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ADDENDUM TO THE IMPROVED STORAGE OF SOIL & DEBRIS REMOVAL ACTION (RA) 17 WORK PLAN, REV NO. 2

DOE-FN/EPA

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ADDENDUM

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TO THE
IMPROVED STORAGE OF SOIL & DEBRIS
REMOVAL ACTION (RA) 17 WORK PLAN, REV. No. 2

REASON FOR ADDENDUM

The Removal Action 17 Work Plan currently advocates a tension-support structure (TSS) as the improved storage option for the Soil and Rubble Pile located north of Third Street. The TSS was originally selected as the in-place improved storage option because it had been determined that intermittent access to the pile would be required. However, site conditions have changed since the Work Plan was prepared. Because of the time necessary to implement Phase I controls as described in the RA 17 Work Plan, the pile continued to receive material until its recent closure in October 1992. Moreover, it was necessary to keep the pile open because continuing construction and maintenance activities as well as an approved removal action work plan specified the use of the pile. After closure, the pile was topographically surveyed in order to more accurately estimate the current pile volume. This survey indicated that the pile contains approximately 23,300 cubic yards of material. The largest dimensions of the pile are 450′ x 240′ x 20′. Even with regrading, the pile is now too large for a conventional tension-support structure. Furthermore, access to this pile will no longer be required. Therefore, it has been determined that another improved storage alternative (i,e. engineered impermeable cover) would be more practical than a TSS.

EXISTING DATA AND PROCESS KNOWLEDGE

A review of process knowledge and site history indicate that the pile received radiologically contaminated soil and debris primarily from the following projects at the FEMP: Laboratory Upgrade, Rotary Kiln, Drum Reconditioner, Tank Farm, Derby Slag, and Plant 1 Pad Extension. Wastes from all of the above projects were declared RCRA non-hazardous based on established FEMP procedures FMPC-720 (since replaced by SSOP-0044, Management of Soil, Debris, and Waste from a Project) and SSOP-0002 (Completing the Material Evaluation Form, issued 10/22/91). The most current versions of these procedures are included in the Removal Action 17 Work Plan as Attachments C and E, respectively.

Approximately two years ago, a radiological survey was performed on the pile by WEMCO Radiation Control Technicians utilizing hand-held friskers. The survey indicated through field-correlated data that the total uranium concentration was between 35 and 100 pCi/g. However, a large amount of soil was added from the Plant 1 Pad extension project after this radiological survey was performed. There is no available documentation to suggest that the pile

contains hazardous material or exceeds the radiological disposition limits according to the RA 17 Work Plan (concentrations >100 pCi/g U, >50 pCi/g TH, >5 pCi/g Ra).

PROPOSED ADDITIONAL CHARACTERIZATION ACTIVITIES

In accordance with the approved RA 17 Work Plan, sampling and analysis may be performed to supplement the characterization data from process knowledge and site history to determine the improved storage requirements. A sampling and analysis plan has been developed in accordance with the sampling methodology presented in the RA 17 Work Plan. The pile contents will be sampled in order to obtain the specific data required to complete the Material Evaluation Form (MEF) which will subsequently provide proper characterization of the stockpiled materials in the pile for implementation of the RA 17 Work Plan. According to the RA 17 Work Plan, proper characterization based on the analytical results from sampling will allow the DOE to determine the prudent improved storage option to manage the pile. The DOE will also obtain a RCRA determination (via the completed MEF) which will verify the predicted non-hazardous status of the pile contents.

The sampling and analysis plan is provided as Attachment A of this letter. Forty-two (42) samples (the minimum number required to meet 95 percent confidence) will be analyzed for total uranium and thorium; isotopic uranium and thorium; TCLP metals, TCLP VOA's, and TCLP SVOA's; total metals, total VOA's and total SVOA's; Radium-226; Radium-228; and Alpha/Beta screening. DOE will then inform the US and Ohio EPA of the final analytical results.

PREFERRED ALTERNATIVE TO THE TSS

According to the approved RA 17 Work Plan, there are three alternatives for the disposition of soil and rubble piles at the FEMP; (1) soil may be dispositioned to a controlled stockpile if the radiological contamination is below the limits (<100 pCi/g U, <50 pCi/g TH, < 5 pCi/g Ra) and there are no hazardous materials present, (2) if the pile does not meet the criteria of a controlled stockpile, the pile can be transported to an improved storage facility (i,e. Central Storage Facility), and (3) if soil requires improved storage, but is too large to be relocated, an in-place containment structure (TSS, impermeable cover, etc.) may be placed over the pile.

