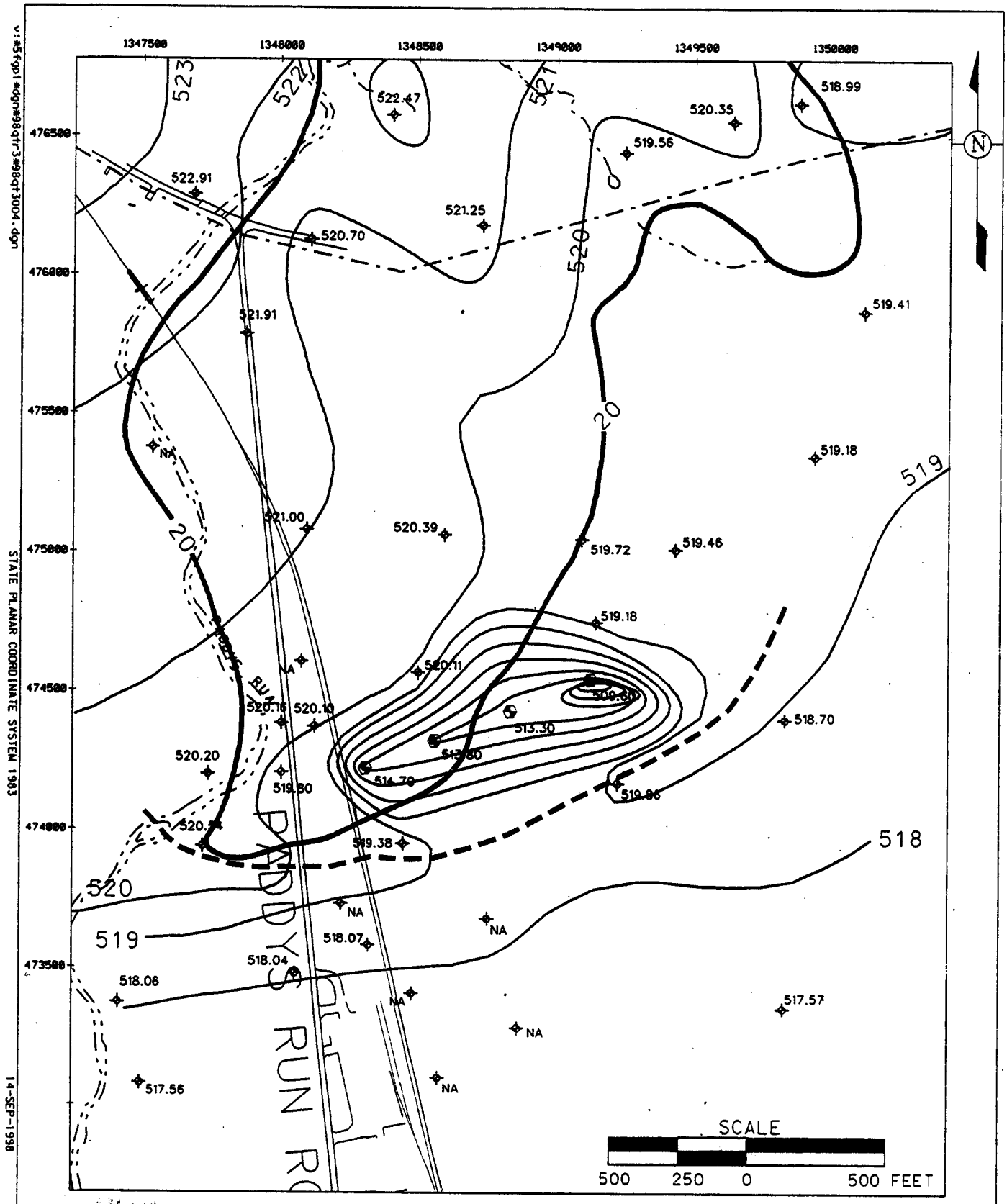
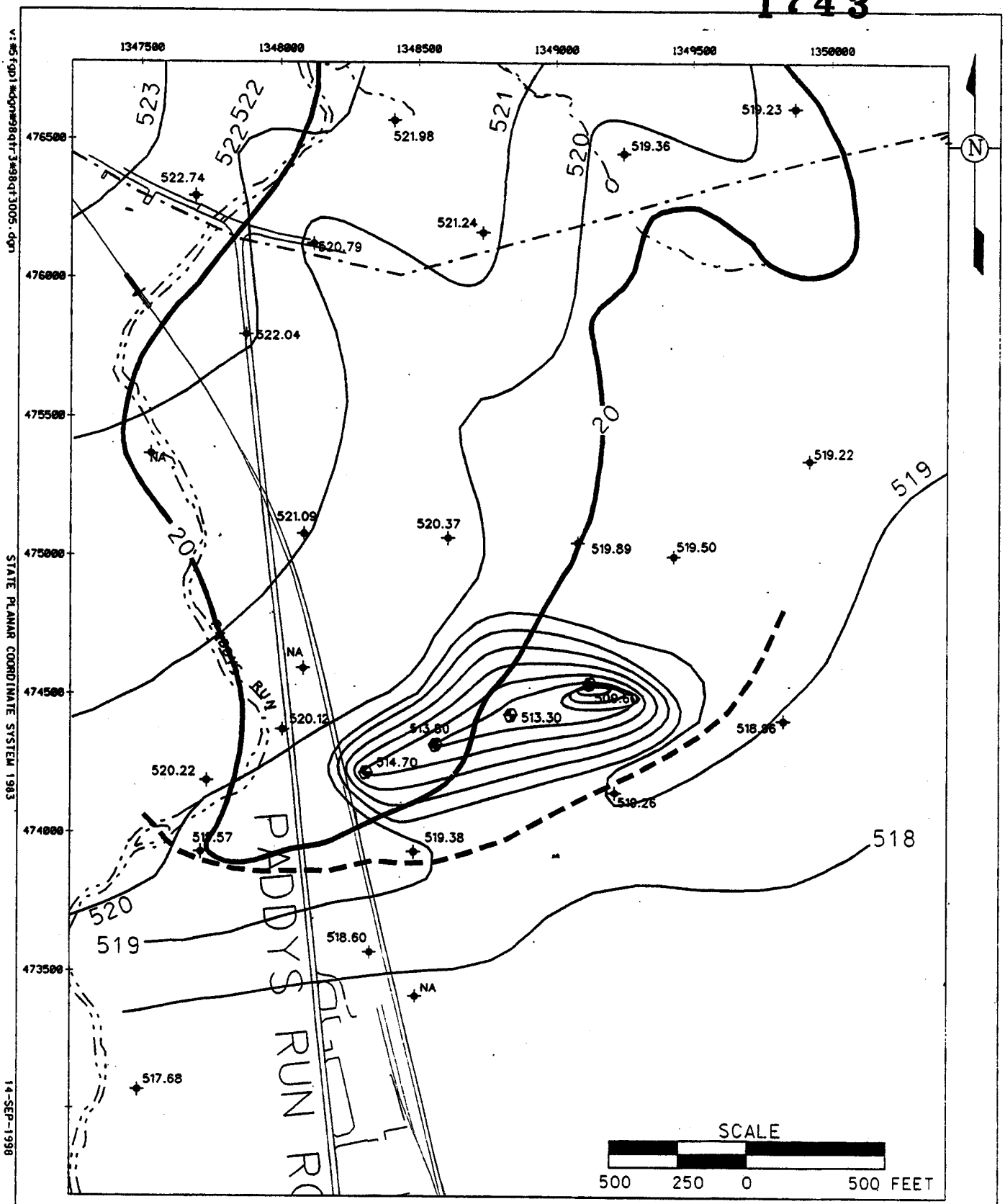


FIGURE 1-19. GROUNDWATER ELEVATIONS FOR TYPE 3 WELLS, APRIL 1998



000046

FIGURE 1-20. DETAILED GROUNDWATER ELEVATIONS IN SOUTH PLUME AREA FOR TYPE 2 WELLS, APRIL 1998



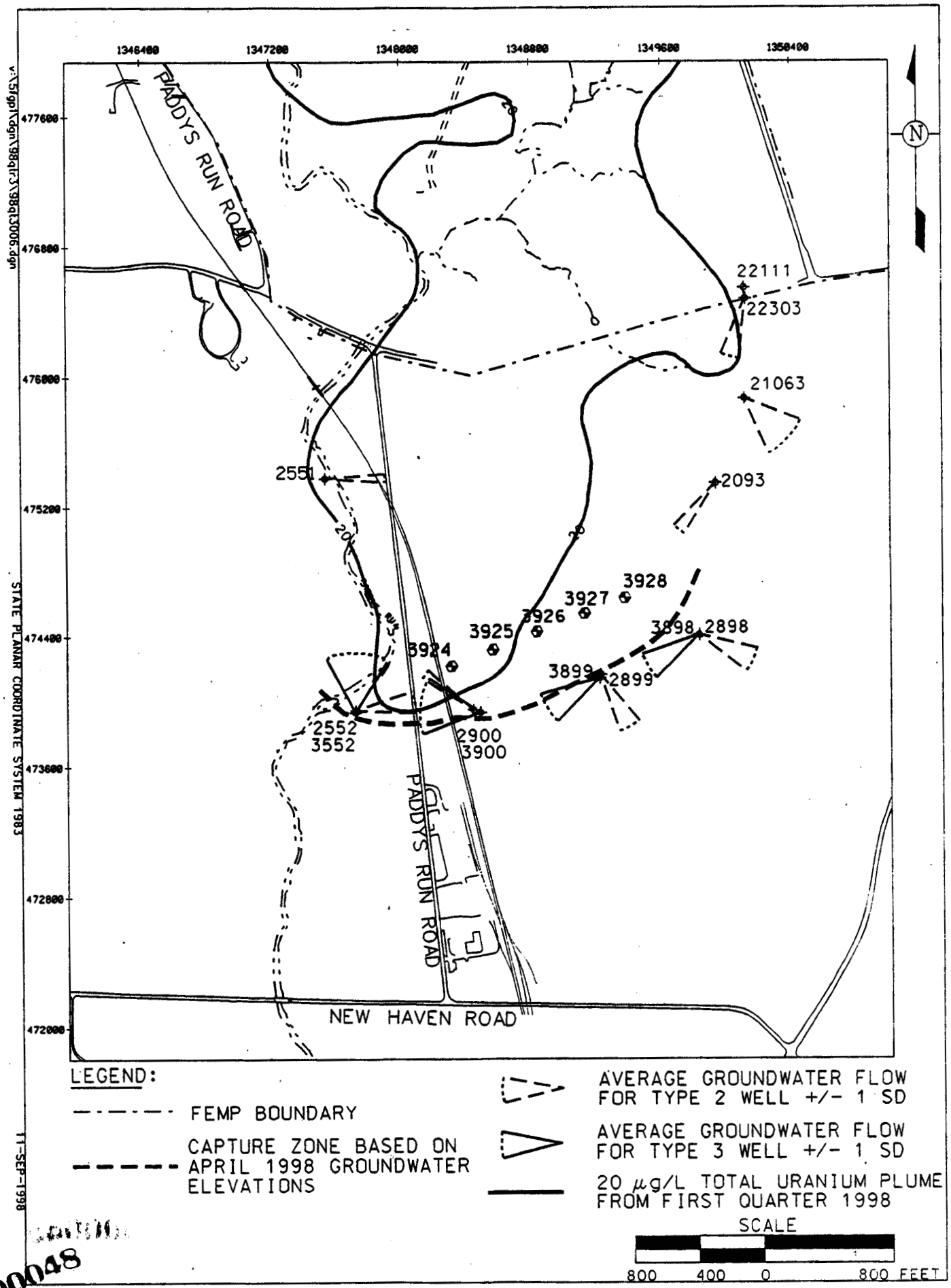
LEGEND:

- FEMP BOUNDARY
- GROUNDWATER ELEVATION CONTOUR (FEET AMSL)
- CAPTURE ZONE
- 516.22 GROUNDWATER ELEVATION (FEET AMSL)
- 20 μg/L TOTAL URANIUM PLUME FROM FIRST QUARTER 1998 DATA

FIGURE 1-21. DETAILED GROUNDWATER ELEVATIONS IN SOUTH PLUME AREA FOR TYPE 3 WELLS, APRIL 1998

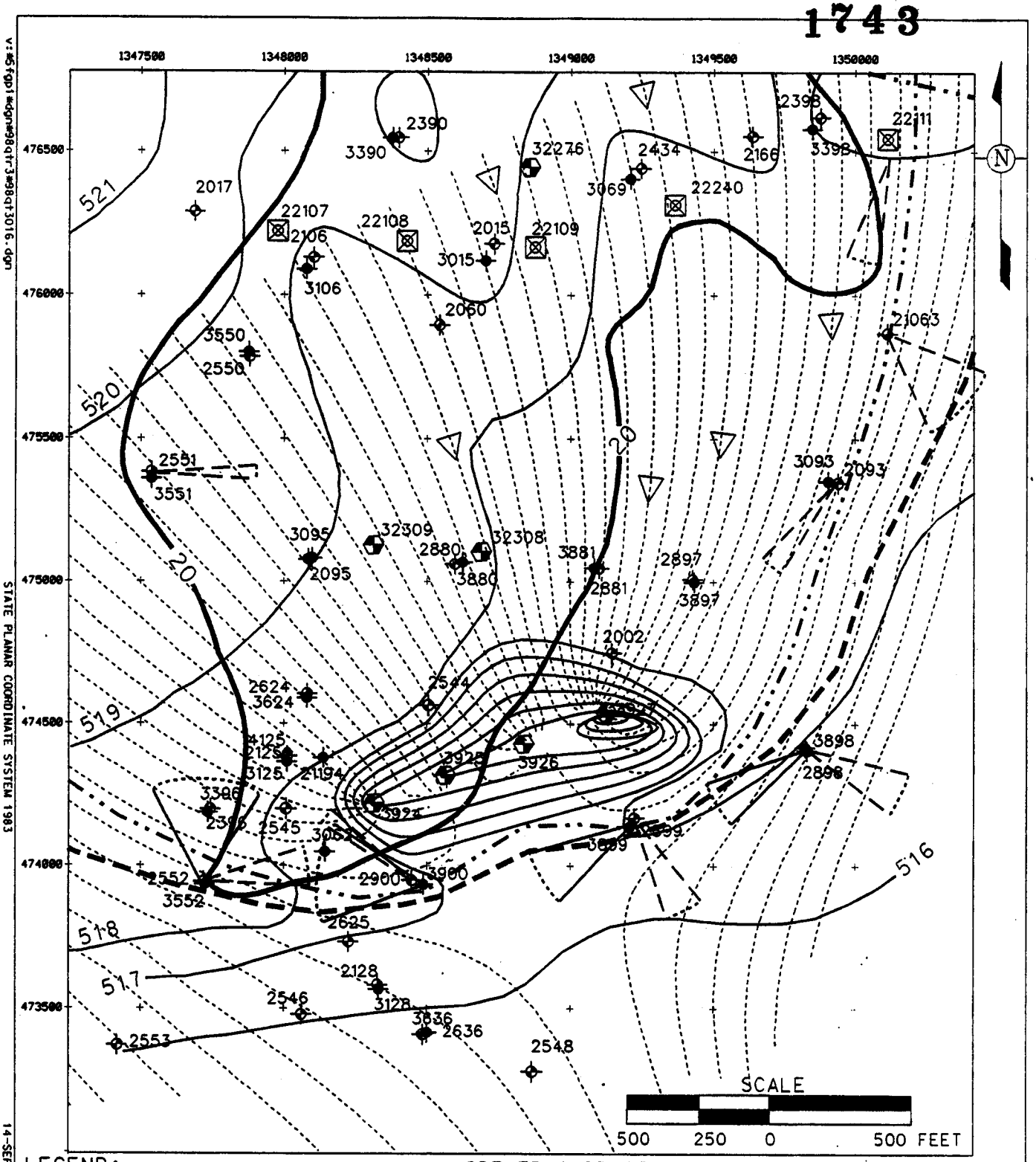
STATE PLANAR COORDINATE SYSTEM 1983

14-SEP-1998



000048

FIGURE 1-22. HYDRAULIC CAPTURE ZONE AND COLLOIDAL BORESCOPE FLOW VECTORS FOR THE SOUTH PLUME EXTRACTION MODULE, SECOND QUARTER 1998

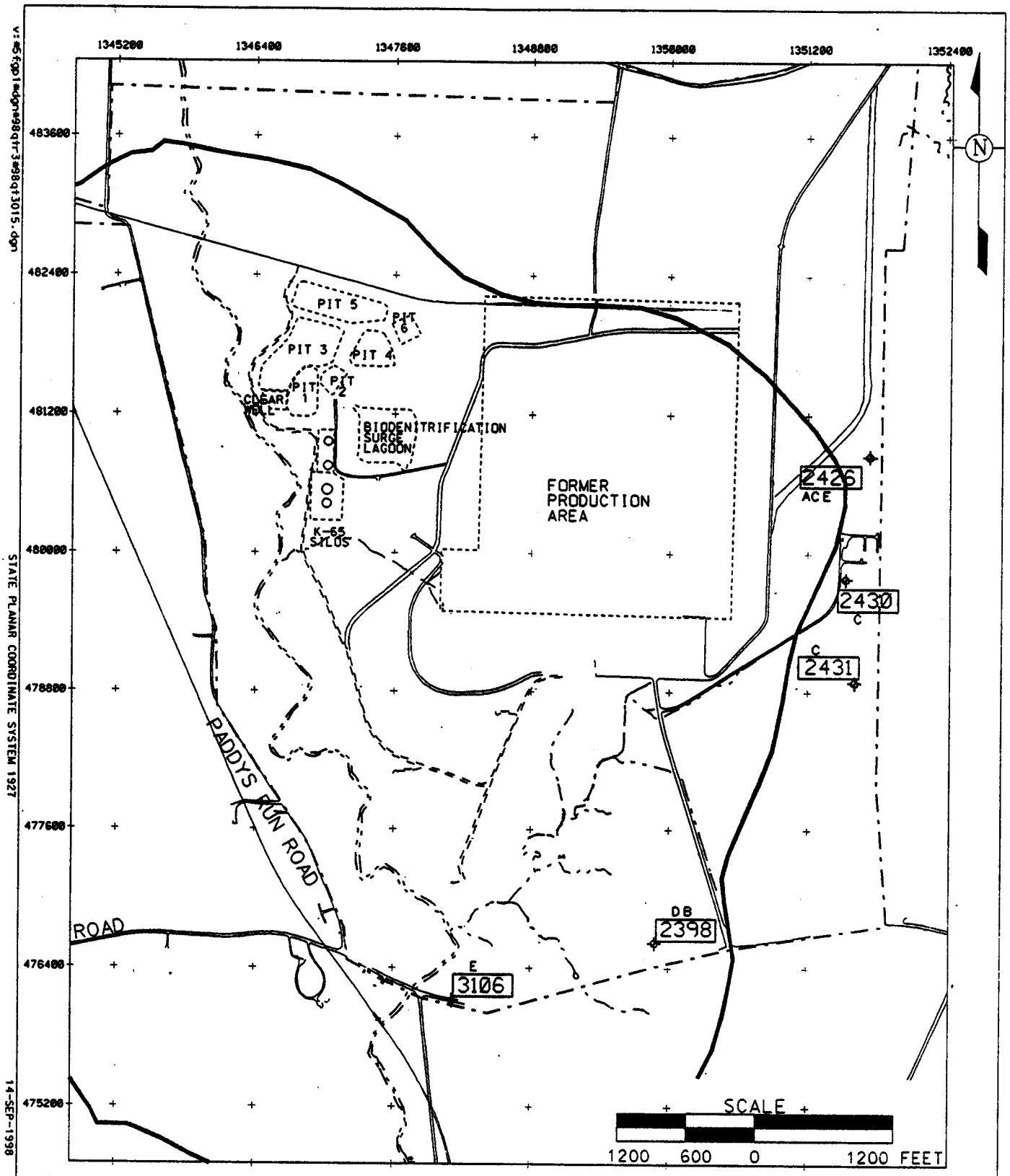


LEGEND:

- FEMP BOUNDARY
- GROUNDWATER FLOW DIRECTION MEASURED WITH BORESCOPE
- AVERAGE GROUNDWATER FLOW FOR TYPE 2 WELL +/- 1 SD
- AVERAGE GROUNDWATER FLOW FOR TYPE 3 WELL +/- 1 SD
- MODELED CAPTURE ZONE (1500 gpm)
- 10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT
- MODELED PARTICLE TRACK (1500 gpm)
- APRIL 1998 GROUNDWATER ELEVATION CONTOUR (FEET AMSL)
- 20 µg/L URANIUM PLUME FROM FIRST QUARTER 1998
- MONITORING WELL
- EXTRACTION WELL
- RE-INJECTION WELL

FIGURE 1-23. MODELED VERSUS ACTUAL GROUNDWATER FLOW DIRECTIONS

v:\5fdp1\dgn\98qtr3\98qt3016.dgn
STATE PLANAR COORDINATE SYSTEM 1983
14-SEP-1998



LEGEND:

FEMP BOUNDARY

MONITORING WELL LOCATIONS WITH FRL EXCEEDANCE

10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT

FRL EXCEEDANCE KEY:

A ARSENIC
B CHROMIUM, TOTAL
C MANGANESE
D NICKEL
E ZINC

000050

FIGURE 1-24. NON-URANIUM CONSTITUENTS WITH FIRST QUARTER 1998 RESULTS ABOVE FINAL REMEDIATION LEVELS

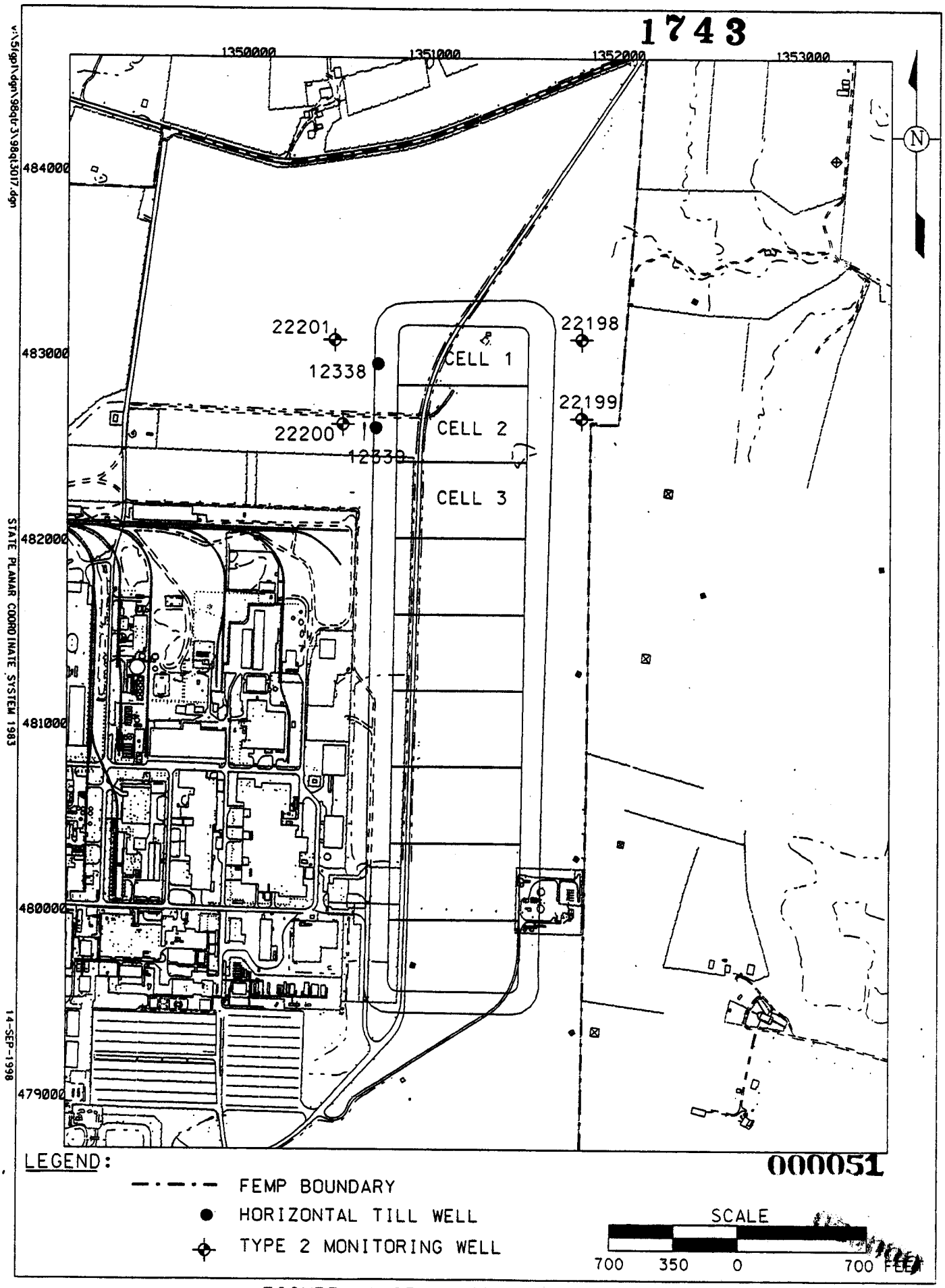


FIGURE 1-25. OSDF WELL LOCATIONS

000052

FIGURE 1-26

GROUNDWATER SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

SAMPLING ACTIVITIES	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
South Plume/South Plume Optimization Modules:												
Operational							♦	♦	♦			
Aquifer Conditions					♦							
South Field Extraction Module:												
Operational (Phase 1)							♦	♦	♦			
Aquifer Conditions					♦							
Re-Injection Demonstration Module[a]:												
Operational									♦			
Waste Storage Area Module:												
Aquifer Conditions												
Plant 6 Area Module:												
Aquifer Conditions												
Routine Water-Level/Flow Direction Monitoring							♦					
RCRA Property Boundary Monitoring				♦								
Private Well Monitoring				♦								
KC-2 Warehouse Monitoring												
OSDF Groundwater Monitoring:												
Post-Baseline (Cell 1)					♦							
Baseline (Cell 2)				♦	♦	♦						

♦ Data summarized/evaluated in the next report

[a]Aquifer conditions for this module are monitored under the South Plume Module, South Field Module, and the RCRA Property Boundary Program.

2.0 SURFACE WATER AND TREATED EFFLUENT UPDATE

2.1 INTRODUCTION

This section provides a status of the surface water and treated effluent monitoring for the second quarter of 1998. Figure 2-1 shows the data included in this section. Figure 2-2 identifies the surface water and treated effluent sample locations. Analytical results from the following routine monitoring program elements were utilized to complete the reporting requirements identified in Section 4.6.2 of the IEMP:

- National Pollutant Discharge Elimination System (NPDES) permit (data obtained from April through June 1998)
- Federal Facilities Compliance Agreement (FFCA) requirements (data obtained from April through June 1998)
- IEMP Characterization Program results (data obtained from January through March 1998).

2.2 FINDINGS

The principal findings from the reporting period are summarized below:

NPDES Permit Compliance

- On May 23, 1998, the new sewage treatment plant came on line. Figure 2-2 identifies the location of the new sewage treatment plant. Sample location STP 4601, previously associated with the effluent from the old plant, now monitors effluent from the new plant. However, it should be noted that concentrations from this new location still represent effluent concentrations directed to the Parshall Flume (PF 4001). (Refer to Figure 2-2 for the previous location of STP 4601 and for the new location.)

- Wastewater and storm water discharges from the FEMP were in compliance 97.8 percent of the time during the second quarter of 1998. The following identifies the NPDES noncompliances:

  In April, heavy sequential rainfall events resulted in an overflow of the Storm Water Retention Basin and caused one exceedance of the total suspended solids limit at the Storm Water Retention Basin spillway. The excessive rainfall also resulted in four exceedances of the total suspended solids limit at the Parshall Flume due to subsequent bypassing of storm water directly from the Storm Water Retention Basin to the Great Miami River.

  In May, there were two exceedances of the interim residual chlorine limit at the Parshall Flume. This interim limit for residual chlorine was in effect from May 1 through May 23 because it was necessary to disinfect sewage treatment plant effluent

using chlorine rather than ultraviolet light during the transition from the old sewage treatment plant to the new sewage treatment plant.

In June, there was one exceedance of the total suspended solids limit at the Parshall Flume, and five exceedances of the total suspended solids limit at the new sewage treatment plant.

- On April 16, 1998, the Storm Water Retention Basin overflowed for a total of 15.9 hours, releasing 1.394 million gallons of water to Paddys Run. (Refer to Table 2-1 for more information on the storm water overflow and treatment bypass events.)

- The following construction activities occurred during the second quarter of 1998 which could potentially impact the water quality at various surface water sample locations (identified in the parentheses):

  Installation of on-site disposal facility borrow area storm water controls (SWD-02 and STRM 4003)

  Construction activities associated with on-site disposal facility Cells 2 and 3 (SWD-02, STRM 4003, and PF 4001)

  Construction completion activities associated with site preparation in Area 2 Phase 1, southern waste units (STRM 4003 and STRM 4004)

  Limited activities in the north railyard, such as installation of lighting and the construction of the rail car maintenance building (STRM 4006)

  Construction completion activities associated with the South Field Extraction, the South Plume Optimization, and the Re-Injection Demonstration Modules (STRM 4003).

  Review of the surface water and treated effluent data provided with this report does not indicate that these activities have caused any significant FRL or benchmark toxicity value (BTV) exceedances (identified in surveillance subsection). However, data will continue to be evaluated in light of ongoing remediation activities to assess impacts to the surface water pathway.

FFCA and Operable Unit 5 Record of Decision Compliance

- Figure 2-3 shows that a cumulative total of 85.5 pounds of uranium were discharged to the Great Miami River in effluent from January through June 1998. The Record of Decision for Remedial Actions at Operable Unit 5 established an annual discharge limit to the Great Miami River of 600 pounds for total uranium.

- Uncontrolled runoff is also contributing to the amount of total uranium entering the environment. It is estimated that 6.25 pounds of total uranium is discharged to the environment through uncontrolled runoff with every inch of rain. It should be noted that the 6.25 value was determined prior to the initiation of remediation activities, and therefore yields conservative uncontrolled runoff concentrations. Figure 2-4 shows that precipitation during the second quarter of 1998 amounted to 22.8 inches; therefore, the

000054

mass of total uranium discharged to the environment through uncontrolled runoff from April through June 1998 was approximately 142 pounds. An additional 4.36 pounds of total uranium were discharged to Paddys Run during the April 16, 1998, overflow event.

- Figure 2-5 shows that the monthly average total uranium concentration limit of 20 μg/L in water discharged to the Great Miami River (effective January 1, 1998) was met during the second quarter of 1998. Seven of the 10 allowable "significant precipitation" bypass days were utilized in the second quarter to meet the limit, for a total of nine bypass days in 1998. Table 2-1 presents the details concerning these bypasses, including volumes.

- It was determined in July 1998 (third quarter) that the frequency and extent of the bypasses that occurred during the second quarter were caused by both high precipitation and because "clean" water from construction related runoff from Cells 2 and 3 of the on-site disposal facility was unnecessarily diverted to the Storm Water Retention Basin. A corrective action was initiated in the third quarter to stop any further storm water flows from Cells 2 and 3 in order to ensure that the Storm Water Retention Basin's design capacity is not exceeded (letter [DOE-1063-98], dated August 6, 1998, from Johnny Reising of the U.S. Department of Energy [DOE] to James Saric of the U.S. Environmental Protection Agency and Tom Schneider of OEPA). Figure 2-6 identifies controlled and uncontrolled surface water flows for the second quarter of 1998. This figure shows the area associated with the on-site disposal facility that was unnecessarily controlled. An evaluation of controlled areas will be conducted periodically (at least quarterly) in order to provide updates to this figure. The IEMP quarterly status reports will provide the updates of these assessments.

- On April 22, 1998, the Advanced Wastewater Treatment (AWWT) Expansion System was declared "ready to operate"; however, due to construction activities associated with the influent supply piping, no water was treated until April 30, 1998. Since that time, the AWWT Expansion has been treating groundwater from the South Plume. Effluent from this treatment system during the second quarter was combined with other AWWT effluents and discharged to the Great Miami River via the Parshall Flume.

Surveillance Monitoring

- No FRL or BTV exceedances attributable to the FEMP were observed in the Great Miami River. (Refer to Tables 2-2 and 2-3 for FRL and BTV exceedances, respectively.)

- No surface water FRL exceedances were observed for total uranium. As Figure 2-7 shows, results from the property boundary at Paddys Run (SWP-03) indicate that total uranium concentrations in surface water leaving the site are consistently below both the surface water FRL and the groundwater FRL.

- The concentration for total uranium (171 μg/L) during the overflow event in April at the Storm Water Retention Basin also did not exceed the surface water FRL for total uranium.

- FRL exceedances were limited to two metals: total chromium and copper. All exceedances were minimally above the FRL as identified in Table 2-2. Total chromium and copper exceedances were associated with the Storm Water Retention Basin overflow (SWRB 4002O) and with STRM 4004. Copper also exceeded the FRL at the Great Miami Background location (SWR-01). Concentrations of these constituents will continue to be monitored and tracked over time to determine the significance of these exceedances.

- Concentrations from three constituents (barium, cadmium, and silver) were evaluated against surface water BTVs and it was determined that only one exceedance occurred. This cadmium exceedance was at SWP-02 and was minimally above the BTV as identified in Table 2-3. Based on the results of the BTV screening process presented in the approved Sitewide Excavation Plan (DOE 1998d), the three constituents (barium, cadmium, and silver) should continue to be evaluated against surface water BTVs. The remaining constituents will be assessed against FRLs or NPDES limits.

Figure 2-8 shows the data from the surface water and treated effluent sampling activities that will be included in the next IEMP quarterly status report. The next quarterly status report will be submitted in December 1998. The report will contain NPDES and FFCA data from July through September 1998 (third quarter) and the results of the analytical data from the IEMP Characterization Program from April through June 1998 (second quarter).

000056

1743

TABLE 2-1

1998 STORM WATER OVERFLOWS AND TREATMENT BYPASS EVENTS

Bypass Days	Duration (hours)	Number of Bypass Days[a]	Cumulative No. of Bypass Days	Total Uranium Discharged to Great Miami River (pounds)	Total Water Discharged to Great Miami River (millions of gallons)
Overflows					
April 16	15.9	NA	NA	4.36 (to Paddys Run)	1.39 (to Paddys Run)
Significant Precipitation-Related					
January 7 through January 9	53.8	2	2	7.81	3.19
April 16 through April 19	76.8	3	5	10.1	6.09
June 11 through June 14	80.0	3	8	11.2	5.69
June 16 through June 17	22.8	0	8	2.4	1.43
June 19 through June 20	24.0	1	9	3.2	2.01

[a]Days are counted according to the definition provided in the Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project (OMMP) (DOE 1997d).

000057

TABLE 2-2

SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE FRL, INCLUDING SUMMARY STATISTICS

Sample Location[a]	Constituent	Total Number of Samples Since 1997[b,c,d]	Number of Samples with FRL Exceedances Since 1997[c,d]	Number of Samples with FRL Exceedances for First/Second Quarters 1998[d]	FRL[e] (mg/L)	Summary Statistics[c,f,g] Min. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with FRL Exceedances for First/Second Quarters 1998 Sample Result (mg/L)	Validation Qualifier	Date Sampled
SWRB 4002O (Storm Water Retention Basin Overflow)	Chromium, Total	2	1	1	0.010[h]	0.003	0.0128	NA	0.0128	NV	4/16/98
SWRB 4002O (Storm Water Retention Basin Overflow)	Copper	2	2	1	0.012	0.0122	0.0156	NA	0.0122	NV	4/16/98
STRM 4004 (Storm Sewer Outfall Ditch)	Chromium, Total	3	2	1	0.010[h]	0.003	0.0288	0.0147	0.0124	NV	6/11/98
STRM 4004 (Storm Sewer Outfall Ditch)	Copper	3	3	1	0.012	0.0152	0.0293	0.0205	0.0152	NV	6/11/98
SWR-01 (Great Miami River)	Copper	3	1	1	0.012	0.0043	0.0121	0.0095	0.0121	J	3/11/98

[a]See Figure 2-2
[b]Total number of samples is from all surface water programs including NPDES, NPDES permit renewal, FFCA, and IEMP Characterization Program.
[c]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for the summary statistics and in determining FRL exceedances.
[d]Rejected data qualified with either a R or Z were not used for this table.
[e]From Operable Unit 5 Record of Decision, Table 9-5
[f]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.
[g]NA = not applicable
[h]FRL based on Chromium VI, from Operable Unit 5 Record of Decision, Table 9-5

000058

TABLE 2-3

SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE BTV, INCLUDING SUMMARY STATISTICS

Sample Location[a]	Constituent	Total Number of Samples Since 1997[b,c,d]	Number of Samples with BTV Exceedances Since 1997[c,d]	Number of Samples with BTV Exceedances for First/Second Quarters 1998[d]	BTV[e] (mg/L)	Summary Statistics[c,f] Min. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with BTV Exceedances for First/Second Quarters 1998 Sample Result (mg/L)	Validation Qualifier	Date Sampled
SWP-02 (Paddys Run)	Cadmium	7	2	1	0.0035	0.0001	0.0105	0.0024	0.0038	-	2/12/98

[a]See Figure 2-2
[b]Total number of samples is from all programs including NPDES, NPDES permit renewal, FFCA, and IEMP Characterization Program.
[c]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples and the sample with the maximum concentration is used for the summary statistics and in determining BTV exceedances.
[d]Rejected data qualified with either a R or Z were not used for this table.
[e]From IEMP Table 3-2
[f]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.

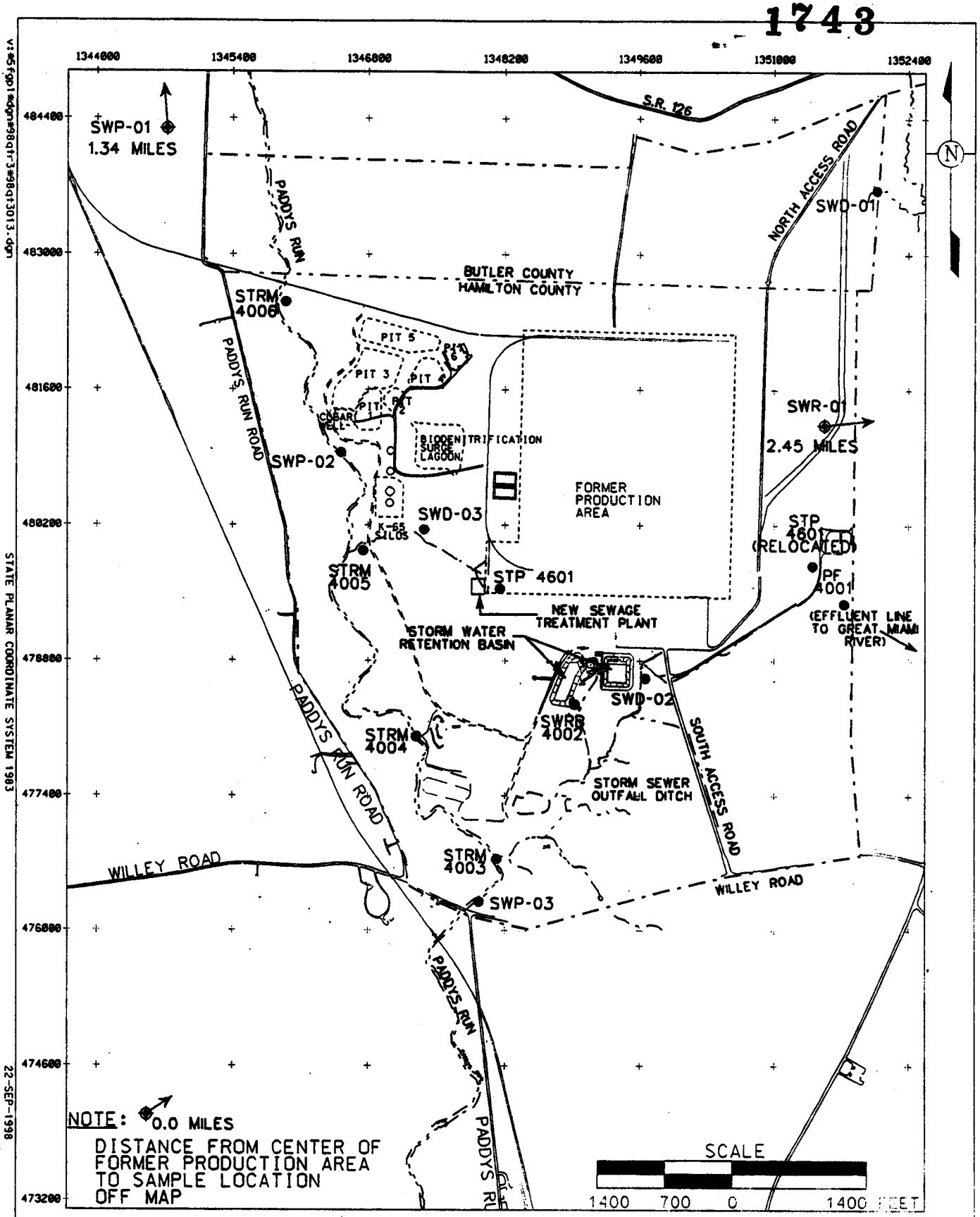
000060

FIGURE 2-1

SURFACE WATER AND TREATED EFFLUENT SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
SAMPLING ACTIVITIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NPDES				♦	♦	♦						
FFCA				♦	♦	♦						
IEMP Characterization	♦	♦	♦									

♦ Data summarized/ evaluated in this report



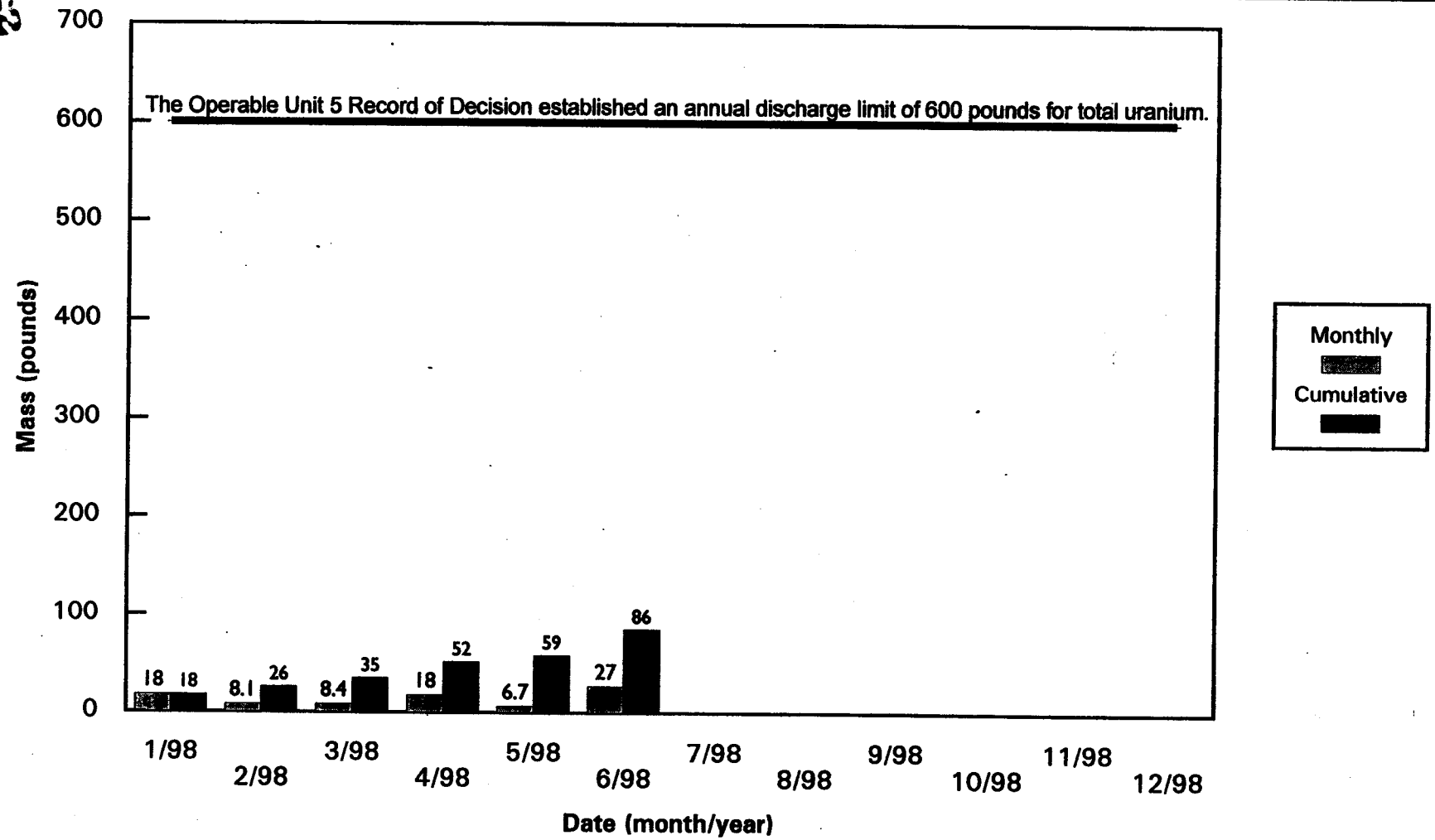
LEGEND:

— · — · — FEMP BOUNDARY

● SAMPLE LOCATION

PF 4001	PARSHALL FLUME
SWRB 4002	STORM WATER RETENTION BASIN
STP 4601	SEWAGE TREATMENT PLANT EFFLUENT

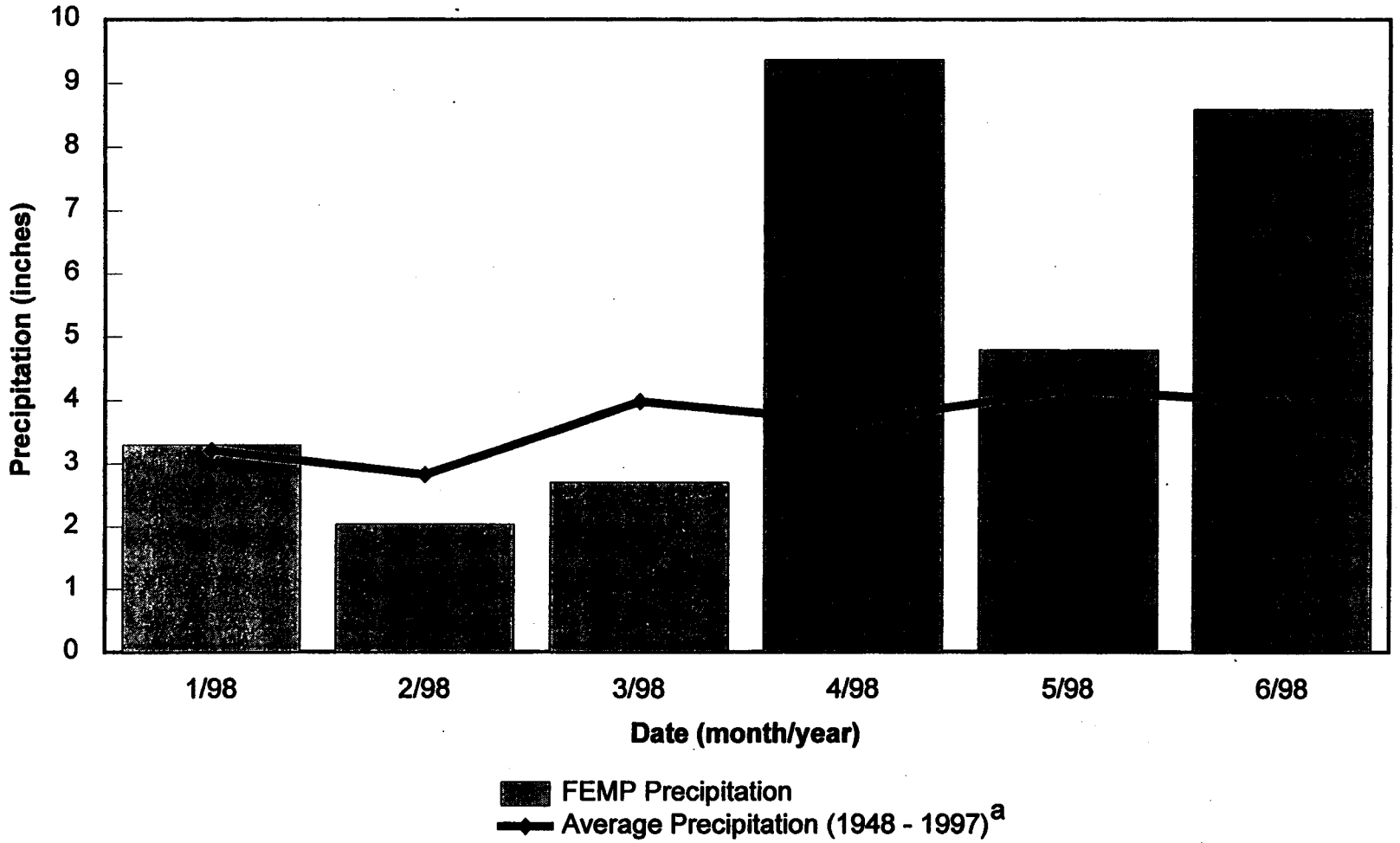
FIGURE 2-2. SURFACE WATER AND TREATED EFFLUENT SAMPLE LOCATIONS



Note: Numbers have been rounded to two significant figures.

FIGURE 2-3. POUNDS OF URANIUM DISCHARGED TO THE GREAT MIAMI RIVER FROM THE PARSHALL FLUME (PF 4001) IN 1998

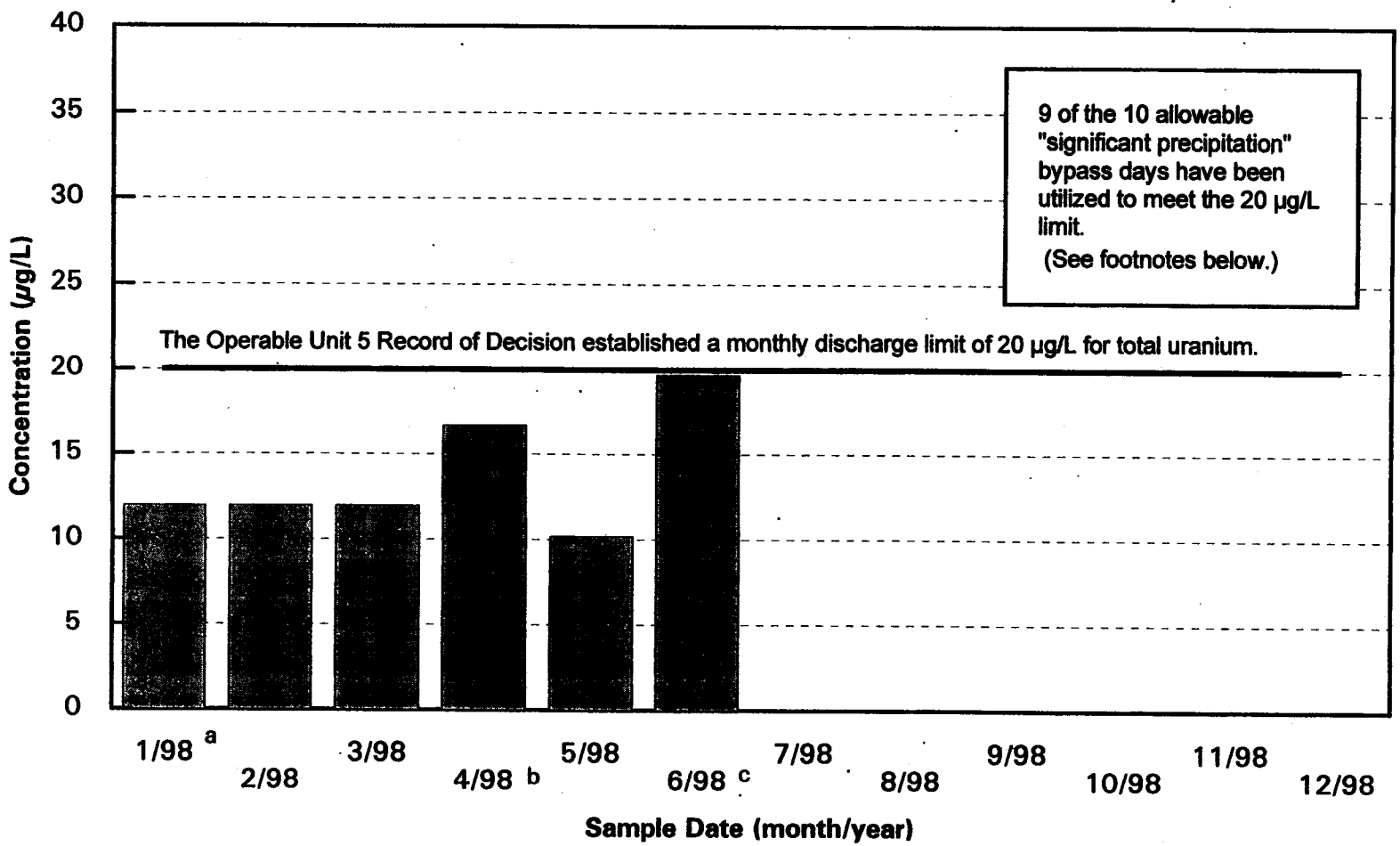
000062



[a] Average precipitation is based on data collected at the Greater Cincinnati/Northern Kentucky International Airport.

FIGURE 2-4. 1998 FEMP MONTHLY PRECIPITATION DATA

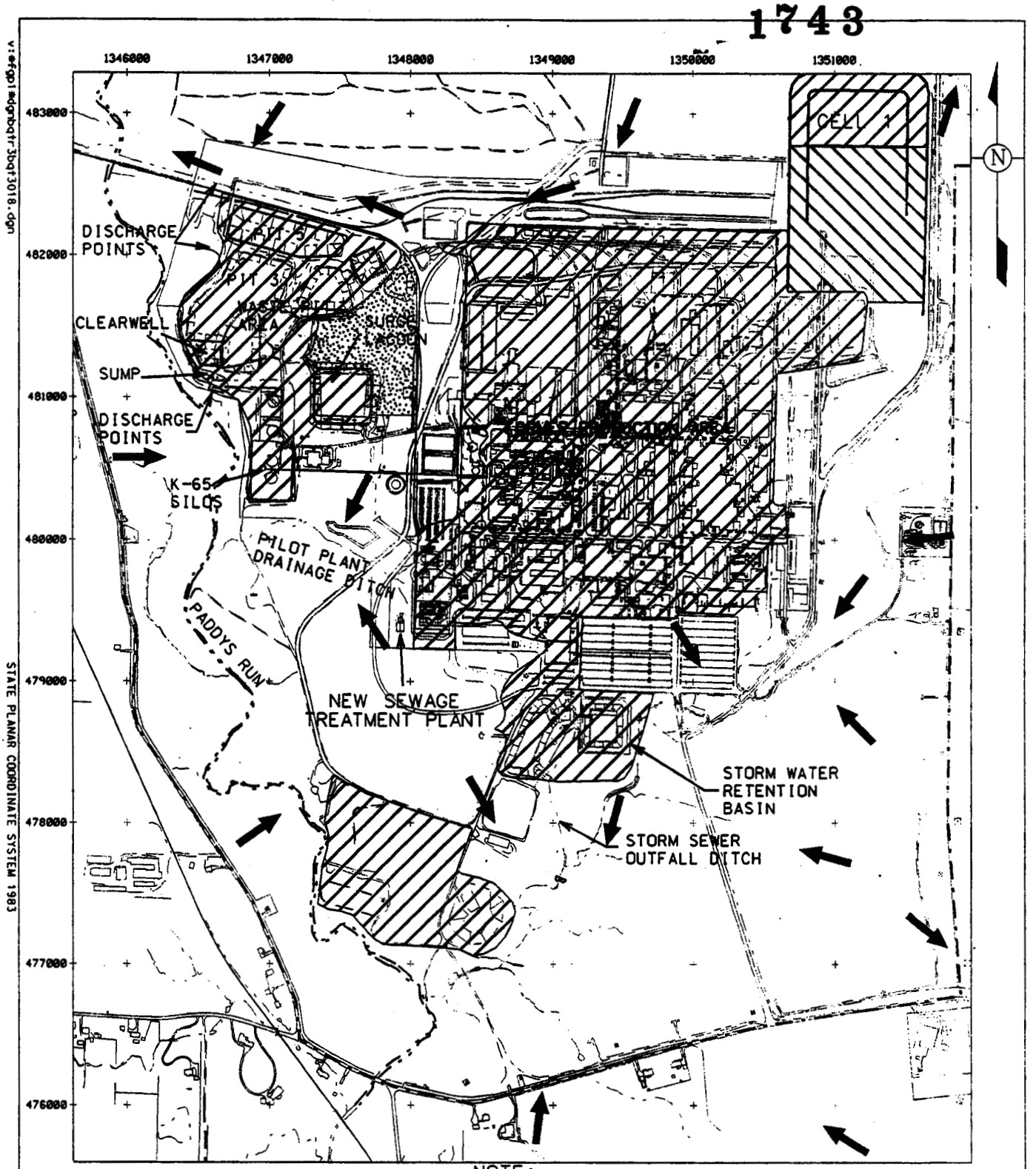
000063



a) Actual concentration was 23.2 µg/L. Eliminating the two "significant precipitation" bypass days reduces average to 12.0 µg/L.
b) Actual concentration was 33.3 µg/L. Eliminating the three "significant precipitation" bypass days reduces average to 16.7 µg/L.
c) Actual concentration was 33.2 µg/L. Eliminating the four "significant precipitation" bypass days reduces average to 19.7 µg/L.

FIGURE 2-5. 1998 MONTHLY AVERAGE TOTAL URANIUM CONCENTRATION IN WATER DISCHARGED FROM THE PARSHALL FLUME (PF 4001) TO THE GREAT MIAMI RIVER

000064



LEGEND:

FEMP BOUNDARY

CONTROLLED AREA

AREA UNNECESSARILY CONTROLLED DURING SECOND QUARTER

WATER TREATED IF TOTAL URANIUM RESULT IS > 20 $\mu g/L$

NOTE:

CONTROLLED MEANS WATER IS COLLECTED AND TREATED, AS NECESSARY, AT THE AWWT.

UNCONTROLLED RUNOFF FLOW DIRECTION

SCALE

1000 500 0 1000 FEET

STATE PLANAR COORDINATE SYSTEM 1983

v:#fgp1#dgnbqtr3bqt3018.dgn

Sep-2-1998

FIGURE 2-6. CONTROLLED SURFACE WATER AREAS AND UNCONTROLLED FLOW DIRECTIONS FOR SECOND QUARTER 1998

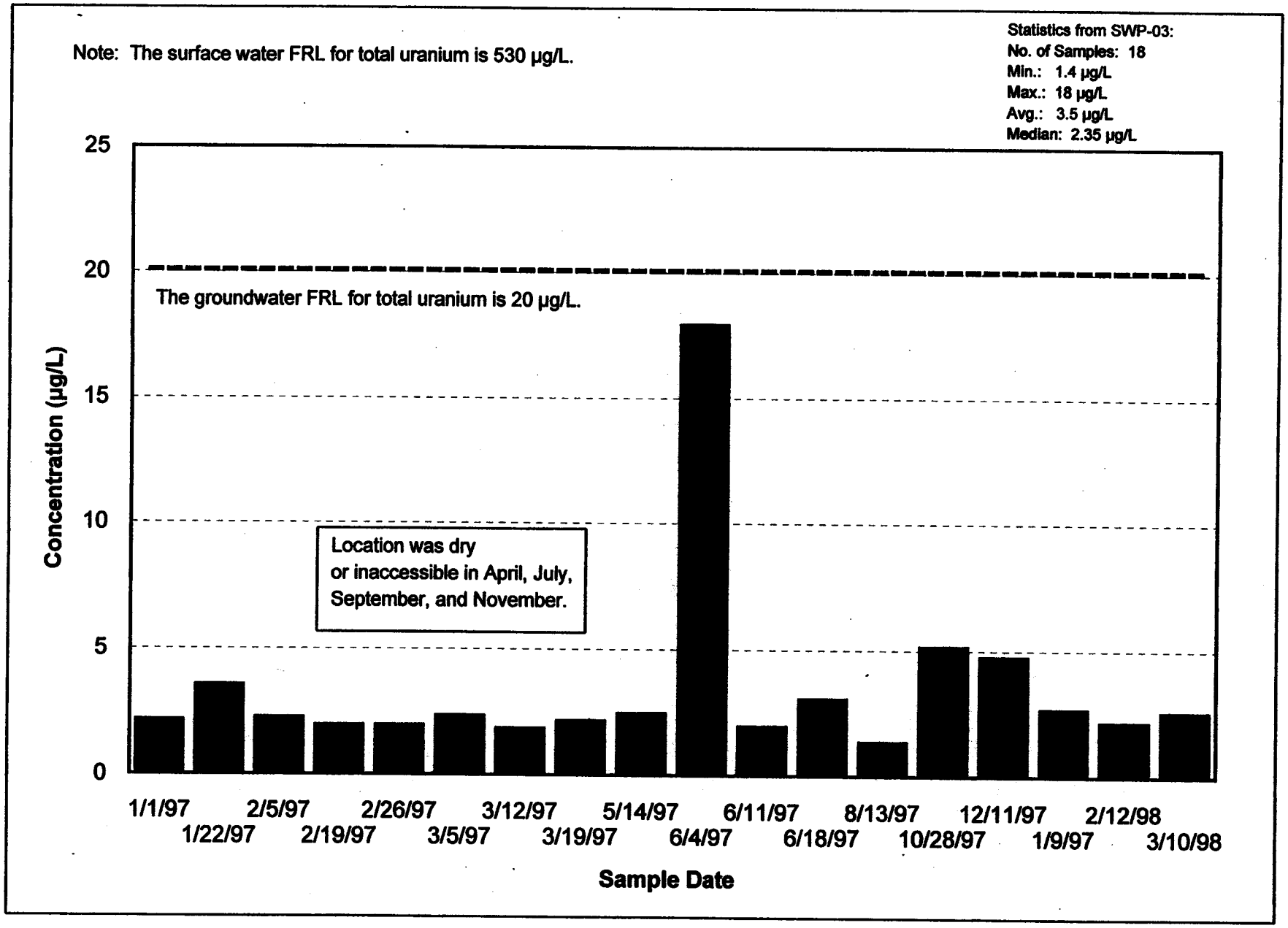


FIGURE 2-7. TOTAL URANIUM CONCENTRATIONS IN PADDYS RUN AT WILLEY ROAD (SWP-03) SAMPLE LOCATION

000066

FIGURE 2-8

SURFACE WATER AND TREATED EFFLUENT SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
SAMPLING ACTIVITIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NPDES							♦	♦	♦			
FFCA							♦	♦	♦			
IEMP Characterization				♦	♦	♦						

♦ Data summarized/ evaluated in the next report

1743

000062

1743

3.0 AIR MONITORING UPDATE

3.1 INTRODUCTION

This section provides a summary of the second quarter 1998 monitoring activities and analytical results for the IEMP air monitoring program. Figure 3-1 shows the data included in this section. Analytical results from the following routine air monitoring program elements and project-specific air monitoring activities covered in this section include:

- Radiological Air Particulate Monitoring:

  National Emissions Standards for Hazardous Air Pollutant (NESHAP) Compliance
  Project-Specific Air Monitoring at the Thorium/Plant 9 Complex
  Air Particulate Monitoring Research Project

- Radon Monitoring:

  Continuous Alpha Scintillation Monitoring - Silo Head Space and Environmental Data
  Alpha Track-Etch Environmental Monitoring Data

- Direct Radiation Monitoring (via thermoluminescent dosimeters [TLDs])

- NESHAP Stack Emissions Monitoring.

3.2 FINDINGS

The principle findings from this reporting period are summarized below:

Radiological Air Particulate Monitoring

- An increase in the quarterly average total uranium concentration was observed at 13 of the 16 fenceline air particulate monitoring locations during the second quarter of 1998. These increasing uranium concentrations reflect the increased level of remediation field activities as projects were restarted following the winter shutdown. This general pattern was reflected in the 1997 data and should be expected in the coming years as the annual cycle of activities is repeated. Increasing trends in the biweekly uranium data were observed at monitoring locations along the east fenceline most notably at air monitoring stations (AMS)-3 and AMS-9C. These trends reflect the restart of full scale operations at the on-site disposal facility and the general downwind position of these monitors in relationship to the remediation and excavation activities which increased over the second quarter of 1998.

  (Figure 3-2 identifies the location of the air monitoring stations and Figure 3-3 shows second quarter 1998 wind rose data.)

000068

While increases in total uranium concentrations were observed and increasing trends in downwind monitors were noted during the second quarter of 1998, the concentrations remain within historical ranges and result in a year-to-date dose that is approximately one percent of the 10 millirem (mrem) standard as verified through the results of the NESHAP dose assessment discussed later in this section. Nevertheless, this information has been shared with the project construction managers to reinforce the need for continued vigilance in controlling fugitive dust emissions across the site.

- Total particulate concentrations at the air monitoring stations were generally higher than first quarter results. Higher particulate concentrations at the background locations (AMS-12 and AMS-16) were also observed. This general increase in particulate concentrations reflects both the increase in site activities during the spring and also the increased farming and gravel pit operations near the site and background monitoring locations.

(Refer to Tables 3-1 and 3-2 and Figures 3-4 through 3-13 for data summaries and graphs.)

NESHAP Compliance

- The maximum second quarter dose, calculated from air composite results, was 0.054 mrem which occurred at AMS-25. For comparison, the maximum first quarter 1998 dose, which also occurred at AMS-25, was 0.056 mrem. This equates to a maximum dose at the facility fenceline, through the second quarter, of 0.11 mrem at AMS-25 (see Table 3-3). This maximum fenceline dose represents 1.1 percent of the 10 mrem NESHAP Subpart H Standard.

The occurrence of the maximum dose at AMS-25 through the second quarter is unexpected based on its location in an upwind direction from remediation activities (refer to Figure 3-3). Based on the wind patterns observed at the site and the location of remediation activities, the highest doses are expected at the monitors located in the northeast quadrant of the site. In fact, not withstanding the AMS-25 results, AMS-9C, AMS-3, AMS-8A, and AMS-2 located in the northeast quadrant exhibited the next highest doses, respectively. A possible explanation for these results was the construction staging area located immediately adjacent to AMS-25 which supported the installation of the south field extraction system piping and other aquifer restoration projects. The construction staging area, which was removed late in the second quarter, may have influenced the results at AMS-25 during the first quarter, as large quantities of stone and building materials were stockpiled near this monitor.

