



DEPARTMENT OF THE ARMY
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND, MARYLAND 21010-5403

REPLY TO
ATTENTION OF

MCHB-TS-OHP (40)

25 JUN 2001

MEMORANDUM FOR Commander, U.S. Army Materiel Command (AMCSG-R),
5001 Eisenhower Avenue, Alexandria, VA 22304-6100

SUBJECT: Industrial and Environmental Radiation Survey
No. 26-MF-8260-R2-01, U.S. Army Jefferson Proving Ground,
Madison, Indiana, 9-10 April 2001

Copies of the subject report and Executive Summary are enclosed.

FOR THE COMMANDER:

MARK A. MELANSON
LTC, MS
Program Manager Health Physics

Encl

CF (w/encl):

DIR, POPM-SA (MCPO-SA) [MCPO-CL-W/COL DAXON (EXSUM ONLY)]
CDR, SBCCOM (AMSSB-RCB-RS/MS. KUYKENDALL)
CDR, AMC (AMCSF-P)
CDR, JPG
CDR, NORTH ATLANTIC RMC

U.S. Army Center for Health Promotion and Preventive Medicine

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INDUSTRIAL AND ENVIRONMENTAL RADIATION SURVEY
NO. 26-MF-8260-R2-01
U.S. ARMY JEFFERSON PROVING GROUND
MADISON, INDIANA
9-10 APRIL 2001

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command; June 01. Request for this document must be
referred to Commander, U.S. Army Materiel Command,
(AMCSG-R), 5001 Eisenhower Avenue, Alexandria,
VA 22304-6100.

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Readiness Thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years. This organization began as the Army Industrial Hygiene Laboratory, established during the industrial buildup for World War II, under the direct supervision of The Army Surgeon General. Its original location was at the Johns Hopkins School of Hygiene and Public Health. Its mission was to conduct occupational health surveys and investigations within the Department of Defense's (DOD's) industrial production base. It was staffed with three personnel and had a limited annual operating budget of \$3,000.

In 1960, the laboratory became internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission expanded to support the worldwide preventive medicine programs of the Army, DOD, and other Federal agencies when directed by the Army Medical Command or the Office of The Surgeon General, through consultations, support services, investigations, on-site visits, and training.

On 1 August 1994, AEHA was redesignated the U.S. Army Center for Health Promotion and Preventive Medicine with a provisional status and a commanding general officer. On 1 October 1995, the nonprovisional status was approved with a mission for providing preventive medicine and health promotion leadership, direction, and services for America's Army.

The mission of USACHPPM is to provide health promotion and preventive medicine leadership and services to counter environmental, occupational, and disease threats to health, fitness, and readiness in support of the National Military Strategy. Its vision is to be the world class center of excellence for the systematic prevention of environmental, occupational, and disease threats to the health performance of individuals and populations.

The Center has been reorganized and reengineered to support the Army of the future. The USACHPPM now has three subordinate commands located in Fort Meade, Maryland; Fort McPherson, Georgia; and Fort Lewis, Washington; to provide responsive regional health promotion and preventive medicine support across the U.S. There are also two CHPPM overseas commands in Landstuhl, Germany and Camp Zama, Japan who contribute to the success of USACHPPM's increasing global mission.

The USACHPPM remains strong and at the forefront of prevention-based programs worldwide. The future will involve meeting multiple challenges, from demonstrating the effectiveness of health promotion and preventive medicine to integrating force health protection, health risk assessment, population health and injury prevention into the life-cycle model of the soldier. The USACHPPM will continue to work closely with sister services to support the continuum of military operations to be faced in the coming years.



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MCHB-TS-OHP (40)

EXECUTIVE SUMMARY
INDUSTRIAL AND ENVIRONMENTAL RADIATION SURVEY
NO. 26-MF-8260-R2-01
U.S. ARMY JEFFERSON PROVING GROUND
MADISON, INDIANA
9-10 APRIL 2001

I. PURPOSE. This survey was performed to assist in your efforts to implement the Nuclear Regulatory Commission approved Environmental Radiation Monitoring (ERM) Program in accordance with (IAW) NRC License Number SUB-1435 and its amendments. It requires the examination of the fate and transport of depleted uranium from the DU impact area at Jefferson Proving Ground.