Based on the analytical results from sampling, the DOE will determine the most prudent management option for the Soil and Rubble pile north of Third Street. If analytical results indicate that the pile contents do not exceed the radiological disposition limits nor does it contain hazardous wastes, the DOE will propose to the EPA that this pile be maintained as a controlled stockpile

according to the RA 17 Work Plan. If the analytical results from sampling indicate that the pile does not meet the controlled stockpile criteria (i.e., exceeds radiological disposition limits; contains hazardous waste, PCBs, or petroleum contaminants), it will require improved storage. Since the pile is too large to be relocated to an improved storage facility, and an in-place containment TSS is no longer practical due to the great increase in volume, an alternative is necessary. After evaluating several alternatives, DOE is proposing the use of an engineered impermeable cover to provide a barrier between the pile and the environment. The engineered cover will be designed to meet the following objectives:

1) Minimize contact of stormwater run-on and run-off with the soil and rubble
2) Provide a stable slope that is erosion resistant and can be maintained
3) Minimize waste material generation (i.e., select a cover that does not significantly increase the volume of waste requiring remediation)

RUN-ON / RUN-OFF CONTROLS NECESSARY

Pursuant to Phase I controls described in the RA 17 Work Plan, regardless of the analytical results, stormwater drainage improvements will be required. Stormwater will be collected by drainage ditches around the pile that are integrated into the existing FEMP stormwater management system.

SUMMARY AND SCHEDULE

In summary, DOE is proceeding with sampling and analysis of the pile to supplement process knowledge. Upon completion of the sampling and analysis, DOE will determine, based on the criteria outlined in the approved RA 17 Work Plan, which management alternative is appropriate for the improved storage of the pile. The DOE anticipates sampling to commence by May 1993 and to receive analytical results by August 1993. The design for the recommended alternative will be completed by December 31, 1993 and installation to be completed by December 31, 1994. These dates are consistent with the milestone dates contained in the approved RA 17 Work Plan. The final disposition of the pile will remain as currently specified in the Work Plan, that is, the pile will be remediated in accordance with the Operable Unit 5 Record of Decision.

EM-SMPLN-92-211
REV - 0

ATTACHMENT A

SAMPLING AND ANALYSIS PLAN

for the

FEMP SOIL AND RUBBLE PILE NORTH OF THIRD STREET

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1.0 INTRODUCTION

1.1. PROJECT BACKGROUND AND DESCRIPTION

The Fernald Environmental Management Project (FEMP) formerly known as the Feed Materials Production Center (FMPC) is a Department of Energy (DOE) owned, contractor operated complex covering approximately 1050 acres. The precise location of the facility is at Fernald, Ohio situated approximately 18 miles southwest of downtown Cincinnati, Ohio bordering Hamilton and Butler counties in the state of Ohio.

In the past FEMP utilized complex manufacturing processes that supported the development of uranium metal products for the Department of Energy (DOE) defense programs. Finished uranium metal products included derbies, ingots, billets, and reactor fuel cores. Since the conclusion of all production related activities the FEMP complex is owned by the Department of Energy (DOE) and has been undergoing environmental characterization and restoration.

All current construction/remediation projects are being conducted in order to remediate the FEMP facility in accordance with CERCLA as well as federal, state, and interstate laws and regulations for the control, abatement, or management of solid or hazardous waste. As a result of these upgrades (renovations, demolitions, new construction, maintenance - general or preventive, area clean up, future remediation, etc.), various typs of excess materials have been, and will continue to be, generated at the FEMP.

To facilitate the above standards, Environmental Monitoring will extract a physical portion of any media suspect of containing any contaminant listed as hazardous/radiological by the Environmental Protection Agency (EPA). Finalized data resulting from stringent analytical procedures set forth by the EPA will be used to characterize the waste streams. This data will also be provided to other groups at the FEMP (i,e. Hazardous Waste Compliance) currently tasked with the responsibility of determining a temporary storage location for these wastes according to RA 17 Work Plan prior to its final disposition.

2.0. PURPOSE OF SAMPLING

EM-SMS has received sampling request number 92-211 to sample stockpiled materials located north of Third Street at the FEMP. The material is being sampled in order to obtain the specific data required to complete the Material Evaluation Form (MEF) and to characterize the stockpiled soils and rubble for implementation of the Improved Storage of Soil and Debris Removal Action 17 Work Plan.

3.0. IDENTIFICATION OF KNOWN CONTAMINANTS

The waste pile located north of Third Street was generated from various projects at the FEMP facility. The little analytical data available for these soils and debris indicate a slight presence of uranium. This data is contained in Attachment H. Process knowledge indicates that these soils and materials are not hazardous (i,e. non-RCRA).

