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RESIDUE SAMPLING FOR K-65 SILOS SAMPLING AND ANALYSIS PLAN U.S. DEPARTMENT OF ENERGY FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO MAY 28, 1991

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REPORT

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RESIDUE SAMPLING FOR

K-65 SILOS SAMPLING AND ANALYSIS PLAN

U.S. DEPARTMENT OF ENERGY

FEED MATERIALS PRODUCTION CENTER

FERNALD, OHIO

May 28, 1991

K-65 SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

This plan provides for the sampling and analysis of materials contained in two concrete silos (Silos 1 and 2) located in the Waste Storage Area at the U.S. Department of Energy (DOE) Feed Materials Production Center (FMPC). These storage silos have been used to store waste raffinate slurries (K-65 residues). Previous sampling studies conducted on the K-65 residues in Silos 1 and 2 have produced variable results, indicating that the residues are not homogeneous. Because of the variability in the analytical results from previous studies and the partial recoveries from the 1989 sampling effort, the available data are not complete enough to adequately characterize the K-65 residues for purposes of evaluating remedial actions. Therefore, resampling, as described in this plan, is required.

This document is an addendum to the FMPC RI/FS Work Plan. Unless different methods have been approved by virtue of being incorporated in this addendum, all work and documentation associated with the K-65 Silos Sampling and Analysis effort is to be performed in accordance with the FMPC Quality Assurance Project Plan (QAPP), Volume 5 of the FMPC RI/FS Task 2 Report Work Plan Requirements documents.

Approval, distribution, control and revision of this addendum are to be in accordance with Sections 15.1, 15.2, 15.3 and 15.4 of the FMPC QAPP. Changes to this appendix must be approved before the changes are implemented, in accordance with Section 15 of the QAPP.

1.1 BACKGROUND

As a part of the Operable Unit 4 (OU 4) Remedial Investigation (RI) the contents of the K-65 silos were sampled in 1989.

The sampling of the silos was only partially successful because of the inability to recover continuous sample cores. Even though an average of 20 feet of penetration of the material was achieved, there was no sample recovery in three locations. One sample contained 12.5 feet of core (66 percent core recovery): eight sample cores were less than 1.5 feet (4 to 9 percent recovery); and four cores ranged from 3.25 to 4.25 feet (18 to 30 percent recovery). Figure 1-1 provides a summary of the core recovery results of the 1989 sampling effort.

The following summarizes additional information on Silos 1 and 2 from various sources including the RI Report for OU 4.

<u>Construction</u>: 6

The silos were constructed in 1951 and 1952. They are of cylindrical concrete construction, 80 feet in diameter and approximately 36 feet high. The silo domes had an