II. CONCLUSION. A review of the ERM Program sampling results for April 2001 indicated the following:

A. There were no levels of uranium detected above the established action levels in any of the environmental samples collected.

B. The overall ERM Program was sound and was being conducted IAW current regulatory requirements for radiation protection.

III. RECOMMENDATION. Environmental monitoring should be continued IAW the ERM Program or as required by the license.



REPLY TO
ATTENTION OF

MCHB-TS-OHP (40)

DEPARTMENT OF THE ARMY
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5158 BLACKHAWK ROAD
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25 JUN 2001

INDUSTRIAL AND ENVIRONMENTAL RADIATION SURVEY
NO. 26-MF-8260-R2-01
U.S. ARMY JEFFERSON PROVING GROUND
MADISON, INDIANA
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I. REFERENCES. See Appendix A for a list of references.

II. AUTHORITY. Meeting among Mr. Clifford Wendel, Risk Management, Soldier and Biological Chemical Command (SBCCOM) and Mr. Patrick Mark Moscato, Mr. James Mullikin, and Mr. David Collins, Health Physics Program (HPP), to establish requested U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) support for the Environmental Radiation Monitoring (ERM) Program.

III. PURPOSE. This survey was performed to assist in your efforts to implement the Nuclear Regulatory Commission (NRC) approved ERM Program in accordance with (IAW) NRC License Number SUB-1435 and amendments thereto. The NRC license requires the examination of the fate and transport of depleted uranium (DU) from the DU impact area at Jefferson Proving Ground (JPG).

IV. GENERAL.

A. An entrance interview was held with Mr. Phil Mann, Department of the Army Civilian (DAC), Site Staff Member, JPG, 9 April 2001.

B. An exit briefing, to include a discussion of initial sample results and concerns, was held with Mr. Kenneth Knouf, DAC, Site Manager, JPG, and Mr. Phil Mann, 10 April 2001.

C. Mr. Lorus Miller, Health Physics Technician, Henry M. Jackson Foundation (HMJF) Participant, Health Physics Program (HPP), USACHPPM, and Mr. Jerry Collins, Health Physics Technician, HMJF Participant, HPP, USACHPPM, performed this survey and are qualified Health Physics Technicians with varied

expertise in radiological health issues and environmental sampling techniques. They have had occupational health and safety training, to include 40-hour hazardous waste operations and emergency response training, and are current with their annual 8-hour refresher training.

D. Abbreviations used in this report can be found in Appendix B.

V. FINDINGS.

A. General.

1. Ms. Joyce Kuykendall is the point of contact for SBCCOM for the ERM.

2. Mr. Knouf and staff provided onsite support to include admission into the JPG restricted areas. There were no onsite unexploded ordnance personnel to provide escort.

3. The USACHPPM standing operating procedure (SOP) for the DU Sampling Program at JPG, effective 10 March 2000 was followed for this project (Reference 6).

4. The ERM Program requires biannual sampling.

B. Personnel Dosimetry Program. None required.

C. Radioactive Materials.

1. The NRC license authorized the possession of DU only for decommissioning of DU metal and alloy located at the JPG site.

a. The NRC approved ERM Program required biannual environmental sampling which included soil, sediment, surface water, and ground water sampling and evaluation.

b. Radioactive material warning signs were posted IAW regulatory requirements. Signs were present on all barriers controlling access into the restricted areas.

c. An Abbreviated Site Safety and Health Plan (ASSHP) for entering restricted areas of JPG was established and implemented.

2. Action Levels. The following criteria for the restricted area will be used to limit DU exposure as stated in the ERM Program. The ERM Program was approved by the NRC in a letter dated 22 July 1996.

a. Soil and Sediment:

Perimeter and background samples:

< 35 picocuries per gram (pCi/g) - no corrective action.