At AMS-25, during the second quarter, thorium accounted for approximately 78 percent of the dose with uranium contributing approximately 15 percent. By comparison, the average dose contribution from uranium at all the fenceline monitors was 72 percent, while the average dose contribution from uranium at AMS-9C, AMS-3, AMS-8A, and AMS-2 was 93 percent. Evaluation of the analytical data associated with the second quarter AMS-25 composite sample indicate that the off-site laboratory experienced difficulties during the thorium analysis which may have contributed to unusually high thorium results. Specifically, the laboratory encountered reoccurring interferences during the thorium analysis resulting in low tracer recoveries. In adjusting the data for the low tracer recoveries, the thorium results may have been biased high, especially the thorium-230 results. While the thorium-230 data were not

000069

rejected through the validation process, they were qualified as "tentatively identified" indicating limited confidence in the results.

To date, there is no conclusive explanation for why AMS-25 has the highest dose, however, since the measured fenceline dose is well below the NESHAP standard, no changes to the monitoring program are proposed at this time.

(Refer to Table 3-3 for the data evaluation.)

Project-Specific Air Monitoring

- Project-specific radiological air monitoring activities initiated during October 1997 continued through the second quarter of 1998 to support the decontamination and dismantlement of the Thorium/Plant 9 Complex. The monitoring program includes five project-specific air monitoring stations located near the project boundary that are monitored weekly for total uranium. This monitoring program is conducted under the Operable Unit 3, Integrated Remedial Action, Thorium/Plant 9 Complex Implementation Plan for Above-Grade Decontamination and Dismantlement (DOE 1997c). The implementation plan establishes criteria for conducting engineering evaluations based on the results from the project-specific air monitors. Specifically, the plan states that if radiological levels from four consecutive weeks of air monitoring are more than twice the maximum baseline levels (established prior to decontamination and dismantlement activities), then an evaluation of the effectiveness of engineering controls will be performed as soon as practical.

  During the second quarter of 1998, results at one project-specific air monitor exceeded the established criteria. As a result, an engineering evaluation was conducted and additional engineering controls were implemented which extend beyond the project boundary. It should be noted that the average total uranium concentrations for the Thorium/Plant 9 Complex are within historical ranges of the Plant 1, 4, and 7 projects during similar work activities. In addition, IEMP monitoring data from the site fenceline does not indicate an off-site impact associated with the elevated on-site concentrations. The environmental data from the Thorium/Plant 9 Complex dismantlement project will be reported in the project completion report as specified in the Thorium/Plant 9 Complex Implementation Plan.

Air Particulate Monitoring Research Project

- During the second quarter of 1998, the DOE Environmental Measurements Laboratory continued to collect samples in order to measure the uranium concentration and the particle size distribution of particulate emissions. Since the analysis of samples collected in late 1997 and early 1998 showed the uranium concentrations to be at or below the detection limit, the analysis of samples collected during the second quarter of 1998 is on hold until improvements can be made to the analytical procedure. Modifications to the analytical methods and installation of a new sampler with a higher flow rate are expected to be completed during the third quarter of 1998.

Radon Monitoring

- During the second quarter of 1998, four monitoring locations were added to the FEMP's network of continuous radon monitors. This brings the total number of continuous radon monitors to 23. The additional monitors were co-located with air particulate monitoring stations along the site fenceline at the following AMS locations: AMS-09C, AMS-22, AMS-26, and AMS-27. It is DOE's intent to expand the network of continuous monitors to provide more timely assessment of environmental radon concentrations than the current network of radon cups can provide. The forthcoming IEMP biennial revision will detail DOE's overall proposal for modifying the radon monitoring network at the FEMP. (Figure 3-14 identifies the radon monitoring - continuous alpha scintillation locations.)

- During the second quarter of 1998, no exceedances of the 100 pCi/L radon limit specified in DOE Order 5400.5 were observed at the site.

- As expected, continuous radon monitoring results showed the highest recorded radon concentrations at the K-65 exclusion fence resulting from radon emissions from the K-65 Silos. All four K-65 exclusion fence monitors recorded radon levels higher than second quarter 1997 results with the highest monthly average being 7.1 pCi/L at location KNE. The increasing radon concentrations at the K-65 exclusion fence reflect the increasing radon emissions from the K-65 Silos as the effectiveness of the bentonite layers continues to slowly diminish. Second quarter 1998 data does not indicate the potential for an exceedance of the DOE on-site or off-site annual average radon limits during 1998. (Table 3-4 presents the monthly continuous radon monitor concentration data.)

- Second quarter 1998 measurements of average radon concentrations in the Silo 1 head space showed an increase of approximately 33 percent over second quarter 1997 results. Average radon concentrations in Silo 2 showed an increase of approximately 33 percent over concentrations measured during second quarter 1997. Silo 1 is now approximately 42 percent of the pre-bentonite concentration level and Silo 2 is now approximately 28 percent of the pre-bentonite concentration level. It should be noted that radon emissions from the K-65 Silos will be mitigated through implementation of the Accelerated Waste Retrieval Project which includes the construction of a radon treatment system for reducing radon concentrations in the silo head space. This system is scheduled to begin operations during 2000. (Figure 3-15 shows the quarterly silo head space radon concentrations and Table 3-5 presents the monthly average head space concentrations.)

- Radon data from the alpha track-etch cups for the period January through June 1998 are contained in this report. Maximum radon concentrations for locations at the silo dome and K-65 exclusion fence increased approximately 15 and 28 percent, respectively, over the first half of 1997. These increases are attributed to emissions from the increasing K-65 Silo head space concentrations. Data from fenceline and off-property locations were within historical ranges and do not indicate the potential for exceeding the DOE annual limit of 3.0 pCi/L above background during 1998. The results from fenceline monitoring location L, located near the silos, was identified as being higher than 1997 data; however, nearby monitoring locations do not show similar increases for 1998. (Figure 3-16 identifies the alpha track-etch locations and Table 3-6 presents the alpha track-etch cup data.)

000071

1743

Direct Radiation (TLD) Monitoring

- All monitoring results from direct radiation measurements for second quarter 1998 were within historical ranges. A positive trend in the immediate area of the K-65 Silos has been identified and will continue to be monitored. This trend is attributed to a corresponding increase in radon concentrations observed in the K-65 Silo head space. The increase in direct radiation measurements adjacent to the silos is still well below the levels observed prior to the addition of bentonite to the silos in 1991. A slight positive trend at the site fenceline near the K-65 Silos is also attributed to the increase in head space radon concentrations. The trend is most evident at location 6, the fenceline location, which is closest to the K-65 Silos (see Figure 3-18). The trend will continue to be monitored during 1998.

  (Refer to Figures 3-17 and 3-18 and Table 3-7.)

NESHAP Stack Emissions Monitoring

- Second quarter 1998 results for Building 71, Laboratory, Laundry, and Plant 6 T-Hopper stacks are within expected ranges and no significant changes in the source operations associated with the stacks were noted. Typically, post production (1991 to present) stack monitoring results are near or below the minimum detectable concentration (MDC) levels for all isotopes monitored. Second quarter 1998 results are consistent with previous post production data with 67 percent of the radioisotopes analyzed indicating non-detectable levels (less than MDC) and the remainder indicating near MDC results.

  (Figure 3-19 identifies the NESHAP stack emissions monitoring locations and Table 3-8 shows the stack monitoring results.)

Figure 3-20 shows the data from the air monitoring activities that will be included in the next IEMP quarterly status report. This next quarterly status report will be submitted in December 1998. Monitoring activities defined under the IEMP for radiological particulate, radon, direct radiation, and stack monitoring will continue as planned during the third quarter of 1998.

000072

TABLE 3-1

TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR

	Second Quarter 1998 Results[b] (pCi/m³ x 1E-6)				1998 Year-to-date Results[b] (pCi/m³ x 1E-6)				1997 Summary Results [b,c,d] (pCi/m³ x 1E-6)				1990 - 1996 Summary Results[b] (pCi/m³ x 1E-6)	
Location[a]	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	Min.	Max.
Fenceline														
AMS-2	7	41	168	74	13	11	168	52	28	0	247	51	0	3500
AMS-3	7	77	336	178	13	27	336	127	28	2.5	1167	186	0	17000
AMS-4	7	19	29	25	13	7.7	51	25	28	0	257	33	0	2300
AMS-5	7	21	62	39	13	13	86	39	28	0	220	27	0	4400
AMS-6	7	11	235	73	13	2.7	235	51	28	5.0	140	42	0	3200
AMS-7	7	23	98	49	13	2.4	98	42	28	0	146	36	0	7800
AMS-8A	7	26	197	103	13	13	197	72	28	10	234	82	13	900
AMS-9C[e,f]	7	76	190	136	13	15	190	90	28	0	431	111	NA	NA
AMS-22[g]	7	3.0	101	42	13	3.0	101	31	6	0	29	14	NS	NS
AMS-23[g]	7	9.0	194	57	13	9.0	194	41	6	9.8	53	29	NS	NS
AMS-24[g]	7	11	62	34	13	0	65	31	1	106	NA	NA	NS	NS
AMS-25[g]	7	10	70	38	13	3.6	70	35	6	6.7	30	19	NS	NS
AMS-26[g]	7	16	98	38	13	7.5	98	39	6	0	41	19	NS	NS
AMS-27[g]	6[h]	13	63	36	12[h]	9.8	64	35	6	0	30	20	NS	NS
AMS-28[g]	7	11	46	24	13	2.6	46	19	6	0	29	13	NS	NS
AMS-29[g]	7	2.6	60	32	13	2.6	60	29	6	0	76	29	NS	NS
Background														
AMS-12	7	0	22	12	13	0	22	9.6	28	0	29	8.1	0	480
AMS-16	7	14	31	26	13	0	31	20	28	0	106	19	0	350

[a]See Figure 3-2
[b]For blank corrected concentrations less than or equal to 0.0 pCi/m³, the concentration is set as 0.0 pCi/m³.
[c]If the total number of samples is equal to one, then the data point is reported as the minimum.
[d]NA = not applicable
[e]Summary results for 1997 include AMS-9B/C data.
[f]NA = not applicable; no meaningful comparative data exist for AMS-9C for this period (1990 through 1996).
[g]NS = not sampled; AMS location was not in operation prior to 1997.
[h]One data point was not obtained due to a damaged filter.

000073

TABLE 3-2

TOTAL PARTICULATE CONCENTRATIONS IN AIR

Location[a]	Second Quarter 1998 Results ($\mu g/m^3$)				1998 Year-to-date Results ($\mu g/m^3$)				1997 Summary Results[b,c] ($\mu g/m^3$)				1990 - 1996 Summary Results ($\mu g/m^3$)	
	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	Min.	Max.
Fenceline														
AMS-2	7	21	46	34	12[d]	14	46	28	28	16	77	31	7.0	67
AMS-3	7	21	49	36	13	14	49	29	28	17	159	39	8.0	128
AMS-4	7	23	59	38	13	16	59	33	28	14	51	30	13	69
AMS-5	7	21	46	35	13	9.6	46	29	28	11	42	28	12	62
AMS-6	7	20	44	32	13	16	48	30	28	8.0	53	29	8.0	69
AMS-7	7	6.8	50	36	13	6.8	50	31	27[d]	24	55	34	13	76
AMS-8A	7	29	63	41	13	13	63	32	28	18	89	35	19	53
AMS-9C[e,f]	7	26	62	41	13	15	62	34	28	7.1	136	42	NA	NA
AMS-22[g]	7	13	46	32	13	13	46	31	6	21	30	27	NS	NS
AMS-23[g]	7	22	45	33	13	15	45	29	6	22	28	25	NS	NS
AMS-24[g]	7	37	79	57	13	18	79	45	1	74	NA	NA	NS	NS
AMS-25[g]	7	32	69	51	13	21	69	44	6	26	40	33	NS	NS
AMS-26[g]	7	20	39	30	13	15	39	28	6	20	23	22	NS	NS
AMS-27[g]	7	25	59	46	13	24	59	43	6	33	49	38	NS	NS
AMS-28[g]	7	18	39	30	13	12	39	25	6	16	30	19	NS	NS
AMS-29[g]	7	20	62	37	13	11	62	30	6	19	30	25	NS	NS
Background														
AMS-12[h]	7	20	39	31	13	12	39	26	14	18	41	27	6.0	416
AMS-16[h]	7	37	77	57	13	18	77	48	14	27	79	46	22	59

[a]See Figure 3-2
[b]If the total number of samples is equal to one, then the data point is reported as the minimum.
[c]NA = not applicable
[d]One data point was not obtained due to a damaged filter.
[e]Summary results for 1997 include AMS-9B/C data.
[f]NA = not applicable; no meaningful comparative data exist for AMS-9C for this period (1990 through 1996).
[g]NS = not sampled; AMS location was not in operation prior to 1997.
[h]Total particulate analysis was discontinued during 1994 and was reinstated for AMS-12 and AMS-16 in 1997.

1743
000074

TABLE 3-3

SECOND QUARTER TRACKING - NESHAP COMPLIANCE REPORT
PERIMETER AIR MONITORS

	40 CFR 61 (NESHAP) Subpart H Appendix E, Table 2; Net Ratios[b]													
Location[a]	Actinium-228[c]	Radium-224[c]	Radium-226	Radium-228[c]	Thorium-228	Thorium-230	Thorium-231[c]	Thorium-232	Thorium-234[c]	Uranium-234	Uranium-235 Uranium-236	Uranium-238	Ratio Totals	Dose[d] (mrem)
Fenceline														
AMS-2	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	5.1E-008	0.0E+000	6.6E-006	1.4E-003	2.0E-003	1.7E-003	5.2E-003	0.052
AMS-3	0.0E+000	0.0E+000	3.5E-004	0.0E+000	0.0E+000	0.0E+000	1.3E-008	0.0E+000	1.2E-005	3.6E-003	5.1E-004	3.1E-003	7.6E-003	0.076
AMS-4	0.0E+000	0.0E+000	4.8E-004	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	6.1E-007	5.3E-005	0.0E+000	1.6E-004	7.0E-004	0.007
AMS-5	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	1.4E-004	1.2E-008	0.0E+000	2.1E-006	5.8E-004	4.7E-004	5.6E-004	1.8E-003	0.018
AMS-6	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	5.1E-009	0.0E+000	2.9E-006	7.7E-004	2.0E-004	7.7E-004	1.7E-003	0.017
AMS-7	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	2.7E-009	0.0E+000	2.6E-006	6.7E-004	1.1E-004	6.9E-004	1.5E-003	0.015
AMS-8A	0.0E+000	0.0E+000	2.6E-004	0.0E+000	0.0E+000	0.0E+000	1.4E-008	0.0E+000	8.8E-006	2.5E-003	5.5E-004	2.3E-003	5.6E-003	0.056
AMS-9C	1.7E-007	4.1E-006	4.6E-004	1.0E-004	2.3E-004	2.7E-005	3.4E-008	9.9E-004	1.2E-005	3.3E-003	1.3E-003	3.3E-003	9.7E-003	0.097
AMS-22	0.0E+000	0.0E+000	5.4E-004	0.0E+000	0.0E+000	3.1E-004	1.0E-008	0.0E+000	1.4E-006	5.0E-004	4.1E-004	3.6E-004	2.1E-003	0.021
AMS-23	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	3.3E-005	1.4E-008	0.0E+000	3.5E-006	6.2E-004	5.6E-004	9.3E-004	2.2E-003	0.022
AMS-24	3.8E-007	9.5E-006	0.0E+000	2.4E-004	2.3E-004	6.5E-004	3.3E-009	2.3E-003	2.0E-006	4.3E-004	1.3E-004	5.3E-004	4.5E-003	0.045
AMS-25	6.0E-007	1.5E-005	3.7E-004	3.8E-004	3.7E-004	4.3E-003	9.9E-009	3.6E-003	2.4E-006	5.2E-004	3.9E-004	6.2E-004	1.1E-002	0.106
AMS-26	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	1.3E-008	0.0E+000	2.7E-006	5.1E-004	5.2E-004	7.1E-004	1.7E-003	0.017
AMS-27	8.5E-008	2.1E-006	0.0E+000	5.3E-005	0.0E+000	1.7E-004	4.7E-009	5.1E-004	2.1E-006	5.6E-004	1.9E-004	5.7E-004	2.0E-003	0.020
AMS-28	0.0E+000	0.0E+000	3.6E-004	0.0E+000	0.0E+000	0.0E+000	1.6E-009	0.0E+000	1.6E-007	0.0E+000	6.3E-005	4.3E-005	4.7E-004	0.005
AMS-29	0.0E+000	0.0E+000	0.0E+000	0.0E+000	0.0E+000	1.5E-004	4.0E-009	0.0E+000	1.3E-006	2.9E-004	1.6E-004	3.6E-004	9.6E-004	0.010
Background														
AMS-12	7.9E-007	2.0E-005	0.0E+000	5.0E-004	1.0E-003	1.1E-003	9.6E-010	4.7E-003	2.1E-006	4.8E-004	3.7E-005	5.6E-004	8.4E-003	
AMS-16	1.5E-006	3.6E-005	0.0E+000	9.1E-004	2.1E-003	2.2E-003	9.2E-010	8.7E-003	3.7E-006	1.0E-003	3.6E-005	9.9E-004	1.6E-002	

Maximum Year-to-Date Ratio: 0.011
Maximum Year-to-Date Dose (mrem): 0.106

[a] See Figure 3-2
[b] A ratio of 0.0+00 indicates the filter results were less than or equal to the blank results, and/or the indicator concentrations were less than or equal to the average net background concentrations.
[c] Isotopes assumed to be in equilibrium with their parents.
[d] Dose conversions are based on the NESHAP Standard of 10 mrem per year.

TABLE 3-4

CONTINUOUS ENVIRONMENTAL RADON MONITORING MONTHLY AVERAGE CONCENTRATIONS

1743

	Second Quarter 1998 Results[b] (Instrument Background Corrected) (pCi/L)			1998 Year-to-Date Results[b] (Instrument Background Corrected) (pCi/L)			1997 Summary Results[b] (Instrument Background Corrected) (pCi/L)		
Location[a]	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
Fenceline									
AMS-02	0.2	0.3	0.2	0.2	0.3	0.2	0.3	0.7	0.5
AMS-04	0.1	0.3	0.2	0.1	0.3	0.2	0.1	0.7	0.4
AMS-05	0.2	0.3	0.3	0.2	0.4	0.3	0.1	1.2	0.5
AMS-06	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.8	0.4
AMS-07	0.3	0.4	0.3	0.2	0.4	0.3	0.1	1.2	0.5
AMS-09C[c]	0.2	NA	NA	0.2	NA	NA	NA	NA	NA
AMS-22[c]	0.2	NA	NA	0.2	NA	NA	NA	NA	NA
AMS-26[c]	0.2	NA	NA	0.2	NA	NA	NA	NA	NA
AMS-27[c]	0.2	NA	NA	0.2	NA	NA	NA	NA	NA
Off Site									
AMS-11	0.2	0.2	0.2	0.1	0.3	0.2	0.1	0.9	0.4
Background									
AMS-12	0.1	0.2	0.2	0.1	0.2	0.2	0.0	0.5	0.2
AMS-16	0.2	0.4	0.3	0.2	0.4	0.3	0.1	0.4	0.2
On Site									
KNE	4.8	7.1	6.2	2.0	7.1	5.0	2.9	7.4	5.5
KNW	1.8	2.2	2.0	1.2	2.5	1.9	0.9	2.3	1.6
KSE	4.0	5.4	4.6	2.4	5.4	4.3	2.8	11.6	5.6
KSW	1.8	2.6	2.2	1.8	4.0	2.7	1.5	3.3	2.3
KTOP	7.2	14.7	11.7	7.2	14.7	10.4	6.0	13.5	9.9
Pilot Plant Warehouse	0.2	0.2	0.2	0.1	0.2	0.2	0.1	1.2	0.4
Pit 5	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.9	0.5
Rally Point 4	0.3	0.4	0.3	0.2	0.5	0.4	0.3	1.0	0.6
Surge Lagoon	0.3	0.4	0.3	0.3	0.5	0.3	0.3	1.3	0.7
T28	0.9	1.7	1.4	0.9	1.7	1.3	1.0	2.4	1.8
WP-17A	0.2	0.3	0.2	0.2	0.4	0.3	0.2	1.0	0.5

[a]See Figure 3-14
[b]Instrument background changes as monitors are replaced.
[c]NA = not applicable; unit was placed in service in June 1998.

000076

TABLE 3-5

RADON HEAD SPACE CONCENTRATIONS

	Radon Head Space Concentrations (pCi/L)											
	Silo 1 1998			Silo 1 1997			Silo 2 1998			Silo 2 1997		
Month	Min.[a]	Max.[b]	Avg.[c]	Min.[a]	Max.[b]	Avg.[c]	Min.[a]	Max.[b]	Avg.[c]	Min.[a]	Max.[b]	Avg.[c]
January	1.06E+007	1.18E+007	1.13E+007	9.23E+006	1.09E+007	9.90E+006	8.24E+006	1.01E+007	9.10E+006	7.05E+006	8.63E+006	7.74E+006
February	1.06E+007	1.18E+007	1.12E+007	9.02E+006	1.03E+007	9.67E+006	8.02E+006	9.48E+006	8.96E+006	6.06E+006	7.94E+006	7.01E+006
March	1.01E+007	1.17E+007	1.10E+007	8.40E+006	9.76+006	9.16E+006	7.27E+006	9.19E+006	8.45E+006	5.66E+006	6.31E+006	6.01E+006
April	9.89E+006	1.09E+007	1.05E+007	7.87E+006	8.70E+006	8.33E+006	7.34E+006	8.87E+006	8.14E+006	5.48E+006	6.33E+006	5.99E+006
May	1.05E+007	1.20E+007	1.10E+007	7.65E+006	8.45E+006	8.06E+006	8.38E+006	8.99E+006	8.62E+006	5.71E+006	6.45E+006	6.05E+006
June	1.08E+007	1.22E+007	1.15E+007	7.77E+006	9.12E+006	8.51E+006	8.25E+006	9.05E+006	8.62E+006	6.14E+006	8.36E+006	7.10E+006

[a]Minimum equals minimum recorded daily average radon concentration.
[b]Maximum equals maximum recorded daily average radon concentration.
[c]Average equals monthly average of recorded daily radon concentrations.