FIGURE 1-1

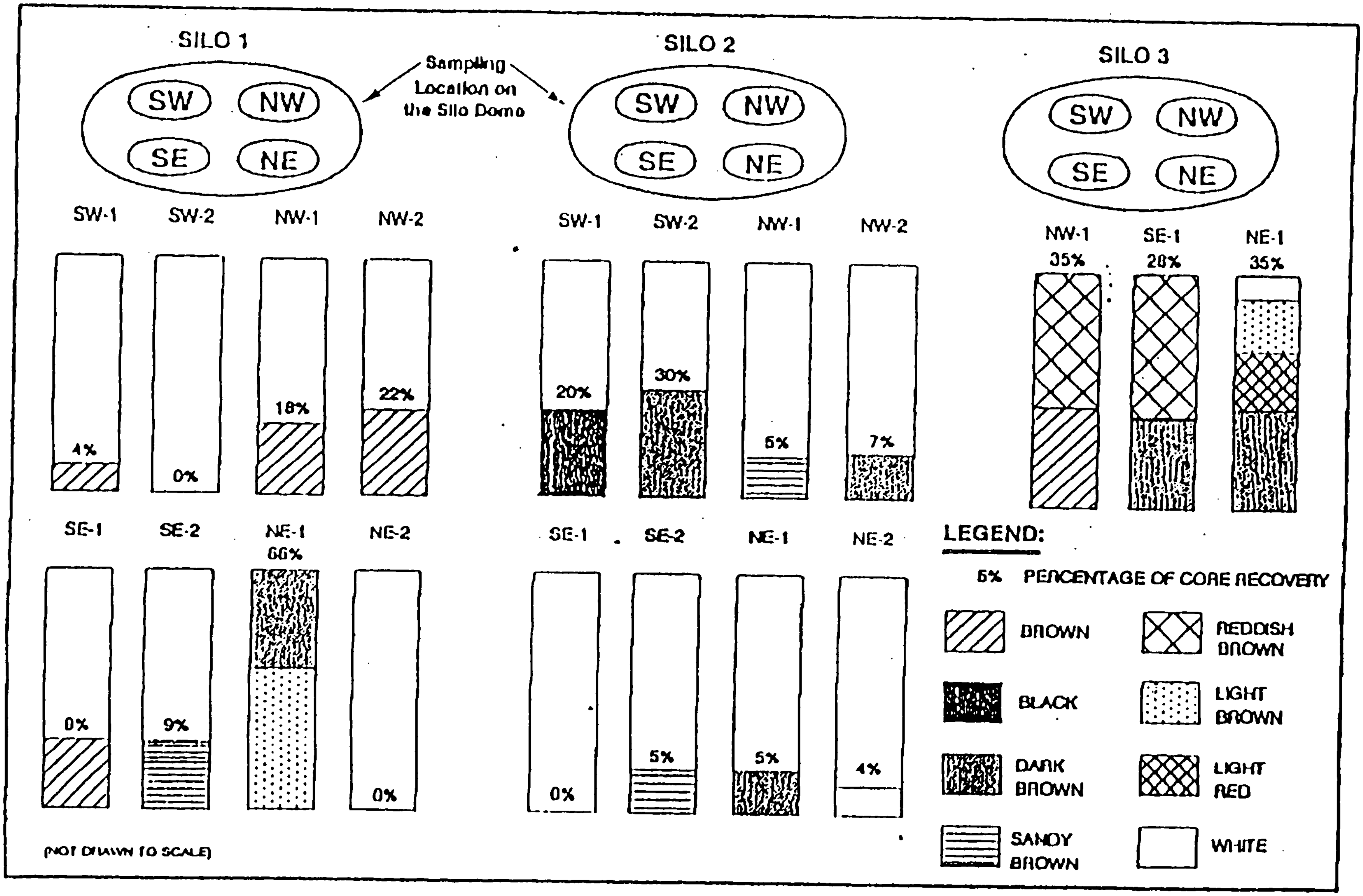

FIGURE 1-1 K-65 AND METAL OXIDES SILOS SAMPLING RESULTS

original design thickness of 4 inches at the center and this thickness tapered to 8 inches at the dome wall edge.

Radionuclide Analysis:

Historic analyses of the K-65 silo residues indicated that approximately 11,200 kilograms of uranium (0.71 percent U-235) is present in the residues (Grumski 1987; ASI/IT 1988). Analytical results of residue samples taken in July 1988 (Gill 1988) indicated that the uranium concentration was 1400 parts per million (ppm) in Silo 1 and 1800 ppm in Silo 2. In addition, approximately 1.6 to 3.7 kilograms of radium were estimated to be in the K-65 Silo residues (Grumski 1987; Litz 1974). Data from these previous studies are summarized in Tables 1-1 and 1-2.

Radiological data from the 1989 sampling effort for Silos 1 and 2 are presented in Table 1-3. The concentration of Ra-226 in Silo 1 ranges from 89,280 pCi/g to 192,600 pCi/g; in Silo 2 it ranges from 657 to 145,300 pCi/g. Th-230 concentrations in Silo 1 range from 10,569 to 43,771 pCi/g; 8365 to 40,124 pCi/g in Silo 2. The concentrations of Pb-210 in Silo 1 range from 48,980 to 181,100 pCi/g; and they range from 77,940 to 399,200 pCi/g in Silo 2. Total uranium concentrations in Silo 1 range from 1189 to 2753 ppm and they range from 137 to 3717 ppm in Silo 2.