> 35 pCi/g - collect 5 additional samples in a 1 meter square grid.

If average activity was verified to exceed 35 pCi/g decontaminate to below 35 pCi/g.

Sample locations along the lines of fire:

< 100 pCi/g - no corrective action.

100 - 300 pCi/g - collect 5 additional samples in a 1 meter square grid.

If average was still > 100 pCi/g, investigate to determine reason for high level.

> 300 pCi/g was verified, investigate to determine reason for the high level and contact the NRC.

b. Surface and Ground Water:

DU [Note: Title 10, Code of Federal Regulations (10 CFR), Part 20, Appendix B (effluent concentrations for water) limit is 3.0×10^{-1} picocuries per milliliter (pCi/ml)].

$< 1.5 \times 10^{-1}$ pCi/ml - no corrective action.

$> 1.5 \times 10^{-1}$ pCi/ml - resample and if activity is verified, investigate to determine reason for the high level and notify the NRC.

3. Basis for Action. When action levels are exceeded, an evaluation of cause will be performed by the SBCCOM Radiation Protection Office. A report of the findings will be provided to the licensee's Radiation Control Committee. Based on their determination, recommendations to the Commander on corrective action will be made.

D. Records and Reports.

1. Records were available to show previous locations sampled as part of the ERM Program.

2. Instrumentation used for the administration of this project were evaluated and found to be adequate for their intended purpose.

E. Survey Results.

1. Soil and Sediment Samples. Soil and sediment samples were analyzed by gamma spectroscopy for thorium-234, the progeny of uranium-238.

a. Soil Samples. All soil sample locations and exposure results are presented in Appendix C. Analysis of the soil samples resulted in no levels of activity above the action level being detected. Laboratory analyses of soil sample results are summarized in Appendix D.

b. Sediment Samples. All sediment locations and exposure results are presented in Appendix C. Analysis of the sediment samples resulted in no levels of activity above the action level being detected. Laboratory analyses of sediment sample results are summarized in Appendix D.

2. Water samples were analyzed fluorometrically for dissolved total uranium.


a. Surface Water Samples. All surface water sample collection locations are presented in Appendix C. Analysis of the surface water samples resulted in no levels of activity above the action level being detected. Laboratory analyses of surface water sample results are summarized in Appendix D.

b. Ground Water (Monitoring Well) Samples. All ground water sample locations are presented in Appendix C. Analysis of the ground water samples resulted in no levels of activity above the action level being detected. Laboratory analyses of the ground water sample results are summarized in Appendix D.

3. External Radiation Monitoring Results. Radiation exposure measurements were taken at each area where soil samples were collected and near areas where sediment, surface water, and ground water samples were collected. All radiation exposure results and monitoring equipment used are presented in Appendix C. The radiation exposure measurements ranged from 3.4 to 9.3 microrentgen per hour ($\mu\text{R/hr}$).

VI. DISCUSSION.

A. The USACHPPM survey team would like to thank the JPG site team for their assistance with coordination and execution of the sampling.

B. The USACHPPM survey team requested to examine any available site survey instrumentation. Upon inspection it was noted that the instruments were past due calibration. The staff will arrange for recalibration through Ludlum Instruments. 

VII. CONCLUSION. An evaluation of the sampling results for April 2001 indicated the following:

A. There were no levels of uranium detected above the established actions levels in any of the environmental samples collected.

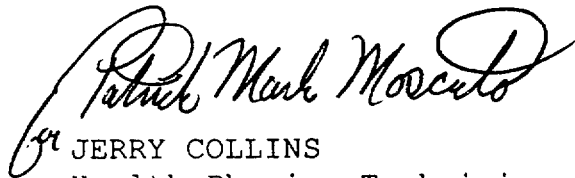
B. The overall ERM Program was sound and was being conducted IAW current regulatory requirements for radiation protection.