000077

TABLE 3-6

RADON MONITORING - ALPHA TRACK-ETCH CUPS, CONCENTRATION DATA FOR FIRST HALF 1998

1743

Location[a]	Radon Concentration ± Precision[b] (pCi/L)		
	1st Half of Year 1998	1st Half of Year 1997	1997 Location Average
K-65 Silo Exclusion Fence			
K65A	1.2 ± 0.2	0.9 ± 0.4	1.0 ± 0.4
K65B	1.5 ± 0.3	1.3 ± 0.6	1.4 ± 0.6
K65C	2.3 ± 0.3	2.0 ± 0.6	2.2 ± 0.4
K65D	3.7 ± 0.9	2.8 ± 0.6	3.5 ± 0.8
K65E	3.3 ± 0.8	2.9 ± 0.4	3.3 ± 0.3
K65F	3.3 ± 0.8	2.7 ± 0.7	3.5 ± 0.8
K65G	2.3 ± 0.1	1.7 ± 0.5	2.1 ± 0.5
K65H	1.6 ± 0.3	1.1 ± 0.3	1.4 ± 0.4
K65I	1.3 ± 0.6	0.8 ± 0.4	1.1 ± 0.4
K65J	0.9 ± 0.3	0.5 ± 0.2	0.7 ± 0.2
K65K	1.1 ± 0.3	0.8 ± 0.1[c]	0.9 ± 0.2
K65L	2.2 ± 0.1	1.7 ± 0.9	1.8 ± 0.7
K65M	2.5 ± 1.1	1.6 ± 0.6	1.6 ± 0.5
K65N	2.1 ± 0.5	1.2 ± 0.4	1.4 ± 0.3
K65O	1.2 ± 0.5	0.7 ± 0.2	0.9 ± 0.2
K65P	1.0 ± 0.2	0.6 ± 0.5	0.8 ± 0.4
Min.	**0.9 ± 0.3**	**0.5 ± 0.2**	**0.7 ± 0.2**
Max.	**3.7 ± 0.9**	**2.9 ± 0.4**	**3.5 ± 0.8**
K-65 Silo Dome			
SILO1-NE	15.4 ± 0.4	12.3 ± 0.3	12.1 ± 0.3
SILO1-NW	10.4 ± 0.2	6.5 ± 0.9	6.4 ± 0.8
SILO1-SE	7.6 ± 0.6	6.0 ± 0.9	7.1 ± 0.6
SILO1-SW	6.3 ± 0.5	3.2± 0.4	4.1 ± 0.3
SILO2-NE	20.4 ± 3.8	18.3 ± 0.1	18.0 ± 1.6
SILO2-NW	5.9 ± 0.1	4.0 ± 0.7	3.8 ± 0.7
SILO2-SE	21.0 ± 0.6	12.1 ± 1.3	12.3 ± 1.0
SILO2-SW	13.5[g]	7.4 ± 0.6	7.6 ± 0.7
Min.	**5.9 ± 0.1**	**3.2 ± 0.4**	**3.8 ± 0.7**
Max.	**21.0 ± 0.6**	**18.3 ± 0.1**	**18.0 ± 1.6**
Fenceline			
AMS-02	0.0 ± 0.1[e]	0.1 ± 0.1	0.2 ± 0.1
AMS-04	0.0 ± 0.1	0.1 ± 0.2	0.2 ± 0.2
AMS-06	0.1 ± 0.1[c]	0.1 ± 0.2	0.3 ± 0.2
AMS-07	0.1 ± 0.1	0.1 ± 0.2	0.3 ± 0.2
AMS-08A	0.0 ± 0.2[e]	0.0 ± 0.1[d]	0.2 ± 0.1
AMS-09C	0.1 ± 0.1	0.2 ± 0.1[c]	0.3 ± 0.1
FEMP-A	0.4 ± 0.2	0.4 ± 0.2	0.4 ± 0.2
FEMP-B	0.0 ± 0.1	0.3 ± 0.2	0.3 ± 0.2
FEMP-C	0.0 ± 0.1[e]	0.1 ± 0.2	0.3 ± 0.2
FEMP-D	0.0 ± 0.1[e]	0.1 ± 0.2	0.2 ± 0.2
FEMP-E	0.0 ± 0.1	0.1 ± 0.2	0.3 ± 0.2
FEMP-F	0.2 ± 0.1[c]	0.1 ± 0.1	0.2 ± 0.1
FEMP-G	0.0 ± 0.1[d]	0.1 ± 0.1	0.3 ± 0.1
FEMP-H	0.0 ± 0.1	0.1 ± 0.2	0.3 ± 0.2
FEMP-I	0.2 ± 0.2	0.2 ± 0.1	0.3 ± 0.2

TABLE 3-6
(Continued)

Location[a]	Radon Concentration ± Precision[b] (pCi/L) 1st Half of Year 1998	1st Half of Year 1997	1997 Location Average
Fenceline (Cont'd.)			
FEMP-J	0.1 ± 0.1	0.1 ± 0.1	0.3 ± 0.1
FEMP-K	0.1 ± 0.1	0.2 ± 0.1[c]	0.4 ± 0.1
FEMP-L	0.5 ± 0.2	0.2 ± 0.1[c]	0.4 ± 0.2
FEMP-M	0.2 ± 0.1	0.2 ± 0.2	0.4 ± 0.2
FEMP-N	0.2 ± 0.2	0.2 ± 0.2	0.4 ± 0.2
FEMP-O	0.1 ± 0.1[c]	0.0 ± 0.2	1.0 ± 0.2
FEMP-P	0.2 ± 0.1	0.2 ± 0.2[e]	0.4 ± 0.2
Min.	**0.0 ± 0.1**	**0.0 ± 0.1**	**0.2 ± 0.1**
Max.	**0.5 ± 0.2**	**0.4 ± 0.2**	**1.0 ± 0.2**
Background			
AMS-12	0.0 ± 0.1[d]	0.0 ± 0.1[d]	0.1 ± 0.1
AMS-13	0.1 ± 0.2[e]	0.1 ± 0.2	0.2 ± 0.2
AMS-16[f]	0.1 ± 0.1	0.0 ± NA	0.2 ± 0.1
BKGD-01	0.0 ± 0.1	0.0 ± NA[d]	0.1 ± 0.1
BKGD-02	0.0 ± 0.1[d]	0.0 ± 0.1	0.2 ± 0.1
BKGD-04	0.0 ± 0.1[d]	0.1 ± 0.2	0.2 ± 0.2
BKGD-05	0.1 ± 0.1[c]	0.0 ± 0.1	0.2 ± 0.1
BKGD-06	0.0 ± 0.1[h]	0.0 ± NA[d]	0.1 ± 0.1
Min.	**0.0 ± 0.1**	**0.0 ± 0.1**	**0.1 ± 0.1**
Max.	**0.1 ± 0.2**	**0.1 ± 0.2**	**0.2 ± 0.2**
Other (On Site)			
PERM-07	Unavailable	0.1 ± 0.1[d]	0.4 ± 0.1
PERM-09	0.1 ± 0.1	0.0 ± 0.1	0.2 ± 0.1
BLDG-65-6	0.2 ± 0.1	0.2 ± 0.2[e]	0.3 ± 0.2
BLDG-65-7	0.2 ± 0.1	0.3 ± 0.1[d]	0.3 ± 0.1
BLDG-65-8	0.2 ± 0.2[e]	0.3 ± 0.1[c]	0.3 ± 0.2
BLDG-65-9	0.2 ± 0.1[c]	Unavailable	0.3 ± 0.1
AMS-01A	0.1 ± 0.1	0.1 ± 0.1[c]	0.3 ± 0.1
Min.	**0.1 ± 0.1**	**0.0 ± 0.1**	**0.2 ± 0.1**
Max.	**0.2 ± 0.2**	**0.3 ± 0.1**	**0.4 ± 0.1**
Other (Off Site)			
AMS-10	0.1 ± 0.1[c]	0.1 ± 0.2	0.3 ± 0.2
AMS-11	0.1 ± 0.2[e]	0.0 ± 0.1	0.3 ± 0.1
RES-01	0.1 ± 0.1	0.0 ± 0.1[d]	0.3 ± 0.2
RES-02	0.2 ± 0.1[c]	0.0 ± 0.1	0.3 ± 0.1
RES-03	0.2 ± 0.2	0.1 ± 0.2	0.4 ± 0.2
Min.	**0.1 ± 0.1**	**0.0 ± 0.1**	**0.3 ± 0.2**
Max.	**0.2 ± 0.2**	**0.1 ± 0.2**	**0.4 ± 0.2**

[a]See Figure 3-16
[b]± 2 Standard deviations
[c]Data edited due to IEMP Screening Criteria II.
[d]Data edited due to IEMP Screening Criteria III.
[e]Data edited due to IEMP Screening Criteria IV.
[f]Formerly known as BKGD-03
[g]Data are only available from one cup.
[h]Data are only available from two cups.

000079

TABLE 3-7

DIRECT RADIATION (TLD) MEASUREMENTS

1743

Location[a]	Direct Radiation ± Uncertainty[b] (mrem)			
	First Quarter 1998 Results	Second Quarter[c] 1998	Year To Date 1998	1997 Summary Results
Fenceline				
2	19 ± 3.0	17 ± 3.0	37 ± 6.0	72 ± 10
3	18 ± 2.8	16 ± 2.7	34 ± 5.5	65 ± 9.0
4	17 ± 2.7	15 ± 2.6	32 ± 5.3	65 ± 9.1
5	18 ± 2.7	16 ± 2.7	33 ± 5.4	67 ± 9.3
6	22 ± 3.5	20 ± 3.4	42 ± 6.9	79 ± 11
7	18 ± 2.8	17 ± 2.8	34 ± 5.6	65 ± 9.0
8A	20 ± 3.1	17 ± 2.9	37 ± 6.1	74 ± 10
9C	20 ± 3.2	18 ± 3.2	39 ± 6.3	79 ± 11[d]
13	19 ± 3.0	18 ± 3.0	37 ± 6.0	71 ± 9.9
14	19 ± 3.0	20 ± 3.5	40 ± 6.5	70 ± 9.8
15	20 ± 3.1	18 ± 3.1	38 ± 6.2	74 ± 10
16	20 ± 3.2	19 ± 3.2	39 ± 6.4	77 ± 11
17	18 ± 2.9	17 ± 2.9	35 ± 5.8	70 ± 9.7
34[e]	20 ± 3.1	17 ± 2.9	37 ± 6.1	73 ± 14
35[e]	19 ± 2.9	16 ± 2.8	35 ± 5.7	67 ± 13
36[e]	17 ± 2.7	16 ± 2.7	33 ± 5.3	60 ± 12
37[e]	20 ± 3.1	18 ± 3.2	38 ± 6.2	75 ± 14
38[e]	17 ± 2.6	15 ± 2.5	31 ± 5.2	60 ± 11
39[e]	20 ± 3.2	19 ± 3.2	39 ± 6.4	76 ± 14
40[e]	17 ± 2.7	16 ± 2.7	33 ± 5.4	65 ± 12
41[e]	19 ± 2.9	17 ± 2.9	36 ± 5.8	70 ± 13
Min.	**17 ± 2.7**	**15 ± 2.6**	**31 ± 5.2**	**60 ± 12**
Max.	**22 ± 3.5**	**20 ± 3.5**	**42 ± 6.9**	**79 ± 11[d]**
On Site				
1B	23 ± 3.5	21 ± 3.6	44 ± 7.2	84 ± 12
22	190 ± 30	186 ± 32	376 ± 62	778 ± 108
23	209 ± 33	167 ± 29	376 ± 62	712 ± 99
24	154 ± 24	NA[f]	307 ± 50[g]	512 ± 71
25	175 ± 27	143 ± 24	319 ± 52	641 ± 89
26	122 ± 19	106 ± 18	228 ± 37	425 ± 59
32	15 ± 2.4	13 ± 2.3	28 ± 4.7	54 ± 7.5
Min.	**15 ± 2.4**	**13 ± 2.3**	**28 ± 4.7**	**54 ± 7.5**
Max.	**209 ± 33**	**186 ± 32**	**376 ± 62**	**778 ± 108**
Off Site				
10	15 ± 2.3	13 ± 2.3	28 ± 4.6	52 ± 7.3
11	18 ± 2.8	16 ± 2.8	34 ± 5.6	65 ± 9.1
12	16 ± 2.6	15 ± 2.5	31 ± 5.1	59 ± 8.2
30	17 ± 2.7	15 ± 2.5	32 ± 5.2	59 ± 8.2
Min.	**15 ± 2.3**	**13 ± 2.3**	**28 ± 4.6**	**52 ± 7.3**
Max.	**18 ± 2.8**	**16 ± 2.8**	**34 ± 5.6**	**65 ± 9.1**

000080

TABLE 3-7
(Continued)

Location[a]	Direct Radiation ± Uncertainty[b] (mrem)			
	First Quarter 1998 Results	Second Quarter[c] 1998	Year To Date 1998	1997 Summary Results
Background				
18	20 ± 3.2	18 ± 3.1	38 ± 6.3	74 ± 10
19	17 ± 2.7	15 ± 2.6	32 ± 5.3	60 ± 8.4
20	16 ± 2.5	14 ± 2.5	31 ± 5.0	57 ± 8.0
21	18 ± 2.9	16 ± 2.8	35 ± 5.7	67 ± 9.4
27	17 ± 2.7	15 ± 2.6	32 ± 5.3	60 ± 8.3
33	18 ± 2.8	16 ± 2.7	34 ± 5.6	65 ± 9.1
Min.	**16 ± 2.5**	**14 ± 2.5**	**31 ± 5.0**	**57 ± 8.0**
Max.	**20 ± 3.2**	**18 ± 3.1**	**38 ± 6.3**	**74 ± 10**

[a]See Figure 3-16
[b]Associated laboratory uncertainty
[c]Uncertainty terms for second quarter 1998 are based on average uncertainty from three previous quarters. Due to an error in the laboratory, the TLDs used to determine the uncertainty were not processed.
[d]Locations 9B and 9C are combined to determine 1997 year end results.
[e]1997 data for locations 4 through 41 are calculated from fourth quarter (October through December) measurement. These locations were established during the fourth quarter of 1997.
[f]NA = not applicable; TLD data from location 24 were lost during processing.
[g]Extrapolated from first quarter results

000081

TABLE 3-8

NESHAP STACK EMISSION MONITORING RESULTS

Analysis Performed	First Quarter Results[a]		Second Quarter Results[a,b]		1998 Year-to-Date Results[a,b]	
	No. of Samples	Total Pounds	No. of Samples	Total Pounds	No. of Samples	Total Pounds
Building 71 Stack						
Uranium, Total	1	ND	1	5.1E-06	2	5.1E-06
Thorium-232	1	ND	1	ND	2	ND
Thorium-230	1	ND	1	ND	2	ND
Total Particulate	0[c]	NA	0[c]	NA	0[c]	NA
Laboratory Stack						
Uranium, Total	1	ND	1	ND	2	ND
Thorium-232	1	ND	1	ND	2	ND
Thorium-230	1	3.5E-10	1	ND	2	3.5E-10
Total Particulate	1	3.1E-01	1	3.2E-01	2	6.4E-01
Laundry Stack						
Uranium, Total	2	ND	3	ND	5	ND
Thorium-232	2	ND	3	3.7E-05	5	3.7E-05
Thorium-230	2	ND	3	3.5E-10	5	3.5E-10
Total Particulate	1	2.5E-01	3	2.6E-01	4	5.1E-01
T-Hopper Stack						
Uranium, Total	1	7.5E-05	2	8.0E-05	3	1.6E-04
Thorium-232	1	ND	2	5.8E-05	3	5.8E-05
Thorium-230	1	4.7E-10	2	5.3E-10	3	1.0E-09
Total Particulate	1	0	2	2.9E-02	3	2.9E-02

[a]ND = non-detectable
[b]NA = not applicable
[c]Total particulate result could not be determined due to damaged filter.

000082
1743

000083

FIGURE 3-1

AIR SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

SAMPLING ACTIVITIES	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Radiological Particulate Monitoring:				♦	♦	♦						
NESHAP Quarterly Composite						♦						
Radon Monitoring - Continuous Alpha Scintillation Monitors				♦	♦	♦						
Radon Monitoring - Alpha Track-etch Cups						♦						
Direct Radiation (TLD) Monitoring						♦						
NESHAP Stack Emissions Monitoring				♦	♦	♦						

♦ Data summarized/ evaluated in this report

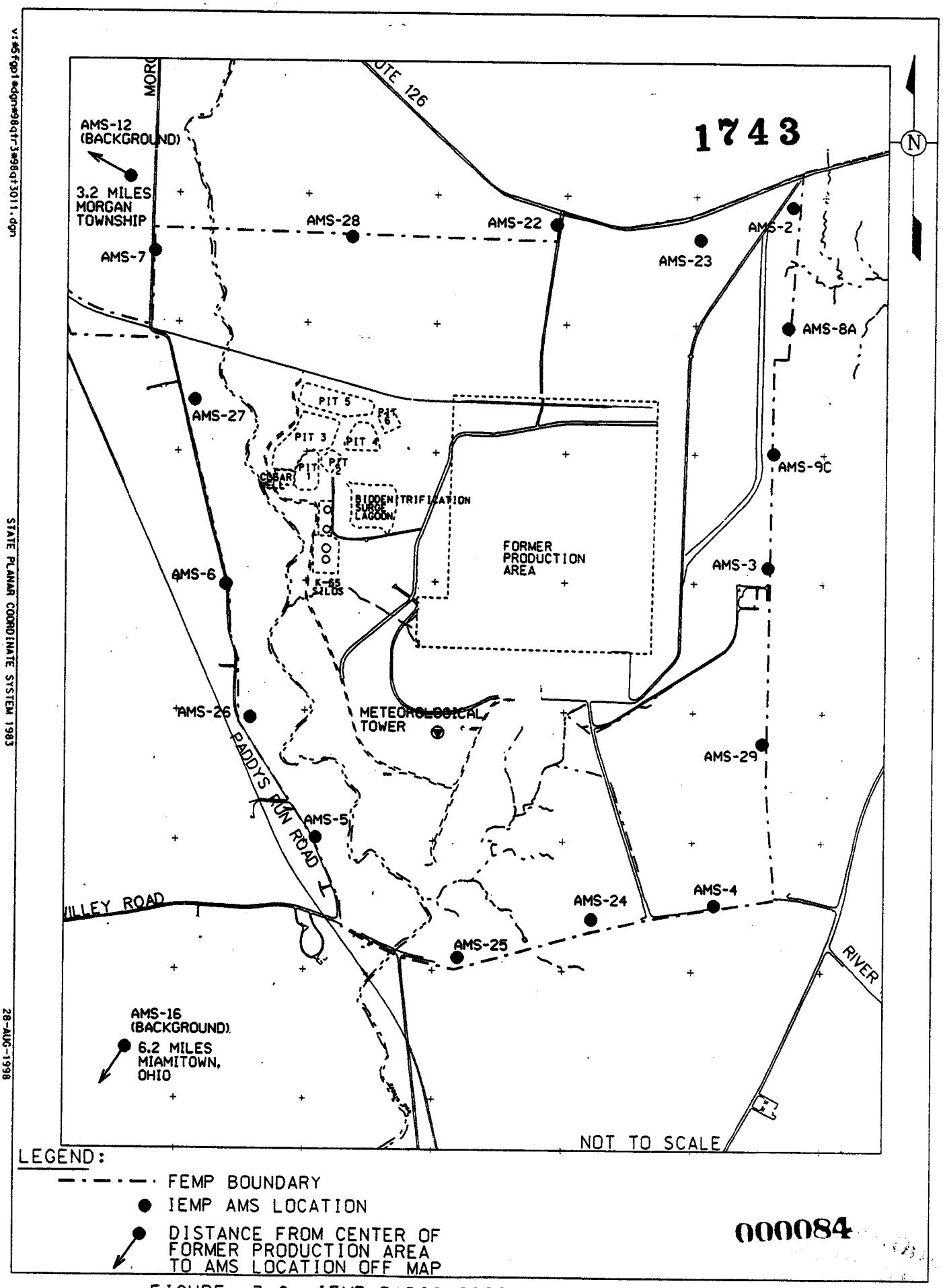
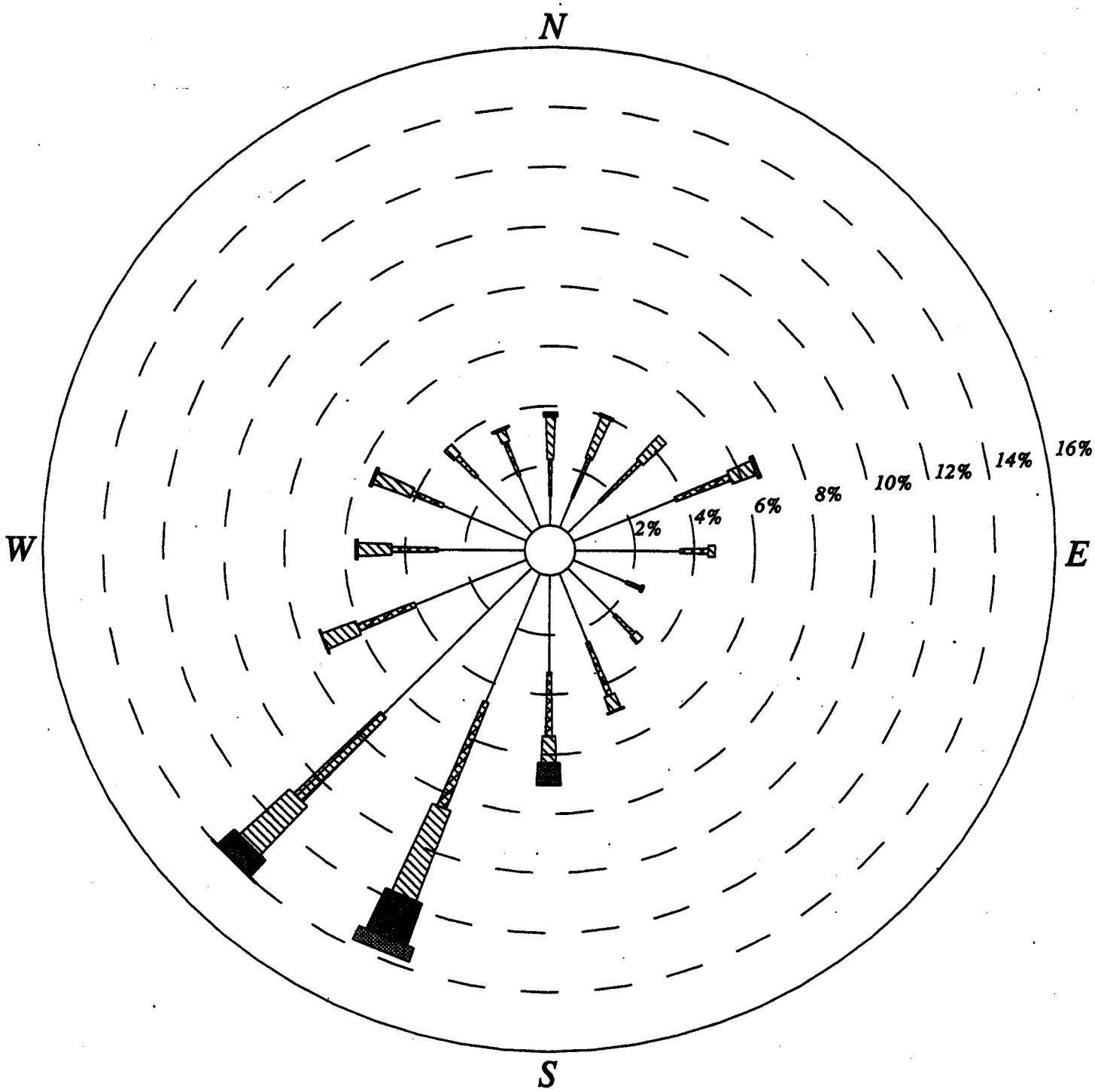


FIGURE 3-2. IEMP RADIOLOGICAL AIR MONITORING PROGRAM



CALM WINDS 4.54%

WIND SPEED (KNOTS)

NOTE: Frequencies indicate direction from which the wind is blowing.