Chemical Analysis

Chemically, the K-65 residue material within Silo 1 and 2 are mixtures of hydroxides, carbonates, and sulfates. Approximately 40 to 60 percent of the residue material is silicates (SiO_2); carbonates and sulfates comprise approximately 20 percent. The primary form of uranium contained in the residue material is sodium uranyl carbonate (Dettorre et al., 1981). Other elements contributing at least 1 percent to the total are calcium, iron, magnesium, and lead. Table 1-2 presents a summary of the elemental, nonradioactive constituents of the silos.

Samples obtained during the 1989 sampling effort were analyzed for HSL inorganics and organics. A summary of the analytical datA for inorganic and organic constituents is provided in Tables 1-4 and 1-5. Complete analytical results are provided in Appendix B of the OU 4 RI Report. The results of the HSL inorganic analyses show that the principal inorganic constituents in Silos 1 and 2 are barium, calcium, iron, lead and magnesium. PCBs (Aroclor 1248 and 1254) were detected in samples collected from the K-65 silos with concentrations ranging from 1700 to 12,000 parts per billion (ppb) and 1900 to 3900 ppb, respectively.

Geotechnical Analysis 8

Silos 1 and 2 contain waste raffinate slurries that were decanted by means of baffles and weirs placed along the height of the silo wall. Over the years the waste slurries have settled to form a wet muddy-looking material that is a mixture of clay and silty sand

TABLE 1-1

CHARACTERISTICS OF THE K-65 RESIDUES STORED AT THE FMPC

	Silos 1 and 2				Silo 3
Characteristic	Vitro (1952)	Litz[a] (1974)	NLO[a] (1980)	Gill (1988)	DOE (1987)
Physical					
Dry weight (kg)	1.59×10^6	--	8.79×10^6	--	--
Volume (m^3)	3,155	--	5,522	--	3,902
Density (kg/m^3)	1,179	--	--	--	--
Water content (%)	30	--	--	--	--
Radiological	(ppm)	(ppm)	(ppm)	(ppm)	(kg)
Radium	0.3	0.28-0.36	0.2	0.13-0.21	0.015[b]
Uranium	2,110	1,800-3,200	600	1,400-1,800	18,000
Total thorium	--	--	--	301-322	--
Chemical					
Carbonates + Sulfates (%)	20				
Quartz (%)	25				
Muscovite clay (%)	60				

[a]As reported by Dettore et al., 1981.
[b]Assumes all radium in K-65 residues is Ra-226 with specific activity of 0.988 Ci/g.
Note: Data validation is currently in progress.

NONRADIOLOGICAL CONSTITUENTS OF WASTE STORAGE SILO CONTENTS

Silos 1 and 2						
Constituents	Silos 1 & 2 Vitro (1952) (ppm)	Silos 1 & 2 Litz (1974) (ppm)	Silos 1 & 2 NLO (1980) (ppm)	Silos 1 & 2 Grumski (1987) (% wt)	Silos 1 & 2 Gill (1988) (% wt)	
Aluminum				0.875	3.7	2.6
Antimony				ND	<0.1	ND
Arsenic				0.03		
Barium	45,300	60,000		0.07	2.0	2.1
Boron				0.015		2.1
Cadmium				ND		
Calcium				3.89	4.0	13.2
Chlorine						
Chromium				0.012	ND	0.4
Cobalt		1,600-2,000	1,500-2,000	0.175	0.6	1.1
Copper		600-800	400-600	0.50	0.2	0.4
Fluorene						
Gold		65-70	<40-60	<0.005		
Iron		13-18,000		1.2	8.3	9.8
Lanthanum				0.089	0.2	0.1
Lead	94,900	60-70,000	48-52,000	5.1	7.5	10.3
Magnesium				1.25		
Manganese				0.02		
Mercury						
Molybdenum				0.02	0.4	<0.1
Nickel		3,500-3,700	2,000-3,000	0.225	1.0	1.8
Palladium		13-18				
Platinum		0.9-1.4				
Potassium						
Selenium						
Silver		18	20	0.002		
Sodium				0.7		
Strontium						
Tin				0.008		
Titanium				0.07		
Vanadium				0.021		
Zinc				ND	<0.1	<0.1
Zirconium				0.02	0.1	0.2
PO_4				ND		
SiO_2				40.76	68.9	55.1
SO_4						