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9-10 Apr 01

VIII. RECOMMENDATIONS. Environmental monitoring should be continued IAW the ERM Program and SOP or as required by license.



LORUS L. MILLER
Health Physics Technician
Henry M. Jackson Foundation Participant
Health Physics Program



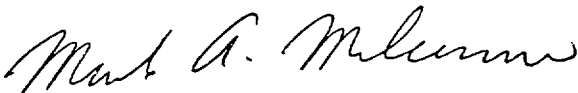
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REVIEWED BY:



PATRICK MARK MOSCATO
Health Physicist
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APPROVED:



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9-10 Apr 01

APPENDIX A

REFERENCES

1. NRC License Number SUB-1435, amendments and ERM Plan at JPG, 8 May 1988, TECOM, Aberdeen Proving Ground, Maryland.
2. 10 CFR, Part 19, 2000 rev., Notices, Instructions and Reports to Workers, Inspection.
3. 10 CFR, Part 20, 2000 rev., Standards for Protection Against Radiation.
4. 10 CFR, Part 21, 2000 rev., Reporting and Defects and Noncompliance.
5. 10 CFR, Part 40.42(c), 2000 rev., Expiration and termination of licenses and decommissioning of site and separate buildings or outdoor areas.
6. USACHPPM HPP SOP for DU Sampling Program at JPG, 10 Mar 00.
7. ASSHP, 15 April 1998, JPG, Madison, IN.
8. ETL 385-1-2, 15 May 1995, Generic Scope of Work for Ordnance Avoidance Operations.
9. USAEHA Technical Guide 155, Environmental Sampling Guide, February 1993.
10. Letter, dated July 22, 1996, NRC, subject: Approval of the Environmental Radiation Plan and Security Plan.
11. USACHPPM Directorate of Laboratory Sciences, Radiologic, Classic and Clinical Chemistry Division, Final Analytical Report, Program 26-Subjono 8260, Serial Number 84766 and 85307, DLS Profile #: 25849- Work Order #: 2471 and 2472, JPG, IN, 30-Apr-01 and 03-May-01.
12. 29 CFR, Part 1910.120, Hazardous Waste Operations and Emergency Response.

APPENDIX B

ABBREVIATIONS

ASSHP	Abbreviated Site Safety and Health Plan
CFR	Code of Federal Regulations
DAC	Department of the Army Civilian
DU	depleted uranium
ERM	Environmental Radiation Monitoring
HPP	Health Physics Program
IAW	in accordance with
JPG	Jefferson Proving Ground
NRC	Nuclear Regulatory Commission
pCi/g	picocuries per gram
pCi/ml	picocuries per milliliter
SBCCOM	Soldier and Biological Chemical Command
SOP	standing operating procedure
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
μ R/hr	microroentgen per hour

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9-10 Apr 01

APPENDIX C

SAMPLING LOCATIONS, SAMPLING
PARAMETERS AND INSTRUMENTATION

SOIL SAMPLES (Refer to Appendix E for graphical representation)				
Sample ID	Sample Date	Exposure Reading (μ R/hr)	Sample Locations	JPG ID Code
SOS1	10 Apr 01 @ 1005	9.29	Vicinity at intersection of C-Road and Wonju Road	(S44)
SOS2	10 Apr 01 @0905	8.48	Vicinity at intersection of E-Road and Morgan Road	(S48)
SOS3	10 Apr 01 @0915	5.38	0.5 miles east of intersection at C-Road and East Recovery Road	(S43)
SOS4	10 Apr 01 @1045	7.44	Corner of Morgan Road and C-Road	(S47)
SOS5	10 Apr 01 @1010	8.85	Duplicate or Split of SOS 1	(S44)
SOS6	Note: Per letter from the NRC dated 7 Sep 99, soil sample locations S6 and S8 that were previously sampled will no longer require sampling. No other changes to the ERM Program have been approved.			
SOS8				