4.0. SAMPLE FIELD SITE

4.1. SAMPLE LOCATION

The waste pile of concern is approximately 450 foot long, 240 foot wide, and a height varying from 0 to 20 foot. The pile was gridded off. This produced 861 grids, each of which are approximately 10 foot square. Forty-two (42) points were then randomly selected for sampling. Forty-two (42) sample points was determined to be the minimum number required to meet the 95 percent confidence interval as specified in the RA 17 Work Plan (Methods for Evaluating the Attainment of Cleanup Standards, Vol. 1: Soils and Solid Media, US EPA 1989a). The plotted grid sampling scheme is attached to this sampling plan (Attachment F). These sample points were then transposed onto a topographical map. This sample point location map is also included in ATTACHMENT F of this sampling plan.

4.2. SAMPLES PER LOCATION

The sample, at each sample point location, will be collected using a stainless steel auger or coring device. The depth of the pile varies throughout. The depth at which the samples will be collected at each point were randomized and are listed in the following table.

SAMPLE LOCATION DEPTHS

Point #	Depth	Point #	Depth	Point #	Depth	Point #	Depth
1	Surface	11	7 Foot	21	Surface	31	2 Foot
2	Surface	12	8 Foot	22	2 Foot	32	4 Foot
3	Surface	13	11 Foot	23	4 Foot	33	2 Foot
4	Surface	14	6 Foot	24	1 Foot	34	3 Foot
5	2 Foot	15	Surface	25	3 Foot	35	6 Foot
6	4 Foot	16	5 Foot	26	1 Foot	36	2 Foot
7	1 Foot	17	12 Foot	27	6 Foot	37	4 Foot
8	3 Foot	18	3 Foot	28	4 Foot	38	Surface
9	10 Foot	19	6 Foot	29	9 Foot	39	Surface
10	Surface	20	1 Foot	30	10 Foot	40	1 Foot
41	7 Foot	42	2 Foot				

5.0 REQUIRED ANALYTICAL PARAMETERS

The characterization analyses will consist of TCLP metals, VOA's, SVOA's, and radiological analyses.

PARAMETERS	FEMP ANALYSIS CODE	ANALYTICAL TEST METHOD	FEMP UNIT CODE
Total Uranium	2001	FM-RAD-0120	U04
Total Thorium	2002	FM-RAD-0080	U04
Isotopic Uranium	2026-2029	FM-RAD-0100	U04
Isotopic Thorium	2015-2018	FM-RAD-0080	U04
TCLP Metals	2401, 2403-2410	FM-MISC-0010 FM-INO-0010	U04
TCLP VOA's	2460-2469	FM-MISC-0010 FM-ORG-0050	U04
TCLP SVOA's	2472-2485	FM-MISC-0010 FM-ORG-0060	U04
Total Metals	2403-2410	FM-INO-0010	U04
Total VOA's	2412-2431	FM-ORG-0050	U04
Total SVOA's	2472-2485	FM-ORG-0060	U04
Radium 226	2013	FM-RAD-0060	U04
Radium 228	2014	FM-RAD-0040	U04
Alpha / Beta Screen	2005	FM-RAD-0130	U19

5.1 REQUIRED SAMPLE VOLUME, SAMPLE CONTAINER, PRESERVATIVE, AND HOLDING TIMES

SOLID MATRIX SAMPLE

PARAMETER	VOLUME	CONTAINER	PRESERVATIVE	HOLDING TIME
Total Uranium & Thorium	8 oz. (240 ml.)	P/G/B	None	180 Days
Isotopic Uranium	8 oz. (240 ml.)	P/G/B	None	180 Days
Isotopic Thorium	8 oz. (240 ml.)	P/G/B	None	180 Days
TCLP Metals	250g. (250 ml.)	P/G/B	None	180 / 28
TCLP VOA's	2x100g.(250ml)	G/B	Cool, 4°C, pH<2, HCL	14 Days
TCLP SVOA's	250g. (250 ml.)	G/B	Cool, 4°C	14 Days
Radium 226 & 228	8 oz. (240 ml.)	P/G/B	None	180 Days
Alpha / Beta Screen	4 oz. (120 ml.)	Glass	None	180 Days

Sample containers are as specified in 40 Code of Federal Regulations part 136 and per this sampling plan in section 5.1.

AQUEOUS MATRIX SAMPLES (QA/QC)