ND = Not Detected.

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TABLE 1-3

RADIONUCLIDE CONCENTRATION IN THE SILOS
(1989 Sampling Program)

SILO 1

Nuclide (pCi/g)	S1NE1A	S1NE1B	S1NE1C	S1SE1	S1SE2	S1SW1	S1NW1
Th-228	ND	ND	ND	ND	ND	ND	ND
Th-230	21,412	39,693	30,751	10,569	20,848	40,818	43,771
Th-232	ND	ND	ND	ND	ND	ND	766
Ra-226	108,100	192,600	166,400	116,800	89,280	181,200	163,300
Ra-228	ND	ND	ND	ND	ND	ND	ND
Pb-210	181,100	83,110	77,460	71,920	48,980	69,480	54,350
U-234	815	326	622	663	814	594	897
U-235/236	ND	ND	ND	ND	56	ND	50
U-238	920	398	610	545	758	532	687
U-Total (ppm)	2753	1189	1831	1633	2280	1602	2066

SILO 2

Nuclide (pCi/g)	S2SW1	S2NW1	S2NE2	S2SW2	S2NE1	S2NW2
Th-228	ND	ND	ND	411	ND	638
Th-230	31,825	32,784	8365	29,716	40,124	25,391
Th-232	ND	ND	ND	851	ND	ND
Ra-226	145,300	61,780	657	104,900	65,520	68,310
Ra-228	ND	ND	ND	ND	ND	ND
Pb-210	141,900	145,200	87,930	77,940	150,700	39,200
U-234	859	1107	974	121	848	1404
U-235/236	ND	74	47	ND	36	70
U-238	661	1069	874	46	814	1240
U-Total (ppm)	1972	3210	2620	137	2437	3717

ND = Not Detected
Note: Data validation is currently in progress.

TABLE 1-4

INORGANICS CONCENTRATION IN THE SILOS
(1989 Sampling Program)

Contaminant (ppm)	Silo 1	Silo 2
Aluminum	60.4 - 1430	464 - 2570
Antimony	ND	ND - 7.2
Arsenic	14.7 - 68.4	57.5 - 1960
Barium	1970 - 7860	89.2 - 8370
Beryllium	0.88 - 2.8	0.66 - 6.0
Cadmium	2.1 - 8.0	3.4 - 19.1
Calcium	2150 - 5700	2430 - 301000
Chromium	21.0 - 165	12.9 - 68.8
Cobalt	349 - 1260	6.2 - 2430
Copper	122 - 473	ND - 1790
Iron	4340 - 75100	4010 - 37800
Lead	35800 - 85100	153 - 29800
Magnesium	1500 - 6020	1520 - 8740
Manganese	33.5 - 257	74.2 - 403
Mercury	0.23 - 2.8	ND - 2.3
Nickel	629 - 2580	14.6 - 2200
Potassium	158 - 492	37.8 - 289
Selenium	106 - 180	ND - 118
Silver	5.0 - 23.3	ND - 22.8
Sodium	360 - 13100	226 - 4070
Thallium	ND - 0.52	ND - 1.4
Vanadium	72.2 - 240	21.9 - 214
Zinc	14.4 - 212	11.2 - 154
Cyanide	0.52 - 4.4	ND - 4.5