SEDIMENT SAMPLES (Refer to Appendix E for graphical representation)				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SES1	10 Apr 01 @0825	5.33	West Perimeter Road Middle Fork Creek (exits JPG property)	SWBS
SES2	10 Apr 01 @0848	4.98	Big Creek (exits JPG property)	SWBN
SES3	10 Apr 01 @0955	6.21	Wonju Road Middle Fork Creek (enters DU impact area)	SWSE
SES4	10 Apr 01 @0945	7.81	Big Creek (enters DU impact area)	SWNE
SES5	10 Apr 01 @0935	8.65	Bridge No.22 Big Creek	SWNB
SES6	10 Apr 01 @1020	7.29	Line of Fire Middle Fork Creek	SWS
SES7	10 Apr 01 @1130	6.67	Bridge No. 12 @ Morgan Road Middle Fork Creek	SWSW
SES8	10 Apr 01 @1055	6.35	Bridge No. 13 @ Morgan Road Middle Fork Creek	SWNW
SES9	10 Apr 01 @1025	7.63	Duplicate or Split of SES 6	SWNE

SURFACE WATER SAMPLES (Refer to Appendix E for graphical representation)				
Sample ID	Sample Date	Exposure Reading (μR/hr)	Sample Locations	JPG ID Code
SWS1	9 Apr 01 @1140	4.88	West Perimeter Road Middle Fork Creek (exits JPG property)	(M1)
SWS2	9 Apr 01 @1150	3.37	Big Creek (exits JPG property)	(M2)
SWS3	9 Apr 01 @0825	6.54	Wonju Road Middle Fork Creek (enters DU impact area)	(M3)
SWS4	9 Apr 01 @0855	5.89	Big Creek (enters DU impact area)	(M4)
SWS5	9 Apr 01 @0910	5.42	Bridge No.22 Big Creek	(M5)
SWS6	9 Apr 01 @1220	5.55	Line of Fire Middle Fork Creek	(M6)
SWS7	9 Apr 01 @1210	5.28	Bridge No. 12 @ Morgan Road Middle Fork Creek	(M7)
SWS8	9 Apr 01 @1000	4.29	Bridge No. 13 @ Morgan Road Middle Fork Creek	(M8)
SWS9	9 Apr 01 @1150	3.77	Duplicate or Split of SWS 2	(M1)

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GROUND WATER SAMPLE (Refer to Appendix E for graphical representation)						
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	Comments		
				pH	Temp (°C)	Conductivity (µmho)
MW01	9 Apr 01 @0845	8.11	Well @ D-Road and Wonju Road (perimeter DU impact area)	6.8	12.6	635
MW01	9 Apr 01 @1225	7.75	Well between C-Road and Wonju Road (perimeter DU impact area)	6.5	11.9	859
MW03	9 Apr 01 @1235	6.81	Well between A-Road and gate on Wonju Road (perimeter DU impact area)	6.8	11.7	758
MW04	9 Apr 01 @1110	7.43	Well on South Perimeter Road (Along south border of JPG)	6.6	14.6	811
MW05	9 Apr 01 @1000	5.86	Well at D-Road and Morgan Road (across Bridge No.13) perimeter DU impact area	6.7	14.3	7870
MW06	9 Apr 01 @1010	6.49	Well at C-Road and Morgan Road (perimeter DU impact area)	7.1	15.5	920
MW07	9 Apr 01 @1025	6.93	Well @ Oakdale School House on Morgan Road (perimeter DU impact area)	6.9	12.4	933
MW08	9 Apr 01 @1120	8.54	Well @ Southwest Corner of JPG (Along south border of JPG)	7.2	15.2	672
MW09	9 Apr 01 @0915	8.68	Well @ D-Road and Bridge No.22 (inside DU impact area)	7.3	14.8	9650
MW10	9 Apr 01 @0945	6.85	Well on Center Recovery Road (inside DU impact area)	6.7	10.9	895
MW11	9 Apr 01 @0925	9.14	Well at D-Road between Morgan and C Recovery Road (inside impact area)	7.1	14.3	656
MW12	9 Apr 01 @0930	NA	Duplicate or Split Sample MW 11	NA	NA	NA