PARAMETER	VOLUME	CONTAINER	PRESERVA-TIVE	HOLDING TIME
FIELD BLANK				
Total Uranium & Thorium	2 x 120 ml.	P/Glass	HNO_3, Ph<2	180 Days
Isotopic Uranium	4 liter	P/Glass	HNO_3, Ph<2	180 Days
Isotopic Thorium	1 liter	P/Glass	HNO_3, Ph<2	180 Days
Alpha / Beta Screen	4 oz. (120 ml.)	P/Glass	HNO_3, Ph<2	180 Days
Radium 226 & 228	4 oz. (120 ml.)	P/Glass	HNO_3, Ph<2	180 Days
Total VOA's	3 x 40 ml.	Glass	Cool, 4°C, pH<2, HCL	14 Days
Total SVOA's	2 liter	Glass	Cool, 4°C	7 Days
Total Metals	1 liter	P/Glass	HNO_3, Ph<2	180/28 Hg
TRIP BLANK				
Total VOA's	3 x 40 ml.	Glass	Cool, 4°C, pH<2, HCL	14 Days
Alpha / Beta Screen	4 oz. (120 ml.)	Glass	HNO_3, Ph<2	180 Days
RINSEATE				
Total Uranium & Thorium	2 x 120 ml.	Glass	HNO_3, Ph<2	180 Days
Isotopic Uranium	4 liter	Glass	HNO_3, Ph<2	180 Days
Isotopic Thorium	1 liter	Glass	HNO_3, Ph<2	180 Days
Radium 226 & 228	4 oz. (120 ml.)	P/Glass	HNO_3, Ph<2	180 Days
Total VOA's	3 x 40 ml.	Glass	Cool, 4°C, pH<2, HCL	14 Days
Total SVOA's	2 liter	Glass	Cool, 4°C	7 Days
Total Metals	1 liter	P/Glass	HNO_3, Ph<2	180/28 Hg
Alpha / Beta Screen	4 oz. (120 ml.)	Glass	HNO_3, Ph<2	180 days

FIELD BLANK AND EQUIPMENT RINSEATE VOLUME REQUIREMENTS - EVERY 20TH SAMPLE OR 1 PER SAMPLING EVENT, FIELD BLANKS AND EQUIPMENT RINSEATE SAMPLES WILL CONSIST OF THE APPROPRIATE VOLUME OF SAMPLE NECESSARY FOR THE REQUESTED ANALYSIS PER SAMPLING PLAN, AND WILL BE MADE UP OF DISTILLED WATER

6.0 QA/QC REQUIREMENTS

Quality Assurance/Quality Control (QA/QC) requirements shall follow the protocol as specified in internal EM procedure EM-SM-001 "Environmental Monitoring On-Site Media Sampling" and the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SGQ). Samples will be contained in glass containers cleaned as specified in 40 Code of Federal Regulations (CFR) 136 (manufacturers specifications can be obtained) using Teflon-Lined Closures (TLC) where applicable. An EMON/SMS technician will prepare a trip blank prior to transit to the requested sample field site. The trip blank media will consist of distilled water and will be contained in glass containers with TLCs, where applicable. The specific weighted volume requirements, which will be the same as those weighted volumes applicable to the requested samples, are outlined in the SMS Sampling Plan. Prior to transport to the field sample site, the trip blank sample (1) will be permanently sealed using tamper proof custody tape and (2) will be preserved in a manner consistent with EPA Document SW-846, and as applicable to the designated sample as outlined in the EMON/SMS sampling plan. Since EMON/SMS sample numbers are sequential, the trip blank sample number will also be consistent with the requested sample number and will be applied in a manner such that the receiving laboratory will not know that the sample is representative of a trip blank.

In addition to the trip blank sample, a duplicate sample as directed by internal procedure EM-SM-001 "Environmental Monitoring On-Site Media Sampling" will be extracted every 20th sample or 1 per sampling event, which ever is more frequent, regardless of the sample media matrix involved. The EMON/SMS sampling team lead technician shall be notified by the Sampling Coordination Unit (SCU) when a duplicate sample is required. In the event that a duplicate sample is required, it will be noted in the field logbook as a duplicate of the requested sample. As a matter of accessibility for tracking and accountability purposes, the duplicate sample number will also be recorded in the permanent EMON/SMS sample log, which will also be permanently maintained by the SCU. If at any time a duplicate sample cannot be extracted due to inadequate sample volume, the EMON/SMS sampling team lead technician shall note such condition into the field logbook and also notify the SCU. The duplicate sample extraction shall then be forwarded to the next available sample extraction.

To verify that sample extraction equipment are free of contaminants, all equipment will be decontaminated prior to transport to the field sample sites. The decontamination procedure will be in accordance with that specified in EM-SMS-001, "Environmental Monitoring On-Site Media Sampling". A sample of the final rinseate will be submitted for the appropriate analysis as outlined in this sampling plan. The containers, weighted sample volume requirements, and preservatives will also be as specified per this sample plan.

7.0 EQUIPMENT NEEDED

As a minimum, the required equipment and associated forms may be required:

Sampling Equipment	Forms
120 ml. plastic sample bottles	Field logbook
Stainless steel scraper	Chain-of-Custody
Health and Safety Equip. see attached H/S Plan	Request-for-Analysis
Glass sample bottles	Sample Labels
	FEMP Work Permit
	Rad. Work Permit

7.1 DECONTAMINATION OF EQUIPMENT

All Equipment used will be decontaminated as per procedure EM-CS-001 "ENVIRONMENTAL MONITORING ON-SITE MEDIA SAMPLING."