ND = Not Detected
Note: Data validation is currently in progress

TABLE 1-5

ORGANICS CONCENTRATIONS IN THE SILOS
(1989 Sampling Program)

CONTAMINANT	Silo 1	Silo 2
VOLATILE ORGANICS ANALYSIS DATA (ppb)		
Methylene Chloride	840 - 4100	1100 - 6300
Acetone	140 - 5300	ND - 1600
Chloroform	480 - 1500	660 - 1300
2-Butanone	7100 - 21000	7800 - 15000
4-Methyl-2-Pentanone	ND - 1400	ND - 2700
Toluene	ND - 430	ND - 250
Chloromethane	ND	ND
Styrene	ND - 350	ND - 200
Total Xylenes	ND	ND - 200
SEMIVOLATILE ORGANICS ANALYSIS DATA (ppb)		
Bis(2-Ethylhexyl)Phthalate	93 - 6000	ND - 560
Di-n-Octyl Phthalate	ND - 820	ND
PESTICIDE ORGANICS ANALYSIS DATA (ppb)		
Aroclor-1248	ND - 8000	ND
Aroclor-1254	1100 - 12000	420 - 6000

ND = Not Detected
Note: Data validation is currently in progress.

particles. During the 1989 sampling effort, this material was easily penetrated by the LEXAN sampling tube, which reached to the bottom of the silos. This indicated that the material might be in a sludge-like condition. Free liquid was occasionally observed during the course of the sampling.

Silo 1 contains material that is brown; Silo 2 contents vary in color from white to brown to black. Water content for the materials in both the silos is consistently high ranging from 21.8 to 73.5 percent. The specific gravity is between 2.59 and 3.37. Only two out of eight samples taken from the silos were plastic. Table 1-6 provides a summary of results from the geotechnical analyses.

EP Toxicity Testing

Extraction procedure (EP) toxicity was measured by using the EPA extraction procedure designed to simulate the leaching a waste could undergo if it is disposed in a landfill. After extraction, the extract from each sample was analyzed for the EP toxic metals. The results are summarized in Table 1-7. Lead was found to have leached from the Silos 1 and 2 residue samples in concentrations as high as 904 ppm and 714 ppm, respectively. These values are in excess of the maximum allowable concentration (MAC) specified under federal standards.

1.2 PURPOSE

The purpose of this K-65 Silos Sampling and Analysis Plan is to describe a statistically sound sampling and analysis approach to characterize the residue materials in Silos 1 and 2. The plan will:

- Prescribe an efficient and safe method for collecting samples from the K-65 Silos
- Specify analyses of the samples that will provide sufficient data to characterize the waste materials and evaluate final disposition options
- Specify methods to ensure protection of the public and the environment
- Specify controls to ensure the quality of the data resulting from laboratory analyses and physical tests, as well as controls to satisfy environmental protection requirements.

TABLE 1-6

GEOTECHNICAL ANALYTICAL RESULTS
(1989 Sampling Plan)

Sample ID	Color	Water Content (%)	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index	200 Sieve (Percent Finer)
S1-NE-1A	Dark Brown	50.7	3.19	55.2	50.0	5.2	72.7
S1-NE-1C	Light Brown	71.5	2.74	70.3	66.6	3.7	71.5
S1-SE-2T	Sandy Brown	31.9	3.37	NP	NP	NP	43.9
S1-Compos.	NA	22.8	2.58	NP	NP	NP	54.5
S2-NW-1A	Brown	25.9	2.87	NP	NP	NP	39.8
S2-NE-2BT	White	21.8	2.59	NP	NP	NP	51.9
S2-SW-1A	Black	73.5	3.11	NP	NP	NP	63.3
S2-Compo	NA	34.2	2.78	NP	NP	NP	38.1
S3-NW-1A	Reddish Brown	7.4	2.35	NP	NP	NP	93.2
S3-NW-1C	Brown	3.7	2.08	NP	NP	NP	93.9
S3-SE-1A	Reddish Brown	10.2	2.58	NP	NP	NP	90.0
S3-SE-1C	Dark Brown	6.3	2.29	NP	NP	NP	92.9
S3-Compo	NA	3.8	2.75	NP	NP	NP	87.8