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The following field instruments were used during the sample
collection process of the monitoring program:

Radiation Detection Instrumentation:

Ludlum Model 2350 Data Logging Scaler/Ratemeter
Serial Number: 120585
Calibrated: 22 March 01
Calibration Due: 18 September 01

Ludlum Model 44-10; 2"x2" Sodium Iodide (NaI) Scintillation
Detector Serial Number: PR122183

Water Quality Instrumentation:

pH Meter:

Lamotte Chemical Products, Inc.
Serial Number: pH5 40 20 3787

Operation Verified using Orion Certified pH Solution packets.
Probe tested using packets of pH=4, pH=7 and pH=10.

Temperature/Conductivity:

Yellow Springs Instrument Co., Inc.
Conductivity/Temperature/Salinity Meter Model 30/10 FT
Serial Number: 98M0399AF

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APPENDIX D

LABORATORY RESULTS OF ENVIRONMENTAL SAMPLES
JPG
APRIL 2001

The following tables are summaries of the laboratory analyses. The complete results are reported in the USACHPPM Directorate of Laboratory Sciences, Radiologic, Classic and Clinical Chemistry Division, Final Analytical Report, Program 26-Subjono 8260 Serial Number 84766 and 85307, DLS Profile #: 25849- Work Order #: 2471 and 2472, JPG, IN, 30-Apr-01 and 03-May-01.

Water Samples
 (Limiting action level 150 pCi/l)

Monitoring Well Samples		
Field Sample Number	Total Uranium (pCi/l)	Minimum Detectable Concentration (pCi/l)
MW01	0 ± 0	0.68
MW02	0.68 ± 0.68	0.68
MW03	0 ± 0	0.68
MW04	0 ± 0	0.68
MW05	0 ± 0	0.68
MW06	2.72 ± 0.68	0.68
MW07	0 ± 0	0.68
MW08	0 ± 0	0.68
MW09	0 ± 0	0.68
MW10	0 ± 0	0.68
MW11	0 ± 0	0.68
MW12	0 ± 0	0.68

Surface Water Samples		
Field Sample Number	Total Uranium (pCi/l)	Minimum Detectable Concentration (pCi/l)
SWS01	0 ± 0	0.68
SWS02	0 ± 0	0.68
SWS03	0 ± 0	0.68
SWS04	0 ± 0	0.68
SWS05	0 ± 0	0.68
SWS06	0 ± 0	0.68
SWS07	0 ± 0	0.68
SWS08	0.68 ± 0.68	0.68
SWS09	0.68 ± 0.68	0.68

Sediment and Soil Samples
(Limiting action level 35 pCi/g)

Sediment Samples		
Field Sample Number	Thorium-234 (pCi/g)	Minimum Detectable Concentration (pCi/g)
SES01	2.00 ± 1.00	1.00
SES02	1.00 ± 2.00	1.00
SES03	3.00 ± 2.00	2.00
SES04	0.05 ± 2.00	1.00
SES05	2.00 ± 2.00	2.00
SES06	2.00 ± 1.00	2.00
SES07	2.00 ± 2.00	2.00
SES08	1.00 ± 1.00	1.00
SES09	2.00 ± 2.00	2.00

Soil Samples		
Field Sample Number	Thorium-234 (pCi/g)	Minimum Detectable Concentration (pCi/g)
SOS01	2.00 ± 2.00	2.00
SOS02	2.00 ± 2.00	2.00
SOS03	2.00 ± 2.00	2.00
SOS04	2.00 ± 2.00	2.00
SOS05	2.00 ± 2.00	2.00

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APPENDIX E

JPG ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

**Jefferson Proving Ground: DU Sampling
GROUNDWATER MONITORING WELLS**



Figure 1: Groundwater samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SOIL SAMPLES