8.0 METHODOLOGY OF EXTRACTION

EM-SMS shall perform soil sampling activities in a manner consistent with the following method of sample extraction: EM-EXM-90-001, Revision 2, "ENVIRONMENTAL MEDIA EXTRACTION METHODOLOGY FOR USING A STAINLESS STEEL AUGER AND A STAINLESS STEEL SCOOP". EM-EXM-90-001 shall be reviewed and signed by EM-SMS personnel assigned to perform sampling activities for this project. A copy of this document will be retained in a three-ring binder, which shall be in possession of the EM-SMS field personnel during sampling operations. If EM-EXM-90-001 does not allow for adequate sample extraction, then the EM-SMS Lead Technician will determine the equipment or methodology to complete the sampling task. The type of equipment selected and a brief synopsis of the sample extraction methodology using said equipment will be noted in the permanent field logbook applicable to this project.

9.0 HEALTH AND SAFETY

The work to be performed and outlined in this sampling plan will be accomplished in accordance with the site specific Health and Safety Plan developed for Environmental Monitoring (EM) / Site Media Sampling (SMS). As a minimum all SMS technicians while working in the FEMP process area are required to wear level D protective clothing.

SMS technicians will conform to all precautionary surveys performed by the FEMP employees representing site Safety, Industrial Hygiene, and Health Physics. Concurrence to all applicable safety permits (indicated by signature of the SMS technicians assigned to the perspective project) is expected by SMS technicians in the performance of their assigned duties.

The SMS Senior technician and responsible sampling team lead will insure that all EM technicians performing sampling related to any project has read and understands all applicable surveys that protect worker safety and health. EM technicians who do not sign the applicable health and safety survey forms will not participate in the execution of sampling activities related to the completion of assigned project responsibilities. A copy of all applicable safety surveys issued for worker safety and health shall be stored for easy reference in the applicable project files maintained by **ENVIRONMENTAL MONITORING.**

10.0 DEPARTMENT OF TRANSPORTATION (DOT) PACKAGING, MARKING/LABELING REQUIREMENTS

As specified in 49 CFR 173.421, DOT criteria will be evaluated to determine the appropriate DOT packaging/marking/labeling requirements.

ATTACHMENT F

SAMPLING SCHEME

Data Entry

Sampling Plan Number: SMS-92-211

Length of Area to be sampled (ft): 210

Width of Area to be sampled (ft): 410

Are the above values correct? (Y or N) Y

Calculate grid intervals or Manually insert? (C,M) M

Number of vertical grids: 21

Number of horizontal grids: 41

Are the above values correct? Y
Number of Vertical Grids = 21
Number of Horizontal Grids = 41
Total Number of Grids = 861

Sampling Plan # SMS-92-211

Data Entry

Sampling Plan Number: SMS-92-211-AMENDMENT

Length of Area to be sampled (ft): 210

Width of Area to be sampled (ft): 410

Are the above values correct? (Y or N) Y

Calculate grid intervals or Manually insert? (C,M) M

Number of vertical grids: 21

Number of horizontal grids: 41

Are the above values correct? Y
Number of Vertical Grids = 21
Number of Horizontal Grids = 41
Total Number of Grids = 861

Sampling Plan # SMS-92-211-AMENDMENT

RANDOM SAMPLE POINT GENERATION

Would you like to Calculate the number of sample points (N) from preliminary data or Dictate N? (C,D) D
Number of sample points = 40

Randomizing. 562 778 615 717 654 475 212 317 283 682 . 216 132 26
681 409 204 647 709 424 . 537 746 45 404 227 730 168 . 91 24 739
721 226 437 649 60 194 . 710 788 567 107 495

The following screen will display a sampling grid with the randomized sampling points plotted. The length and width of each grid is the calculated grid interval.