NA = Not Applicable
NP = Non Plastic
Note: Data validation is in progress

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TABLE 1-7

EP TOXIC METALS RANGE OF VALUES FOR K-65 SILOS

(1989 Sampling Program)

Analyte	Silo 1	Silo 2	Maximum Allowable Concentration
Arsenic (ppm)	ND - 0.484	0.163 - 0.592	5.0
Barium (ppm)	0.079 - 14.5	0.095 - 2.62	100
Cadmium (ppm)	ND - 0.100	0.017 - 0.278	1.0
Chromium (ppm)	0.020 - 0.964	ND - 1.02	5.0
Lead (ppm)	0.159 - 904	0.155 - 714	5.0
Selenium (ppm)	0.217 - 0.997	0.240 - 1.56	1.0
Silver (ppm)	ND - 0.121	ND - 0.213	5.0
Mercury (ppm)	ND	ND	0.2

ND = Not Detected
Note: Data validation is currently in progress.

1.3 SCOPE

The sampling, analysis, and testing of materials contained in the K-65 Silos are required to obtain accurate chemical, radiological, and physical characteristics to support the assessment of alternatives for final disposition of the material. To accomplish this objective, this plan provides for furnishing of all necessary facilities, labor, technical and professional services, supervision, equipment, materials, and supplies for conducting the sampling, analysis, and testing tasks.

This K-65 Silos Sampling and Analysis Plan describes the technical approach to be used for completing the required tasks. Detailed procedures for conducting the tasks are contained in Appendix A. A list of these procedures is provided in Table 1-8. Detailed Work Procedure (DWP-001), "Silo Sampling" provides a sequential overview of the sampling and analysis procedural requirements. Appendix B contains the Site-Specific Health and Safety Plan and the Training Plan. Plan-001, "Site-Specific Health and Safety Plan", will describe applicable policies, requirements and procedures to ensure the health and safety of the workers and protection of the environment. Appendix C contains sample collection and chain-of-custody procedures.

2.0 SAMPLING RATIONALE

The objective of the silo sampling program is to adequately characterize the radiological, chemical, and physical composition of the contents in K-65 Silos One and Two. While the parameters stated above are the goal of the sampling program, changes in sampling techniques used for silo core recovery differ from previous Sampling and Analysis Plans. These new sampling techniques have been successful, where previous techniques have not. Because of these technique changes, the number of sample cores shall be reduced by one per silo. This shall assist in conducting the sampling program phase and remedial efforts in a more efficient and timely manner.

2.1 <u>Statistical Basis for Sampling Strategy</u>

To establish the statistical basis for determination of the sample size, method SW-846 was used, the statistical method recommended by the U.S. Environmental Protection Agency (EPA). A requirement for the effective use of SW-846 in establishing an appropriate sample size is a prior estimation of the mean and standard deviation of the population to be sampled. Further, because the assumed mean must be compared to the regulatory threshold (RT) for use in the equation, any available data for use in approximating the mean must be consistent with the basis of the regulatory threshold. In the case of SW-846, this implies measured concentrations in an aqueous solution generated from EPA-approved extraction procedures. The 1989 sampling results, which provided leachate of known quality, were used to determine the sample size per method SW-846.