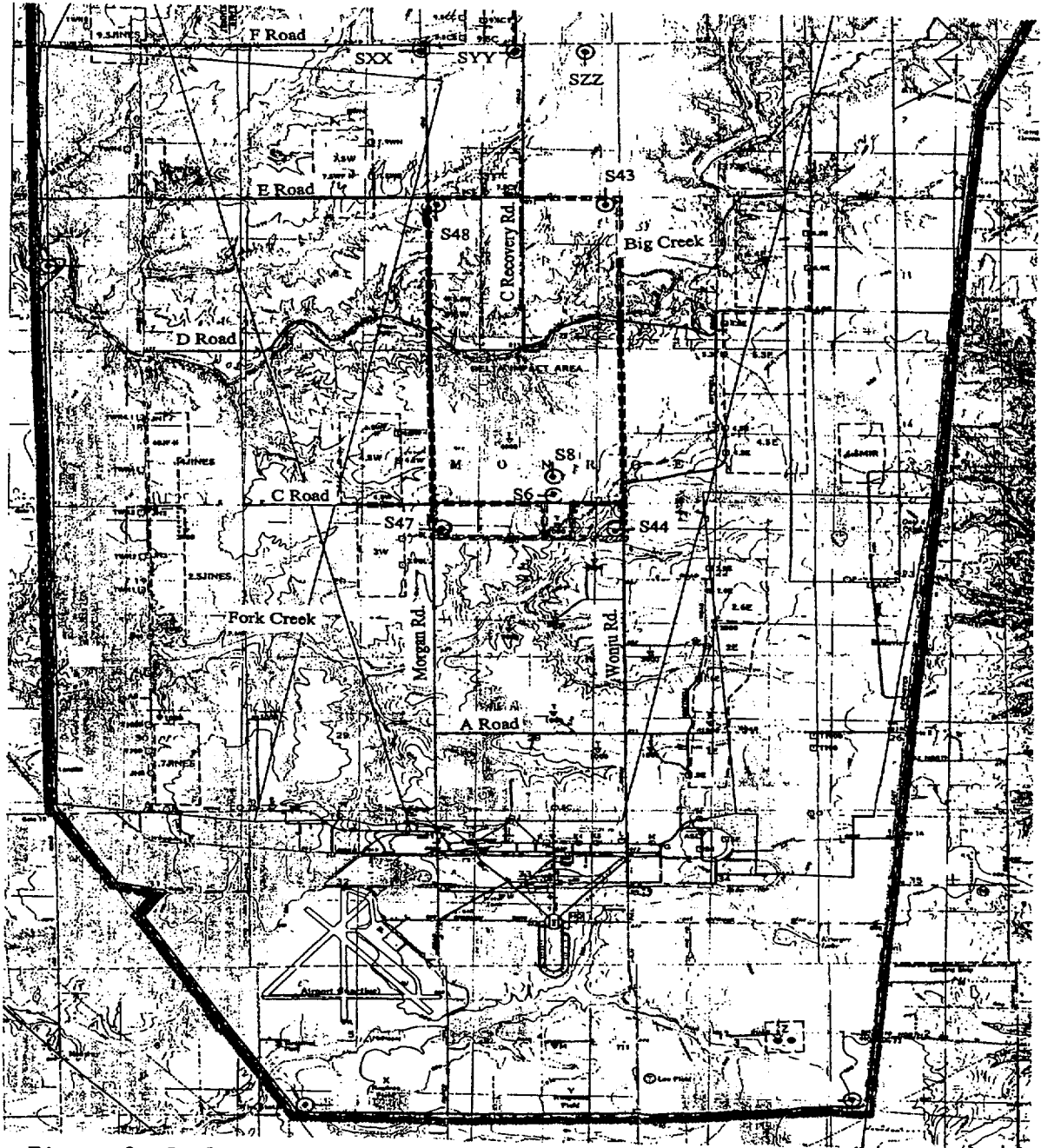


Figure 2: Soil Samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SURFACEWATER & SEDIMENT SAMPLES