Sampling Plan # SMS-92-211

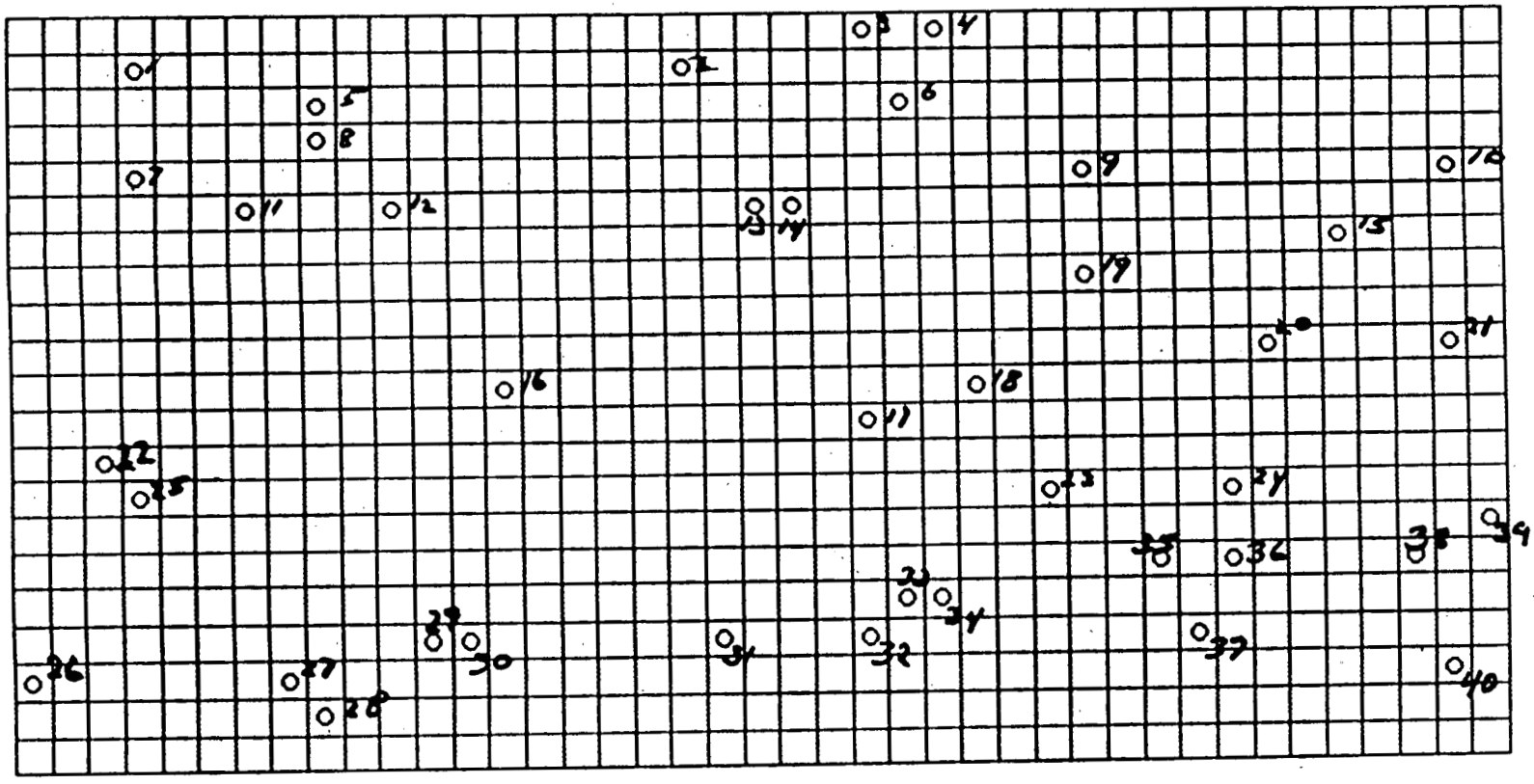
RANDOM SAMPLE POINT GENERATION

Would you like to Calculate the number of sample points (N) from preliminary data or Dictate N? (C,D) D
Number of sample points = 2