TABLE 1-8

DETAILED WORK PROCEDURES FOR K-65 SILOS SAMPLING

DWP-001	K-65 SILOS SAMPLING PROCEDURE
DWP-002	SAMPLE CORE HANDLING PROCEDURE
DWP-003	BREATHING AIR SYSTEM PROCEDURE
DWP-005	RADON MONITORING AND SAMPLING CHECKLIST FOR K-65 SILOS
DWP-006	SET-UP AND POSITIONING OF CRANE PROCEDURE
DWP-007	K-65 SILO SAFETY NET APPLICATION

2.2 Recommended Number of Samples

The spatial variability of the silo contents must consider both horizontal and vertical variability. The known disposal history would indicate that the K-65 residues are homogenous in the horizontal direction and non-homogeneous in the vertical direction. Material variability in the vertical direction is most directly related to changes in the disposed material over time.

An underlying assumption in the statistical analysis to determine sample size is that the expected mean concentration of each parameter is equal to 50 percent of the RT. Based on the assumption that the RT is twice the mean concentration, the recommended number of samples per SW-846 would increase as the mean concentration approaches the RT and decrease as the mean concentration moves away from the RT. Probability dictates that any RT is more likely to fall outside of the narrow range between the observed mean and the RT. Consequently, the difference between the actual mean and the RT will be much greater than the value used in the current calculations, resulting in a lower number of samples to be collected than estimated here.

Tables 2-1, 2-2, and 2-3 summarize the results of the analyses of the number of samples to be collected using the 1989 data and SW-846 methodology. In all cases except three, the recommended number of samples is less than four. The exceptions involve arsenic, calcium, and copper in Silo 2. The large number for arsenic is primarily due to the one high reading (1960) in sample S2NE1. Calcium concentrations span three orders of magnitude; however, because this parameter is not likely to drive the remedial effort, there seems little reason to use the recommended number of samples calculated for this parameter as the minimum number that should be collected for all parameters. The higher than average number of samples for copper is attributed to two factors: a high reading in S2NE1 (1970) and the substitution of the value zero for the ND reading in sample S2NE2. A more appropriate value to use would have been one-half the detection limit. Use of this value would have resulted in a lower number of recommended samples.

It has been determined, that the most successful technique for recovering the silo material is to segregate each complete sample core into one-third sampling attempts. This may cause an additional time delay of up to two weeks per sample core per manway at up to three times the additional time and materials cost. Based on this knowledge and the minimum requirements for the SW-846 statistical analysis, three sample cores shall be drawn from each silo for analysis and archiving. Eight samples will be drawn from two cores from each silo for a total of 16 samples. Figures 2-1, and 2-2 show the core sectioning and sampling scheme for the sampling program.

TABLE 2-1

Determination of Number of Samples (Radionuclides) Method SW-846

SILO 1

Nuclide (pCi/g)	S1NE1A	S1NE1B	S1NE1C	S1SE1	S1SE2	S1SW1	S1NW1	MEAN	STD	EST NMBR OF SAMPLES
Th-230	21412	39693	30751	10569	20848	40818	43771	29694.6	12487.4	0.4
Ra-226	108100	192600	166400	116800	89280	181200	163300	145382.9	40061.6	0.2
Pb-210	181100	83110	77460	71920	48980	69480	54350	83771.4	44598.0	0.6
U-234	815	326	622	663	814	594	897	675.9	191.3	0.2
U-238	920	398	610	545	758	532	687	635.7	170.6	0.1
U-Total*	2753	1189	1831	1633	2280	1602	2066	1907.7	511.5	0.1

SILO 2

Nuclide (pCi/g)	S2SW1	S2NW1	S2NE2	S2SW2	S2NE1	S2NW2	MEAN	STD	EST NMBR OF SAMPLES
Th-230	31825	32874	8365	29716	40124	25391	28049.2	10776.3	0.3
Ra-226	145300	61780	657	104900	65520	68310	74411.2	48312.1	0.9
Pb-210	141900	145200	87930	77940	150700	399200	167145.0	117874.0	1.1
U-234	859	1107	974	121	848	1404	885.5	427.2	0.5
U-238	661	1069	874	46	814	1240	784.0	414.2	0.6
U-Total*	1972	3210	2620	137	2437	3717	2348.8	1243.3	0.6