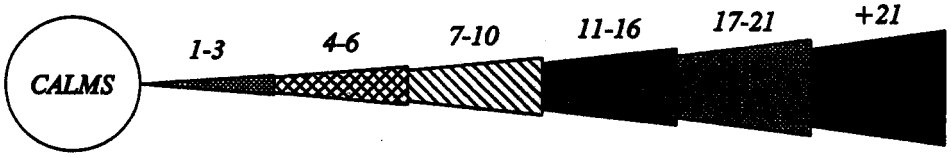


FIGURE 3-3. SECOND QUARTER 1998 WIND ROSE DATA, 10-METER HEIGHT

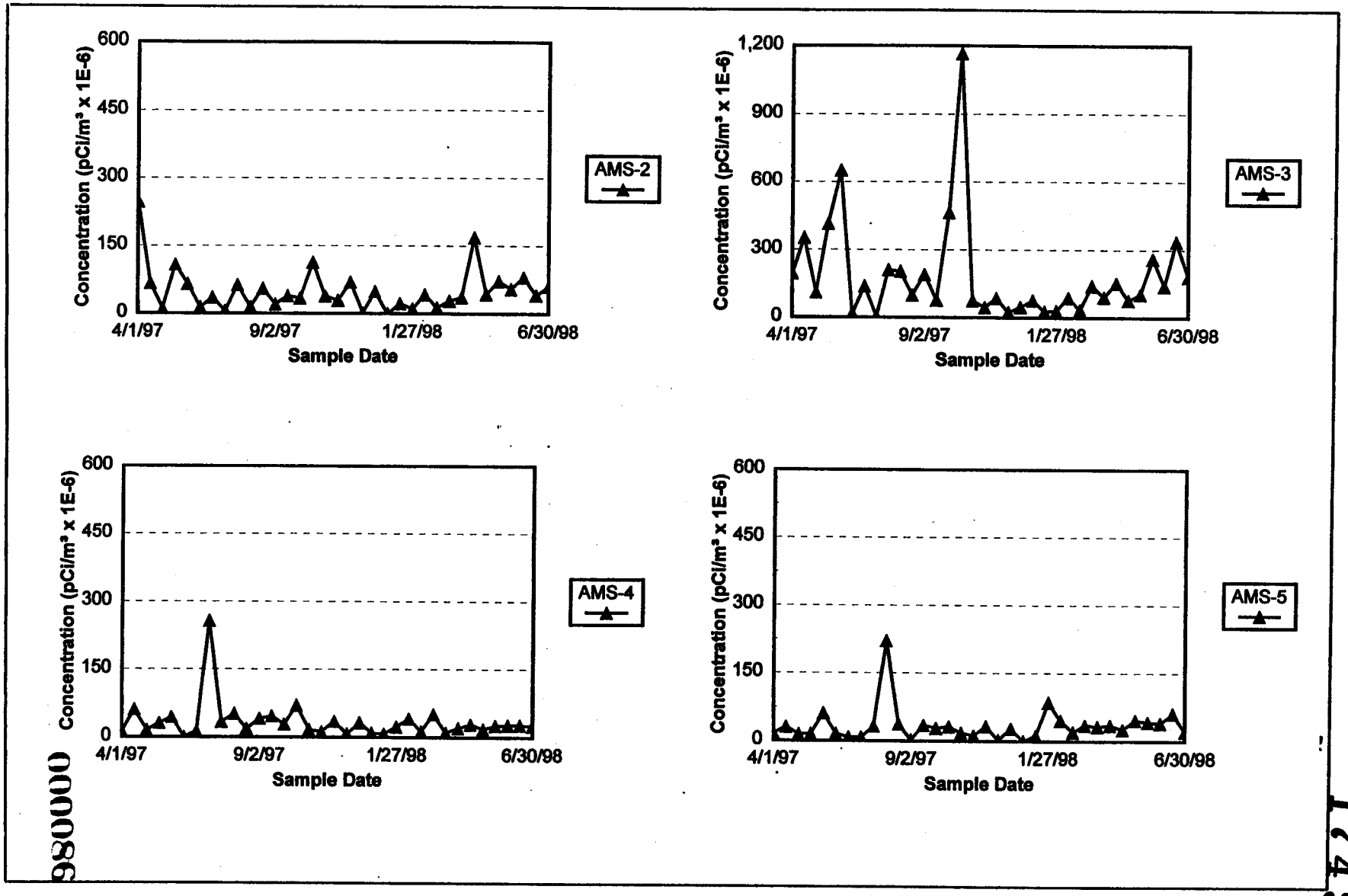


FIGURE 3-4. TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR
(AMS-2, AMS-3, AMS-4, AND AMS-5)

980000

17243

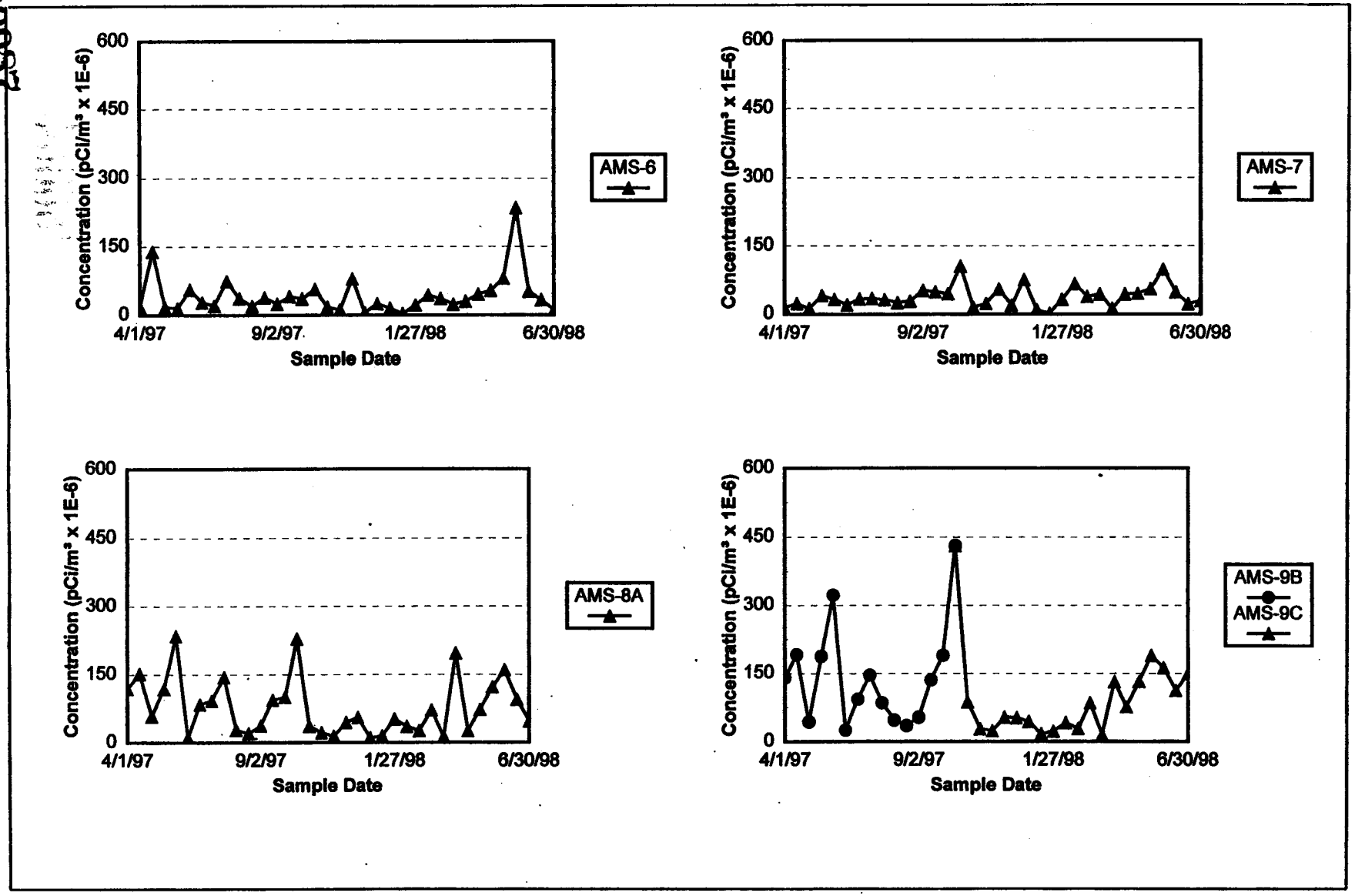


FIGURE 3-5. TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-6, AMS-7, AMS-8A, AND AMS-9C)

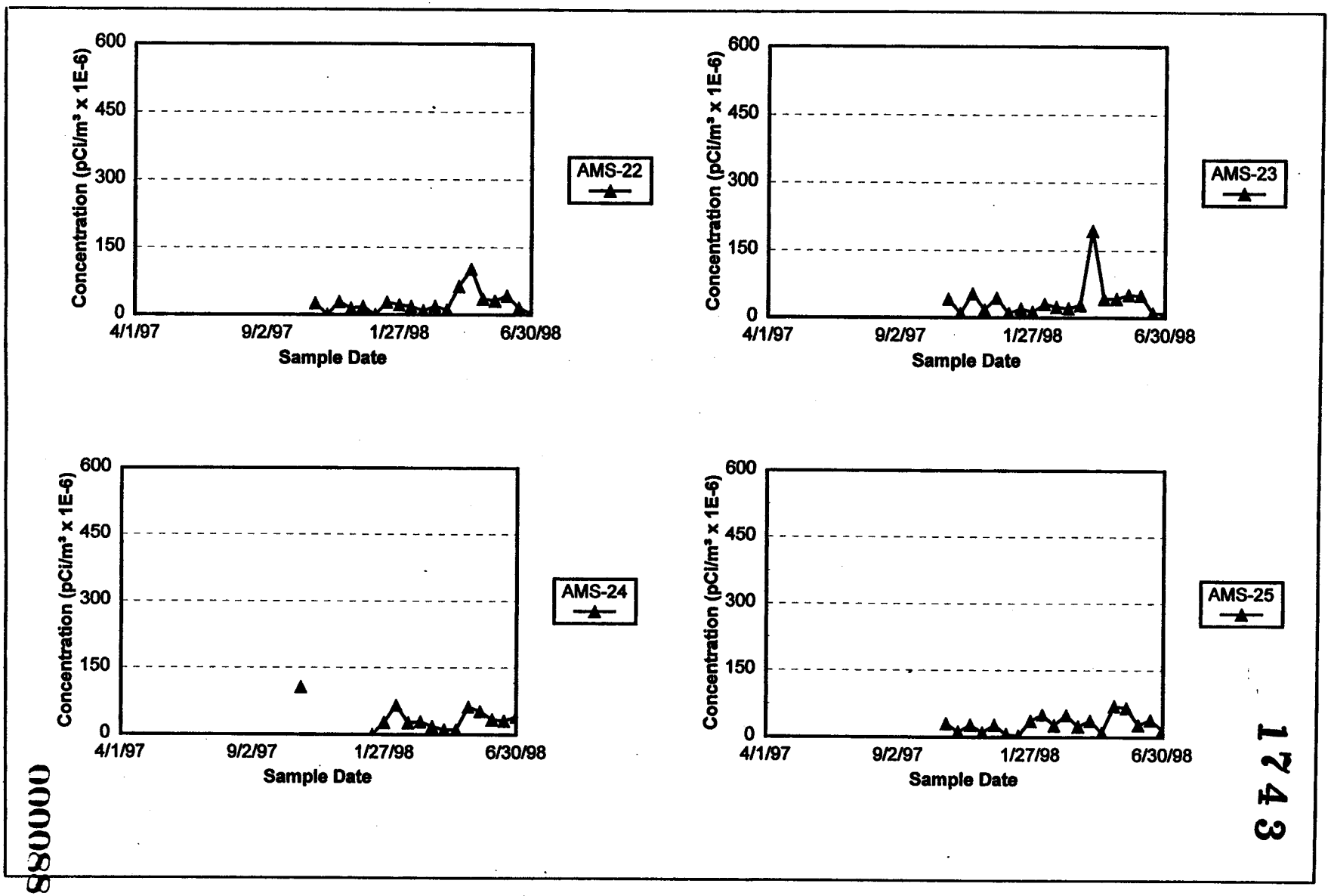


FIGURE 3-6. TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR
(AMS-22, AMS-23, AMS-24, AND AMS-25)

000088

680000

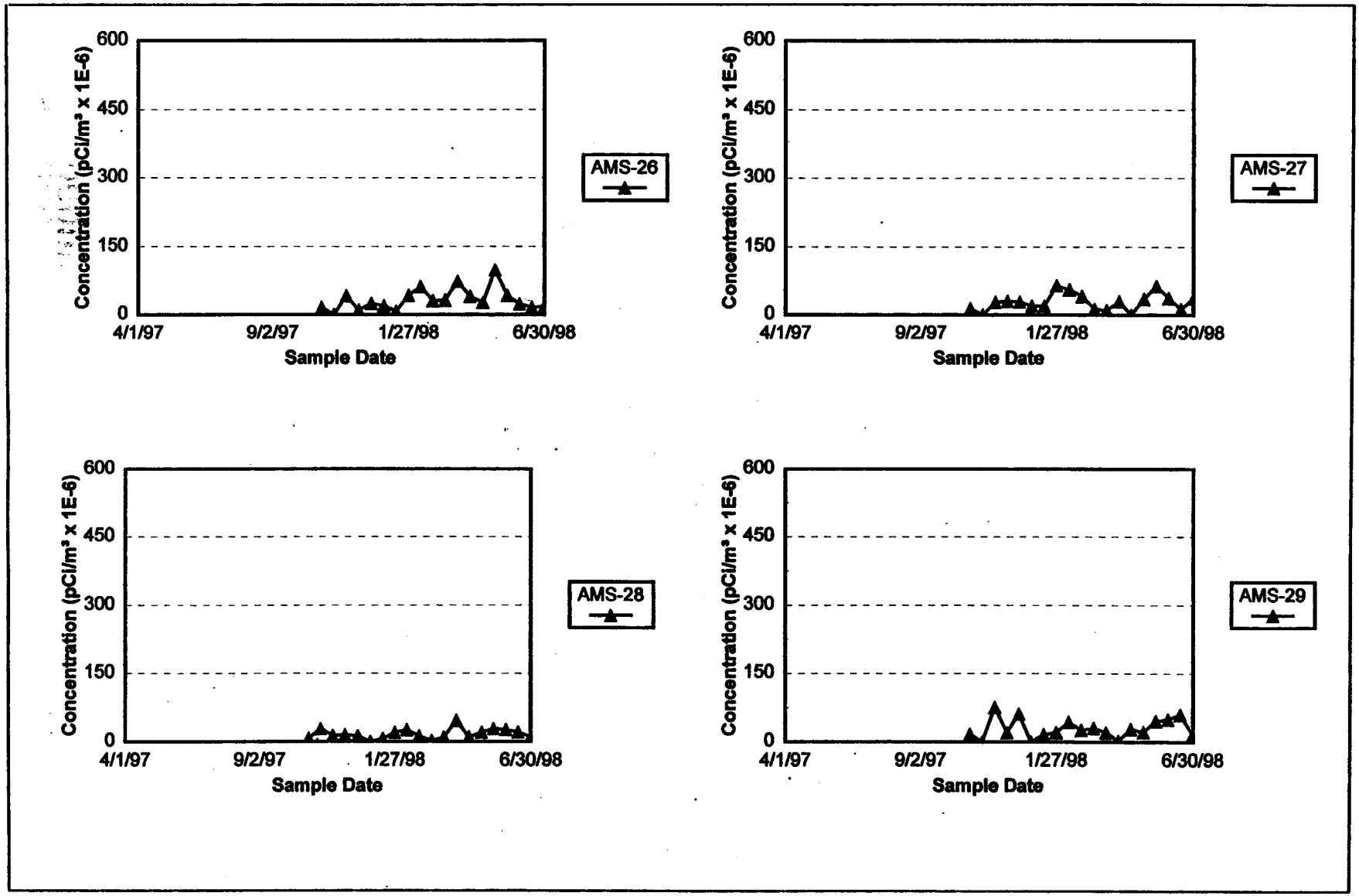


FIGURE 3-7. TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR
(AMS-26, AMS-27, AMS-28, AND AMS-29)

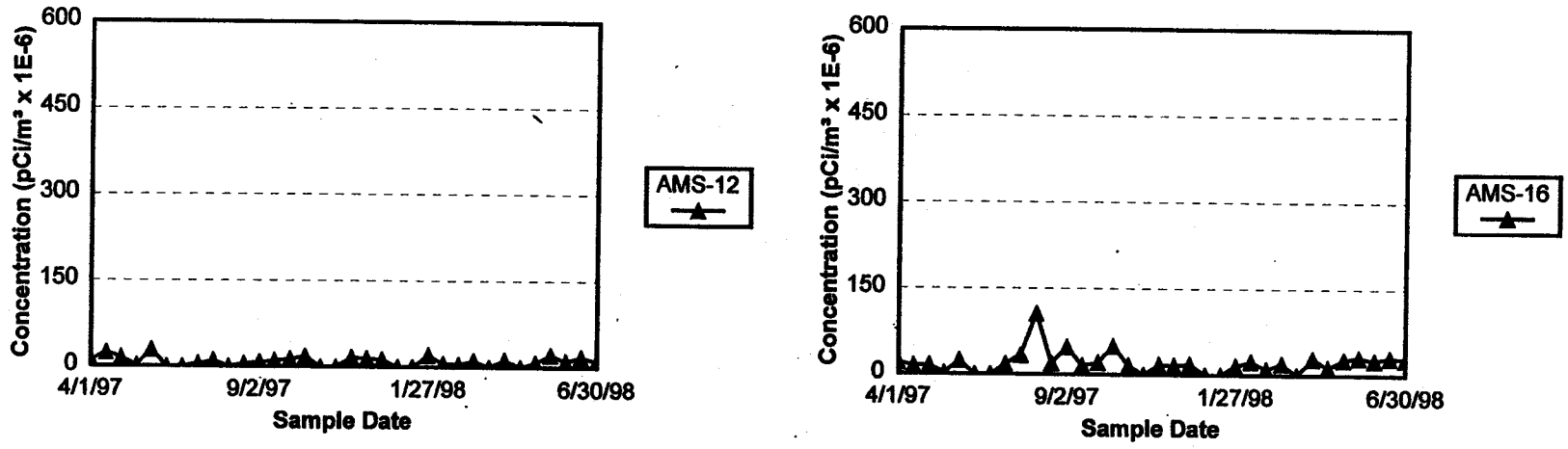


FIGURE 3-8. TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-12 AND AMS-16)