Randomizing. 375 753

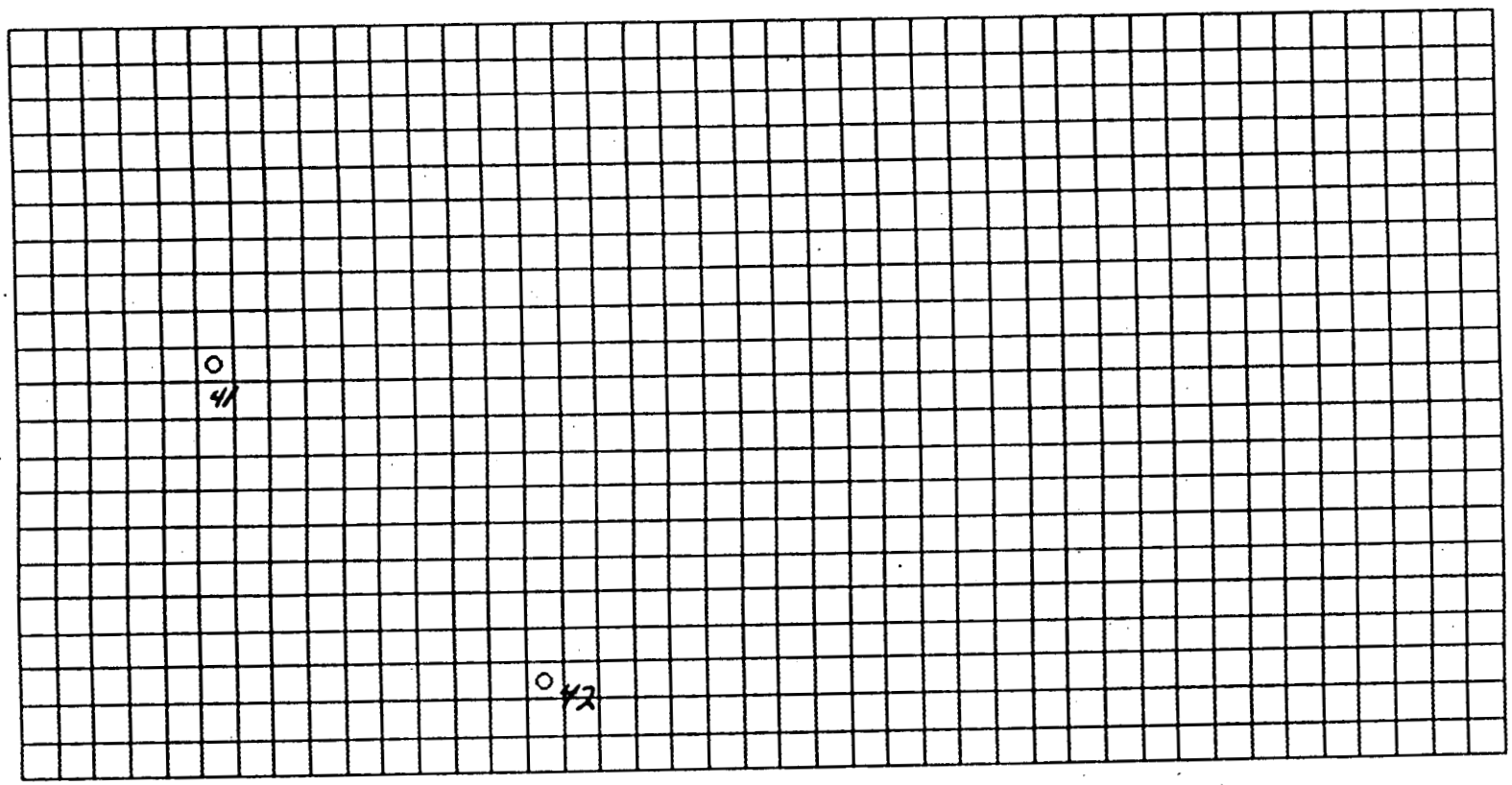
The following screen will display a sampling grid with the randomized sampling points plotted. The length and width of each grid is the calculated grid interval.