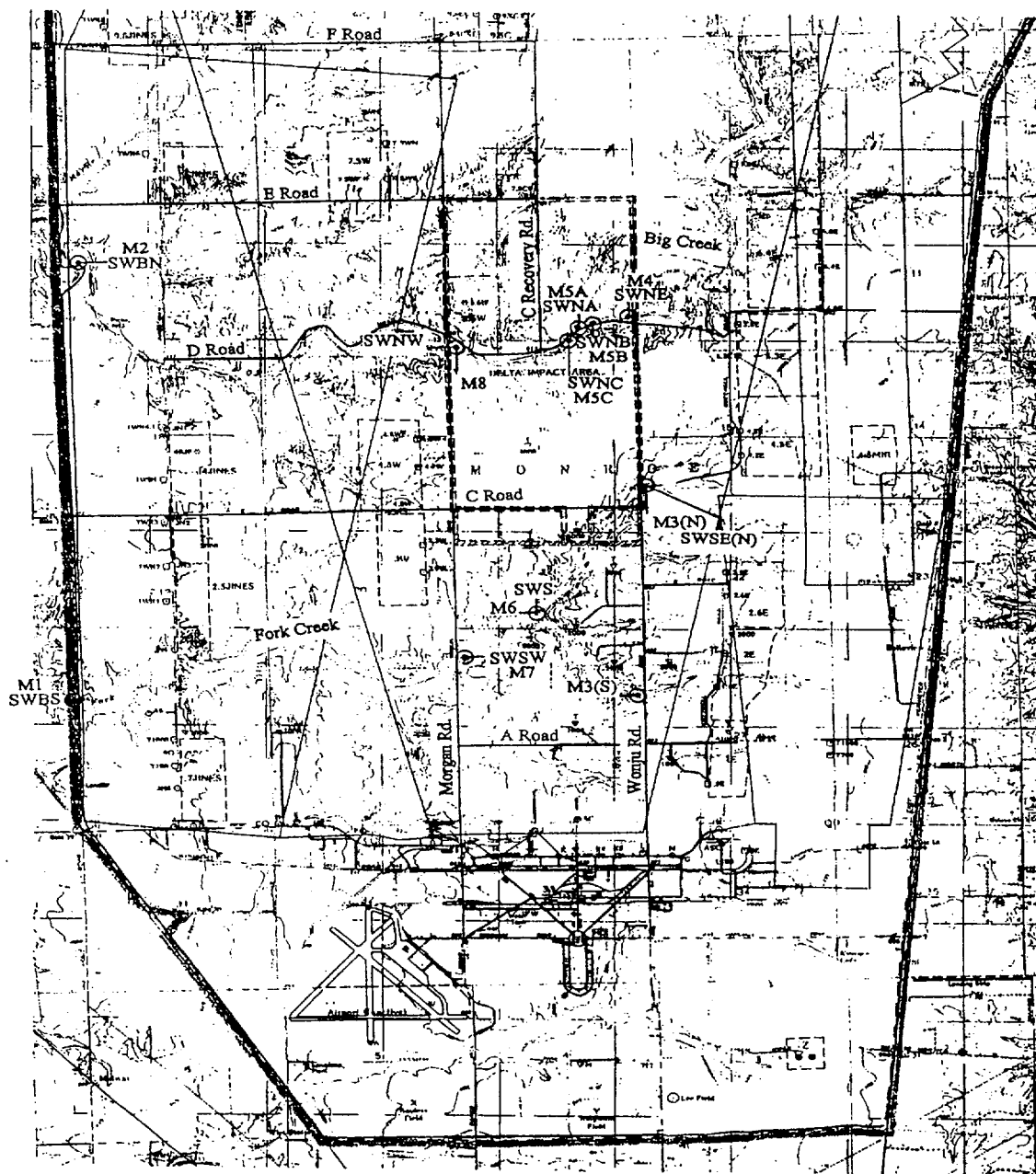


Figure 3: Surfacewater & Sediment Samples (Sept. 1997)