000091

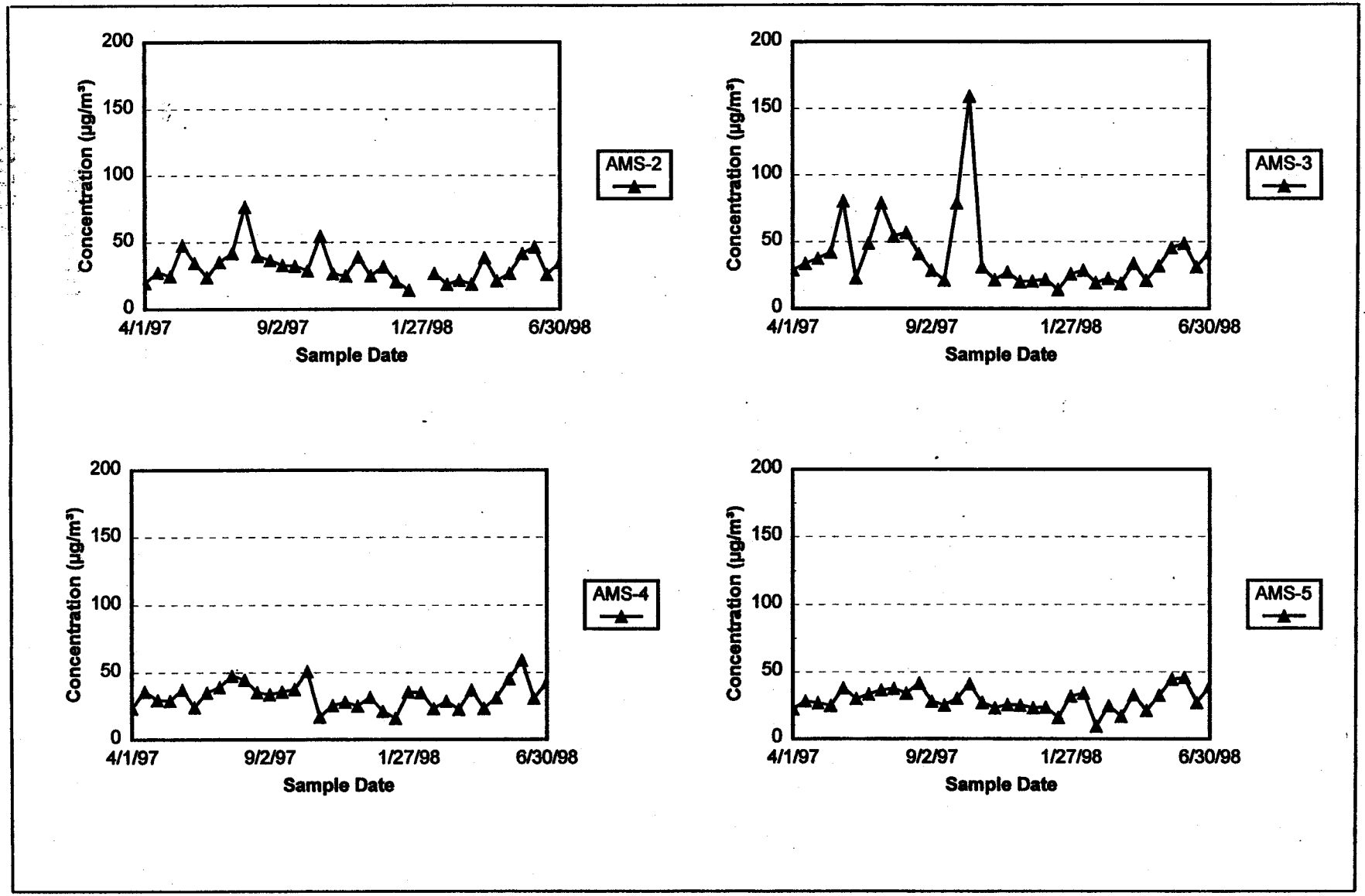


FIGURE 3-9. TOTAL PARTICULATE CONCENTRATIONS IN AIR
(AMS-2, AMS-3, AMS-4, AND AMS-5)

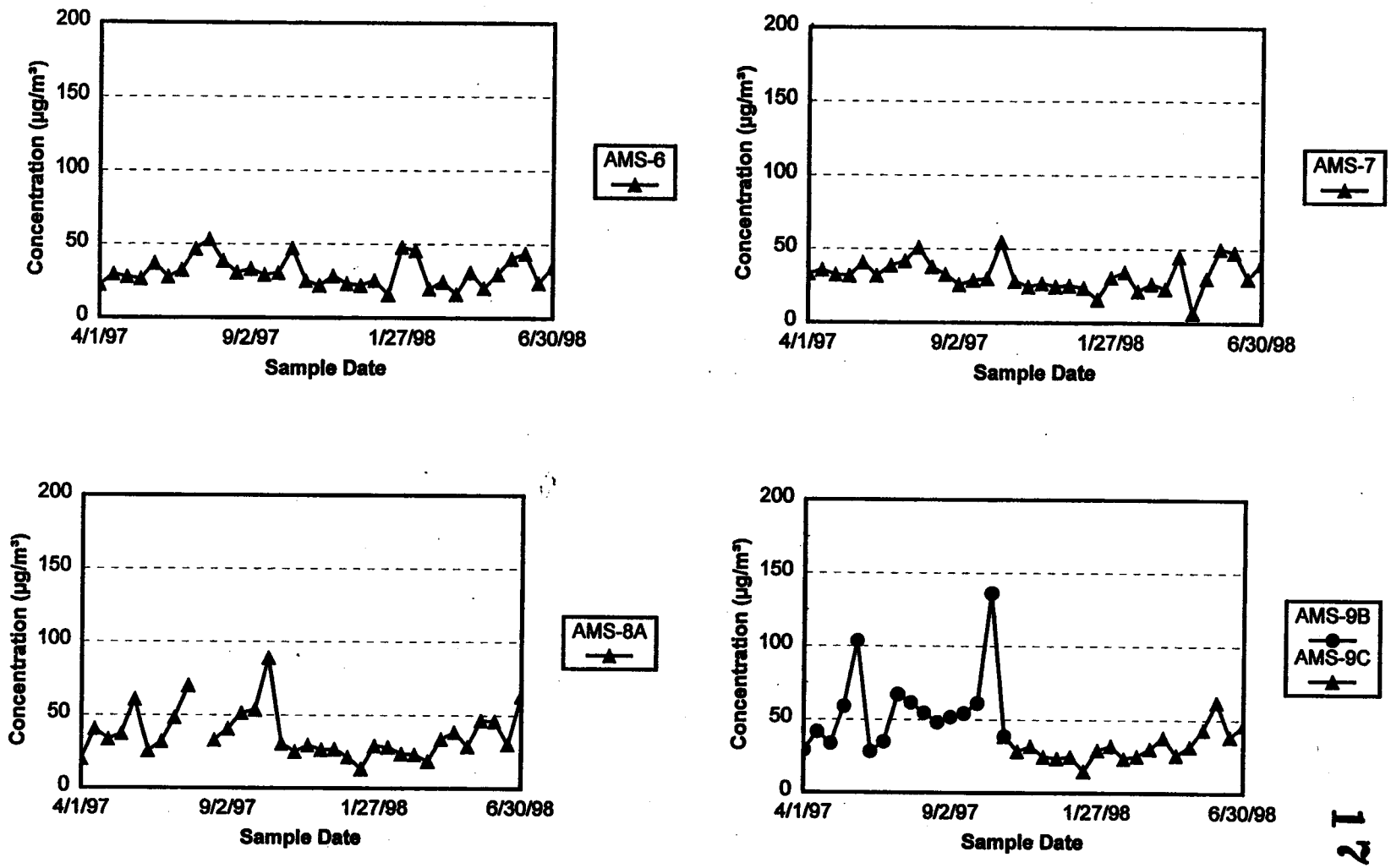


FIGURE 3-10. TOTAL PARTICULATE CONCENTRATIONS IN AIR
(AMS-6, AMS-7, AMS-8A, AND AMS-9C)

000092

000093

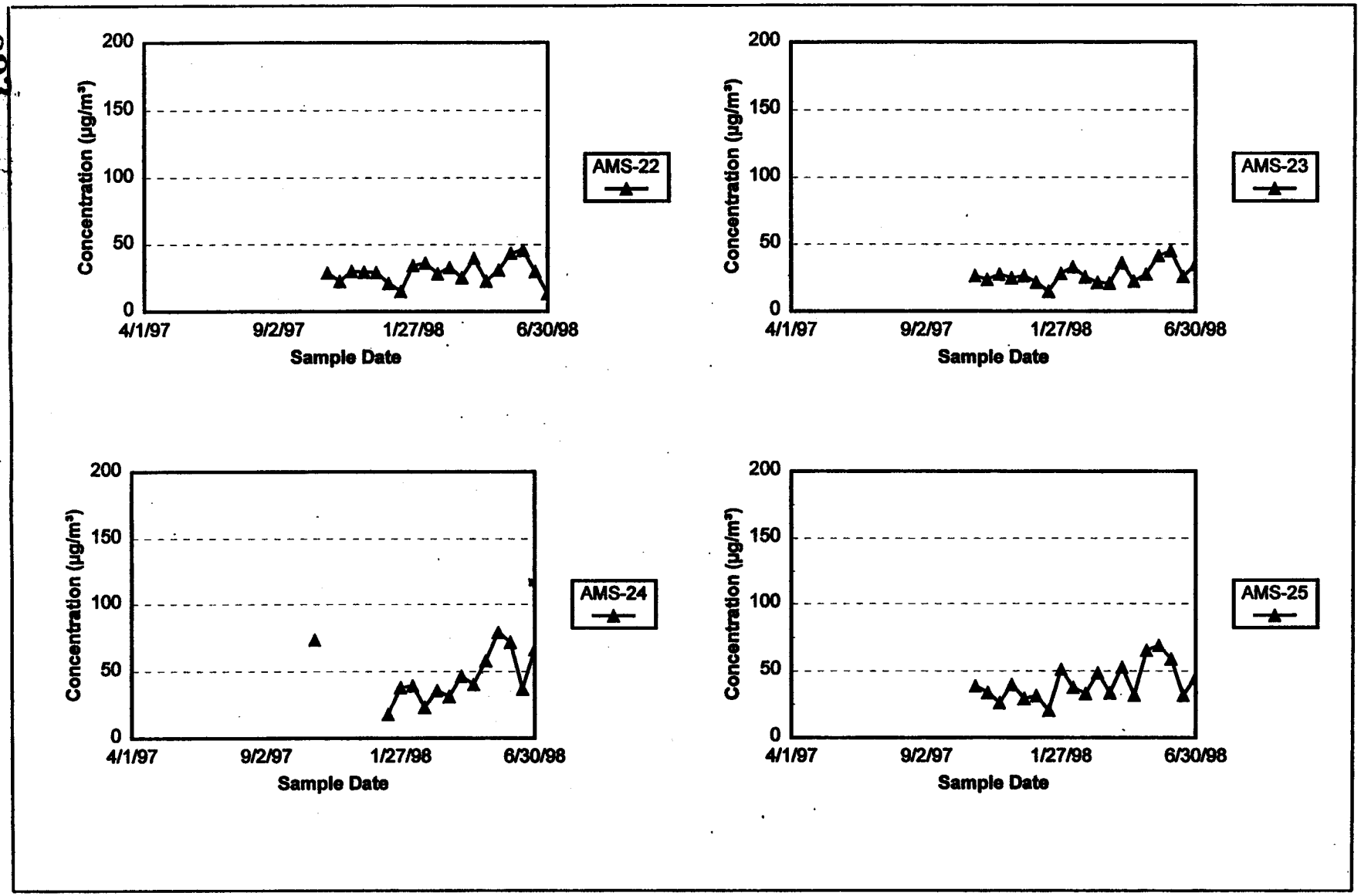


FIGURE 3-11. TOTAL PARTICULATE CONCENTRATIONS IN AIR
(AMS-22, AMS-23, AMS-24, AND AMS-25)

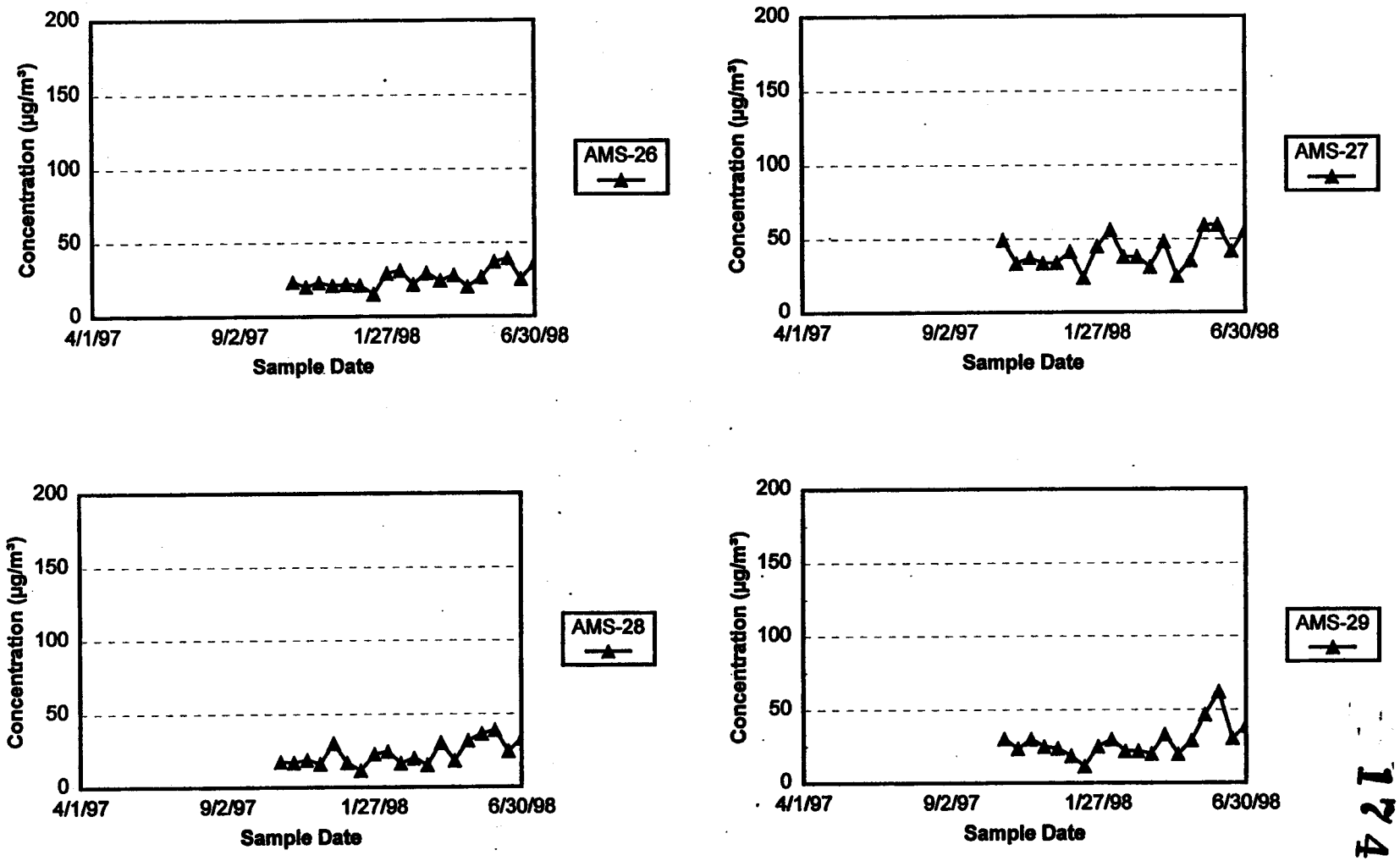


FIGURE 3-12. TOTAL PARTICULATE CONCENTRATIONS IN AIR
(AMS-26, AMS-27, AMS-28, AND AMS-29)

000095

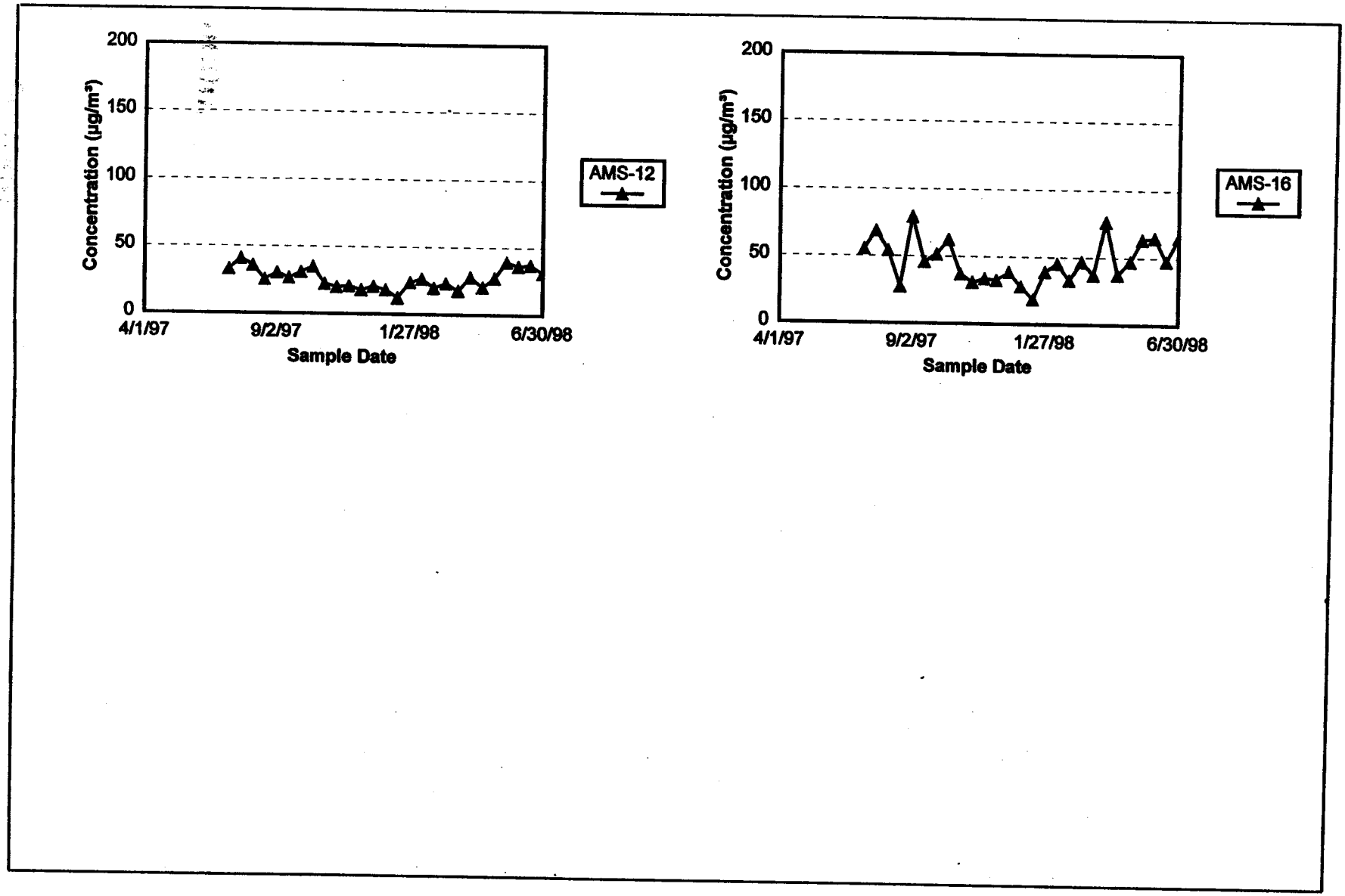
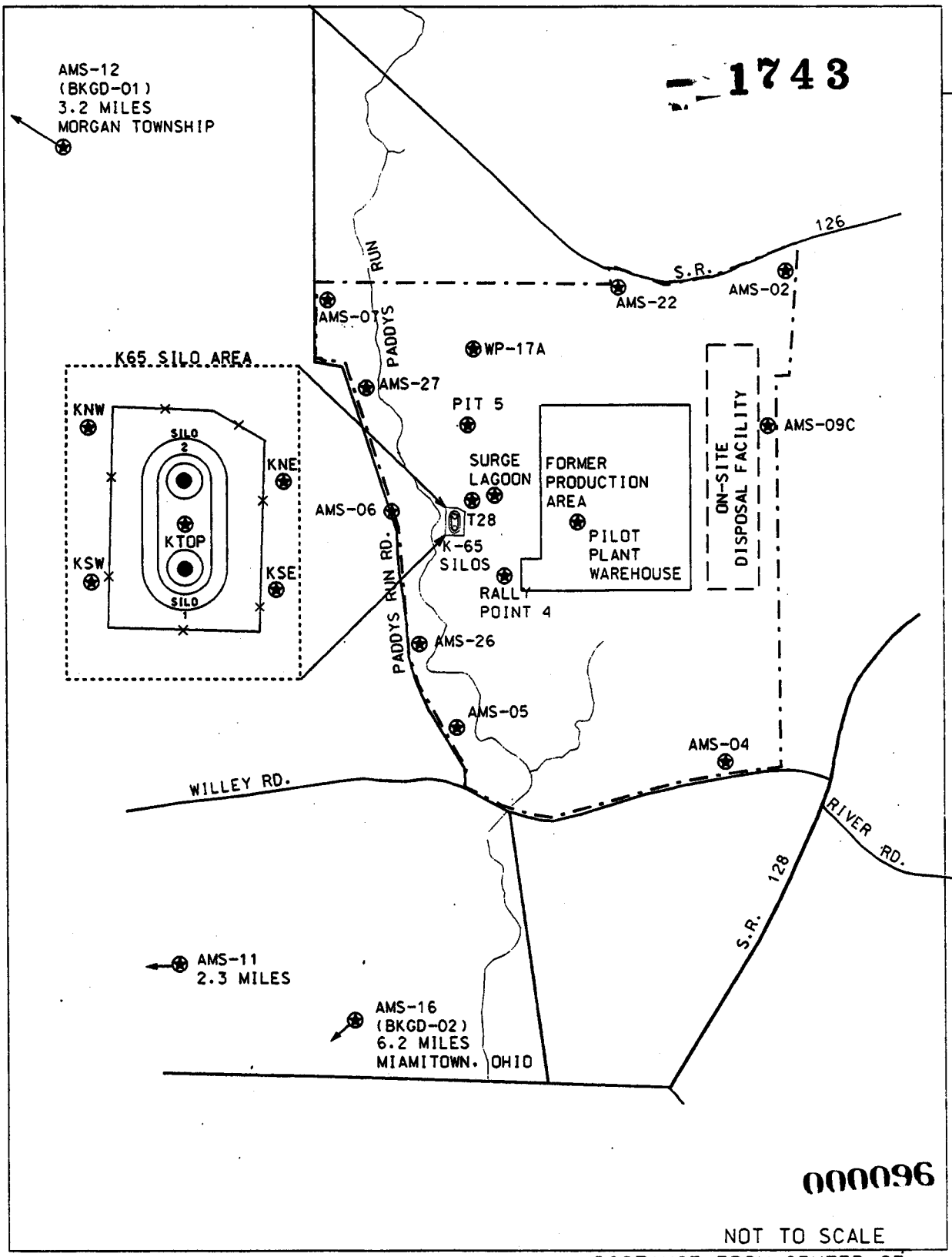


FIGURE 3-13. TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-12 AND AMS-16)