Sampling Plan # SMS-92-211-AMENDMENT



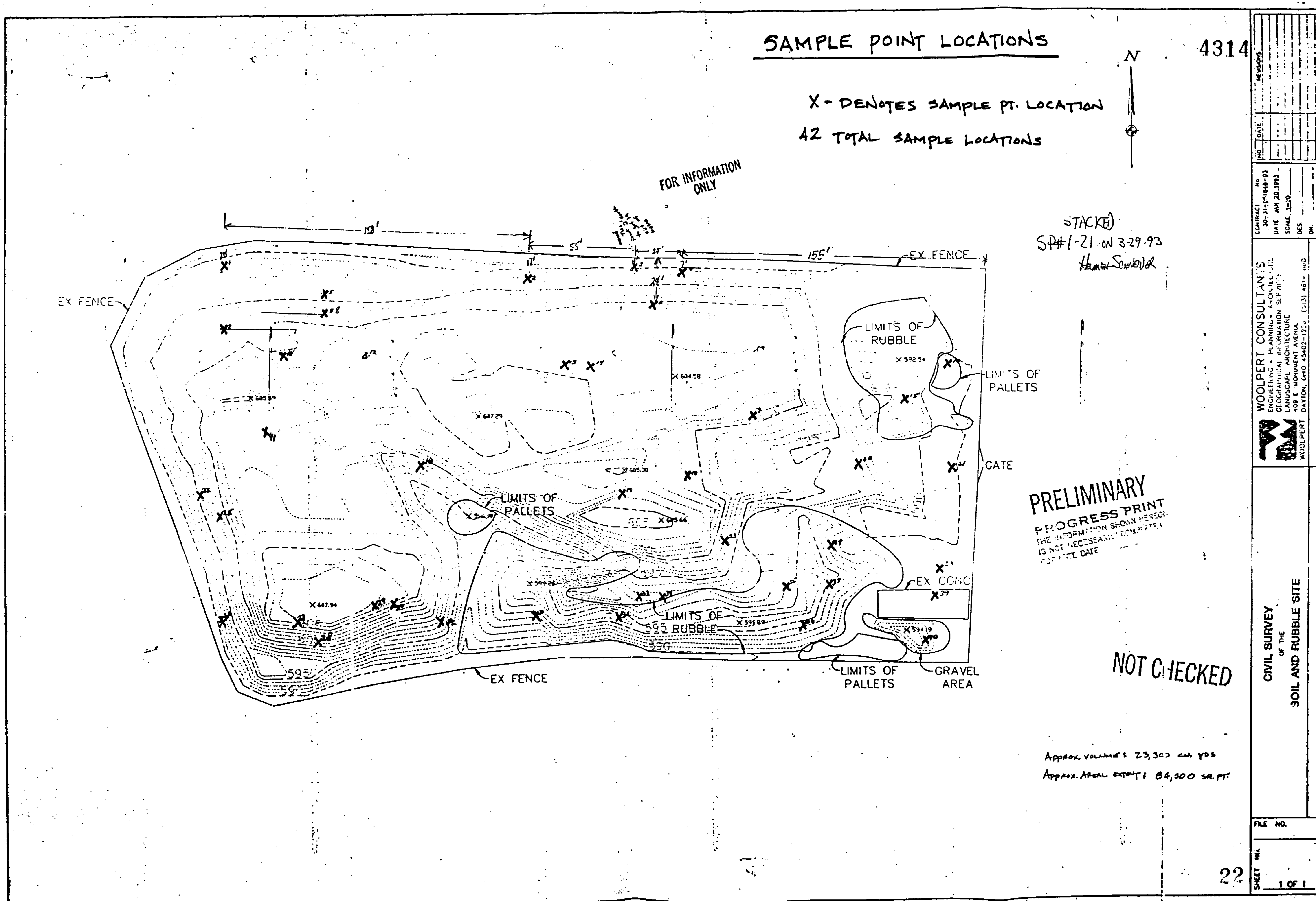
Sampling Plan # SMS-92-211

* The grid dimensions are 10 foot squares
** For sample point locations see plotted drawing
These points are super-imposed on the plotted drwg.



* The grid dimensions are 10 foot squares
** For sample point locations see plotted drawing
These points are super-imposed on plotted drwg.

Sampling Plan # SMS-92-211-AMENDMENT


SAMPLE POINT LOCATIONS
4314
X - DENOTES SAMPLE PT. LOCATION
42 TOTAL SAMPLE LOCATIONS
N
FOR INFORMATION ONLY
STACKED SP#1-21 ON 3-29-93
155'
55'
EX FENCE
LIMITS OF RUBBLE
LIMITS OF PALLETS
GATE
EX CONC
GRAVEL AREA
PRELIMINARY
PROGRESS PRINT
NOT CHECKED
Approx. volume: 23,300 cu. yds
Approx. Areal extent: 84,000 sq. ft.
WOOLPERT CONSULTANTS
LANDSCAPE ARCHITECTURE
409 E. MONUMENT AVENUE
WOOLPERT
APPROVED BY:
CONTRACT No.
DATE
SCALE
DES.
DR.
CKD.
NO
DATE
REVISIONS
CIVIL SURVEY OF THE SOIL AND RUBBLE SITE
FILE NO.
SHEET NO. 1 OF 1
22

ATTACHMENT H

ANALYTICAL DATA

REMOVAL SITE EVALUATION
STOCKPILE FOR EXCAVATION/DEMOLITION SOILS & RUBBLE - NORTH OF PLANT 1 PAD

EVALUATION OF THE MAGNITUDE OF THE POTENTIAL THREAT (con't)

The following table presents the data for total uranium analytical results of soil samples collected at the stockpile location. Attached figures 1 & 2 further identify sample locations.

Total Uranium in Stockpile for Excavation/Demolition Soils & Rubble
North of Plant 1 Pad

East Pile			West Pile		
Sample No.	Uranium Concentration (ppm)	Thorium Concentration (ppm)	Sample No.	Uranium Concentration (ppm)	Thorium Concentration (ppm)
2E-3	91	<23	1W-2	53	<23
4E-4	33	<23	5W-5	72	23
6E-5	60	27	7W-9	48	<23
8E-9	96	<23	9W-4	113	<23
10E-13	<11	<23	11W-4	42	<23
12E-9	169	37	13W-6	42	<23
14E-13	51	<23	5W-4	53	<23
15E-12	50	<23	17W-20	70	<23
16E-12	941	39	19W-16	36	24
17E-6	119	38	20W-20	52	<23
18E-4	29	33			
19E-20	241	<23			
20E-13	130	<23			

U mean = 155 ppm
std. dev. = 244 ppm

U mean = 58 ppm
std. dev. = 22 ppm

Sample technique - Vibra-Corer, 20' long x 4" diameter lexan tube.
- Continuous sampler.
- Random discrete sampling.