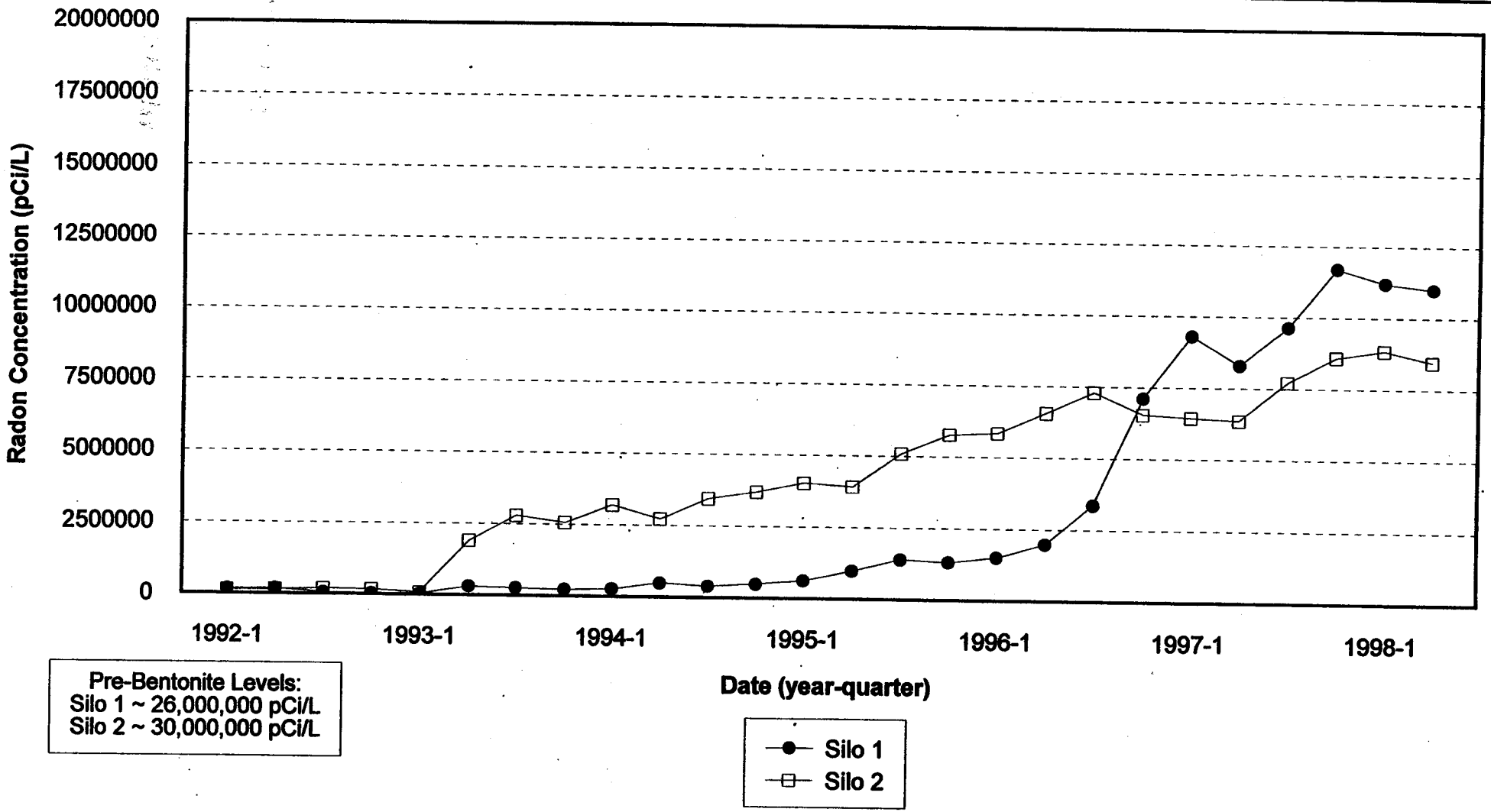
LEGEND:

- 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

FIGURE 3-14. RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATIONS

V:\5fgp1\dgn\98qtr3\98qtr3014.dgn
04-SEP-1998

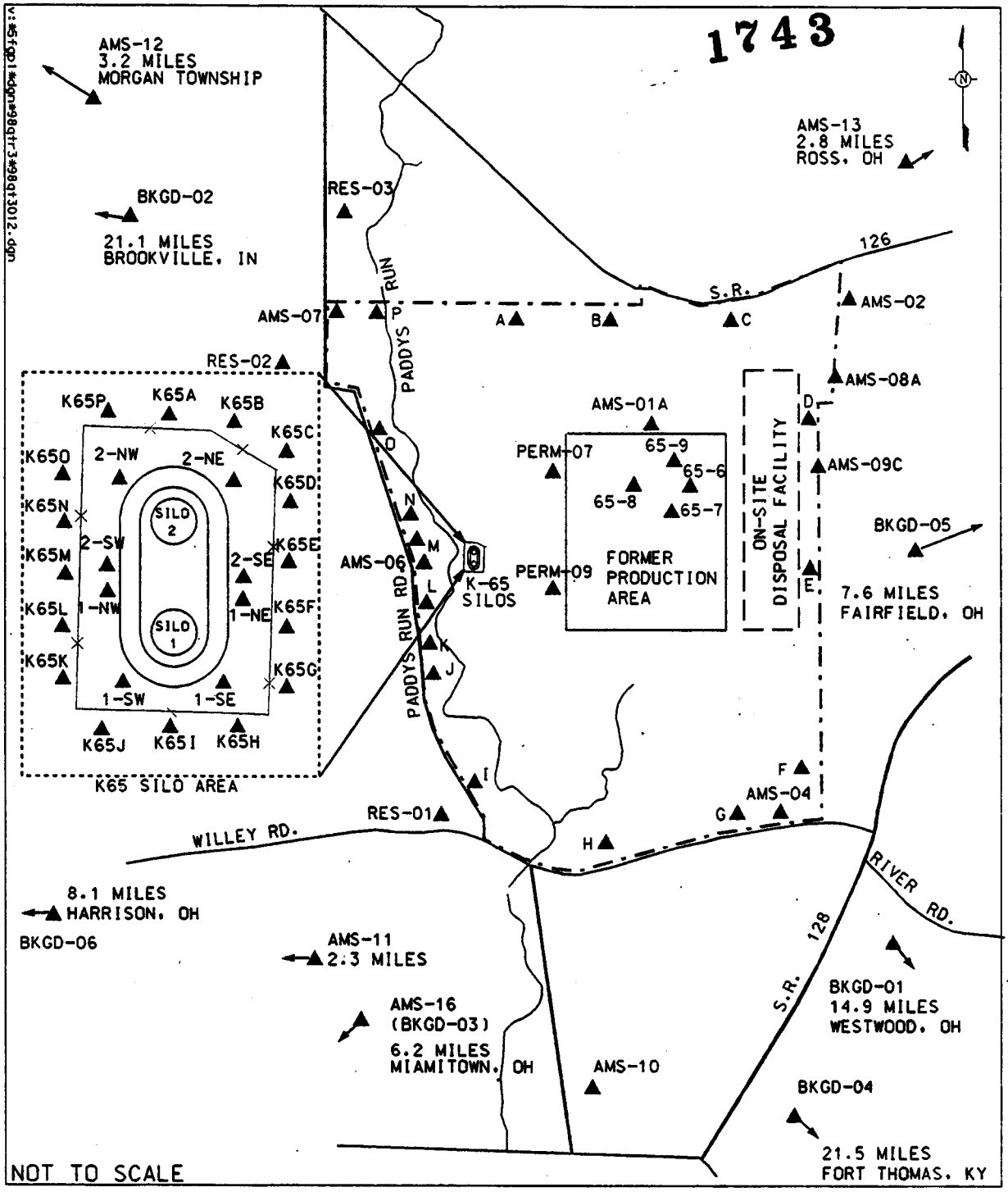
000092



Pre-Bentonite Levels:
Silo 1 ~ 26,000,000 pCi/L
Silo 2 ~ 30,000,000 pCi/L

NOTE: Defective sample line for Silo 1 was replaced during fourth quarter 1996.

FIGURE 3-15. QUARTERLY K-65 SILO HEAD SPACE RADON CONCENTRATIONS, 1992-1998



LEGEND:

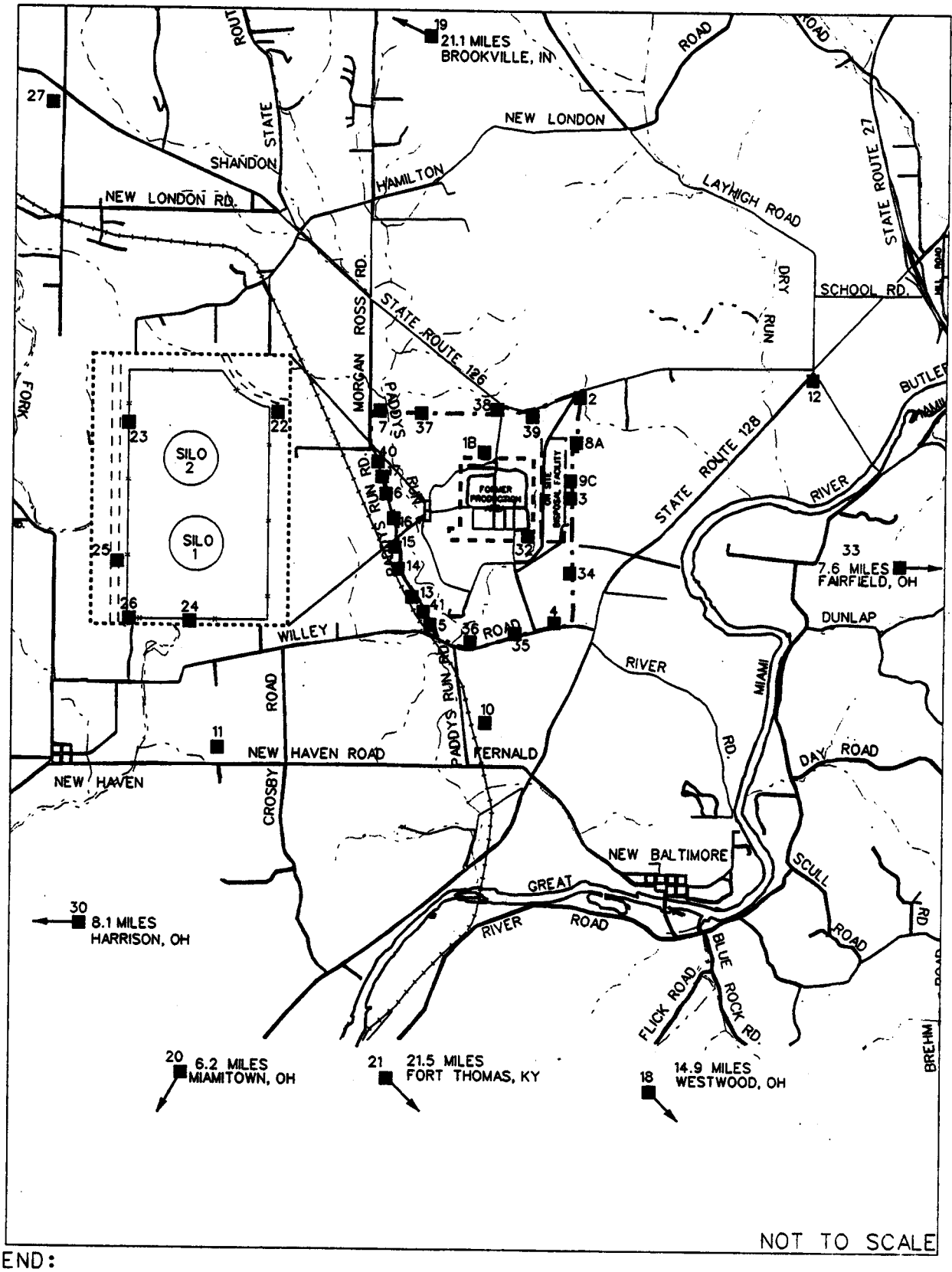
DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO LOCATION OFF THE MAP

FEMP BOUNDARY

RADON MONITORING-ALPHA TRACK-ETCH CUP MONITORING LOCATION

000098

FIGURE 3-16. RADON MONITORING - ALPHA TRACK-ETCH CUP LOCATIONS



LEGEND:

FEMP BOUNDARY

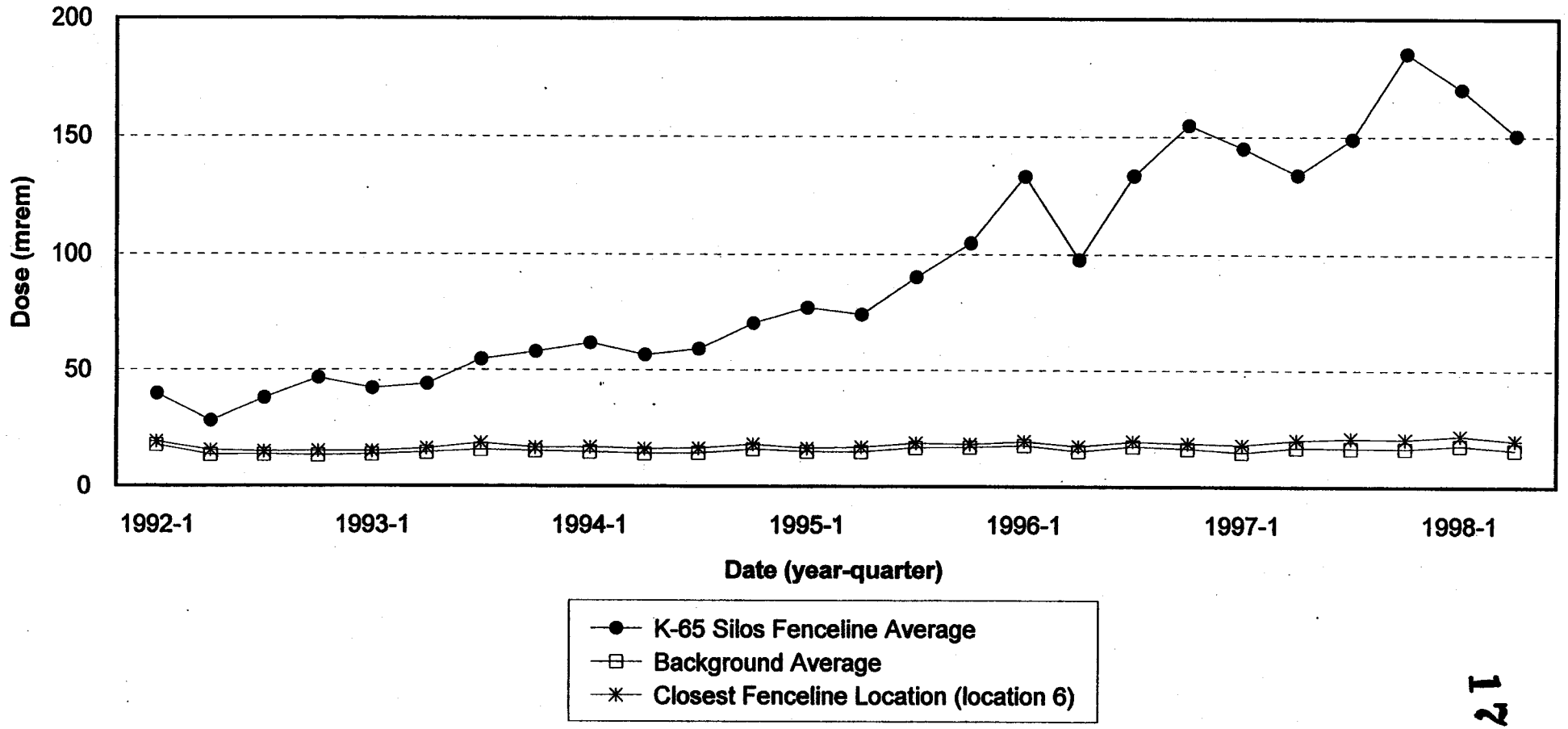
DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO LOCATION OFF MAP

DIRECT RADIATION (TLD) MONITORING LOCATION

FIGURE 3-17. DIRECT RADIATION (THERMOLUMINESCENT DOSIMETERS) MONITORING LOCATIONS

000099

04-SEP-1998



Pre-Bentonite Silos Fenceline Average
1991: 484 mrem

1743

FIGURE 3-18. QUARTERLY DIRECT RADIATION (TLD) MEASUREMENTS, 1992-1998

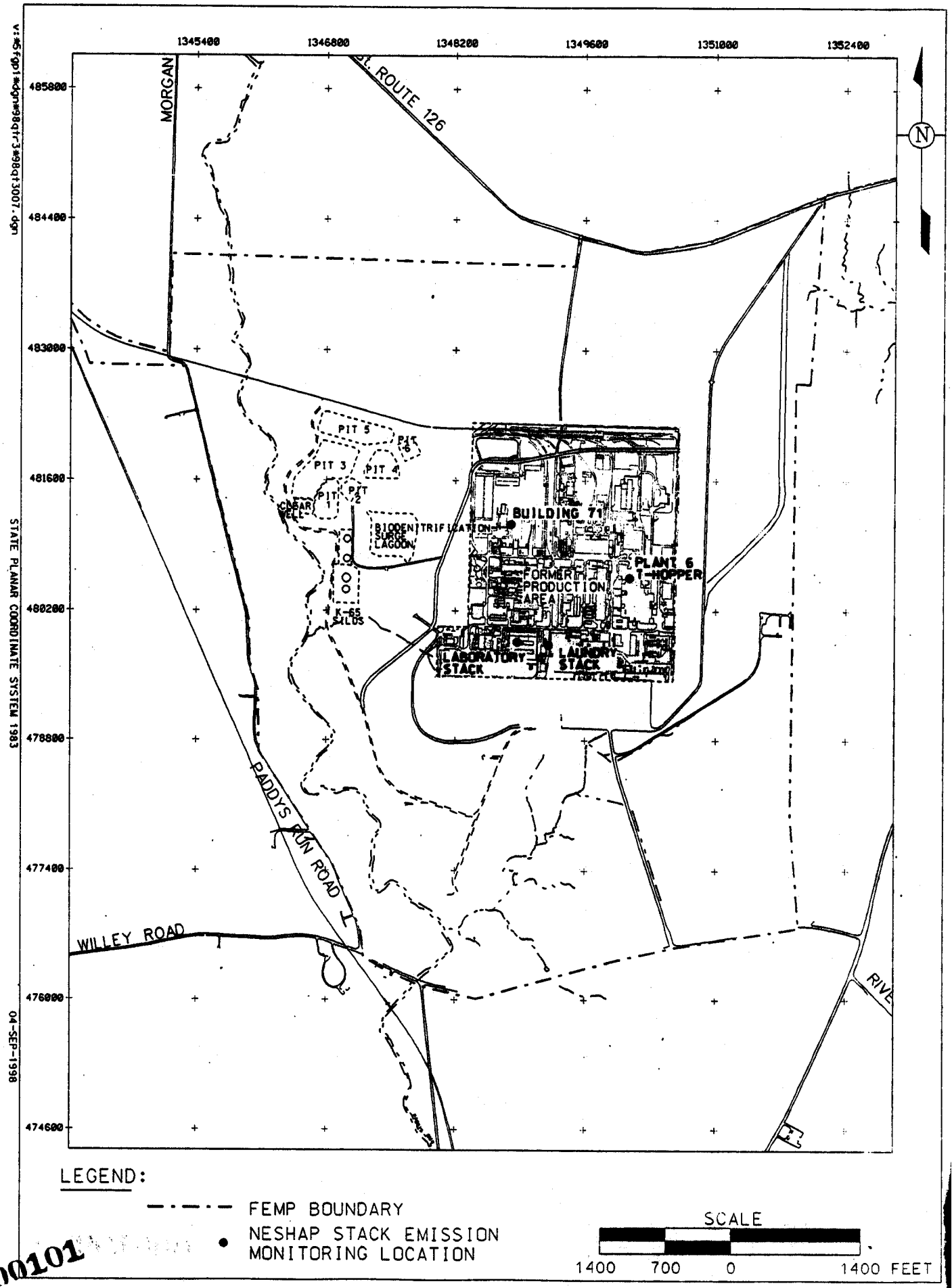


FIGURE 3-19. NESHAP STACK EMISSION MONITORING LOCATIONS

FIGURE 3-20

AIR SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

SAMPLING ACTIVITIES	1998											
	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Radiological Particulate Monitoring:							♦	♦	♦			
NESHAP Quarterly Composite									♦			
Radon Monitoring - Continuous Alpha Scintillation Monitors							♦	♦	♦			
Radon Monitoring - Alpha Track-Etch Cups												
Direct Radiation (TLD) Monitoring									♦			
NESHAP Stack Emissions Monitoring							♦	♦	♦			

♦ Data summarized/ evaluated in the next report

4.0 NATURAL RESOURCES UPDATE

1743

This section in previous quarterly status reports has provided updates for the following natural resource monitoring activities conducted under the Natural Resource Monitoring Plan (Appendix D of the IEMP):

- Impacted Habitat
- Status of Wetlands
- Threatened and Endangered Species Surveys
- Cultural Resources.

As a result of the tentative agreement in April 1998 among the Fernald Natural Resource Trustees and in response to OEPA comments on the Integrated Environmental Monitoring Status Report for First Quarter 1998, DOE will provide quarterly narrative summaries of newly impacted or restored habitat areas. In addition, annual reporting in integrated site environmental reports will identify the progress of natural resource restoration activities and also will contain pertinent updates regarding threatened and endangered species and wetlands. Cultural resource updates will be conducted pursuant to the programmatic agreement regarding archeological investigations at the FEMP and will be provided annually through integrated site environmental reports.

During the second quarter of 1998, no unanticipated impacts to FEMP habitats occurred. In summary, a streambank stabilization project along Paddys Run in the vicinity of the southern waste units resulted in altered streambank and streambed habitat and the loss of some riparian canopy. However, the use of bioengineering techniques mitigated and minimized the extent of impact.

It should be noted that remediation activities associated with the Operable Unit 1 area are expected to begin during third quarter 1998. If these activities cause significant soil disturbances to occur in the drainage area discharging to Paddys Run via the north drainage ditch, then visual observations of sediment loading to Paddys Run for the Sloan's Crayfish monitoring will be initiated.

REFERENCES

1743

U.S. Dept. of Energy, 1998a, "1997 Integrated Site Environmental Report," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1998b, "Integrated Environmental Monitoring Status Report for First Quarter 1998," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1998c, "Re-Injection Demonstration Test Plan," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1998d, "Sitewide Excavation Plan," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1998e, "Start-Up Monitoring Plan for the South Field Extraction and South Plume Optimization Modules," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1997a, "Integrated Environmental Monitoring Plan," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1997b, "On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1997c, "Operable Unit 3, Integrated Remedial Action, Thorium/Plant 9 Complex Implementation Plan for Above-Grade Decontamination and Dismantlement," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1997d, "Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Area Office, Cincinnati, OH.

U.S. Dept. of Energy, 1996, "Record of Decision for Remedial Actions at Operable Unit 5," Final, Fernald Environmental Management Project, U.S. Dept. of Energy, Fernald Field Office, Cincinnati, OH.

000104