* ppm

NOTES:

S1SW1 - The first penetration of the southwest manway of Silo 1

S2NW2 - The second penetration of the northwest manway of Silo 2

TABLE 2-2

Determination of Number of Samples (Silo 1 Inorganics) Method SW-846

SILO 1

Inorganic (mg/kg)	S1NE1A	S1NE1B	S1NE1C	S1NW1	S1SE1	S1SE2	S1SW1	MEAN	STD	EST NMBR OF SAMPLES
Aluminum	1260	60.4	1380	450	364	1430	733	811.1	549.0	0.9
Arsenic	57	47.9	45.8	54.5	14.7	68.4	61	49.9	17.3	0.2
Barium	4340	1970	4140	5000	2720	2190	7860	4031.4	2043.8	0.5
Beryllium	2.8	1.3	1.4	1.1	0.88	2.4	1.3	1.6	0.7	0.4
Cadmium	4.4	2.3	2.9	2.1	3	8	2.7	3.6	2.1	0.7
Calcium	5580	2320	2150	4130	3500	5700	5410	4112.9	1516.4	0.3
Chromium	43.3	25.8	22.8	21	165	111	42.6	61.6	55.2	1.7
Cobalt	1260	404	1210	681	349	814	657	767.9	357.7	0.4
Copper	473	122	410	217	126	307	209	266.3	136.2	0.5
Iron	24100	9090	7170	4340	22600	75100	8370	21538.6	24856.7	2.8
Lead	35800	61400	85100	81300	38900	38800	76900	59742.9	21798.7	0.3
Magnesium	2770	3270	3620	1900	1500	6020	2830	3130.0	1472.0	0.5
Manganese	178	36.5	83.1	33.5	94.2	257	54	105.2	83.1	1.3
Mercury	2.8	0.47	0.72	0.43	0.23	0.6	0.56	0.8	0.9	2.3
Nickel	1970	815	2580	1180	629	1350	1140	1380.6	679.4	0.5
Potassium	158	347	424	350	173	293	492	319.6	122.9	0.3
Selenium	172	139	170	162	106	180	168	156.7	25.8	0.1
Silver	9.8	5	23.3	9.5	6.3	13.1	9.8	11.0	6.0	0.6
Sodium	360	5730	13100	7080	1640	2610	7010	5361.4	4322.9	1.3
Thallium	0.09	0.38	0	0.49	0.24	0	0.52	0.2	0.2	1.7
Vanadium	240	111	110	105	72.2	140	106	126.3	53.9	0.4
Zinc	212	14.4	26.3	24.7	23.9	57.3	17.8	53.8	71.2	3.6
Cyanide	0.52	1.4	1.4	2.9	0.99	1.6	4.4	1.9	1.3	1.0

1300

TABLE 2-3

Determination of Number of Samples (Silo 2 Inorganics) Method SW-846

SILO 2

Inorganic (mg/kg)	S2NE1	S2NE2	S2NW1	S2NW2	S2SW1	S2SW2	MEAN	STD	EST NMBR OF SAMPLES
Aluminum	2570	1360	1250	1180	464	551	1229.2	756.7	0.8
Arsenic	1960	330	71.3	57.5	81.4	64.5	427.5	758.1	6.9
Barium	2460	89.2	1190	3090	8370	8000	3866.5	3503.7	1.8
Beryllium	2	0.66	6	2.7	1.6	2.1	2.5	1.8	1.2
Cadmium	19.1	4.1	5.6	5	3.6	3.4	6.8	6.1	1.7
Calcium	41900	301000	10300	2430	3610	8570	61301.7	118328.1	8.1
Chromium	42.2	12.9	68.8	47.2	24.3	34.1	38.3	19.4	0.6
Cobalt	2430	6.2	648	543	692	602	820.2	827.6	2.2
Copper	1790	0	220	221	263	249	457.2	660.1	4.5
Iron	13500	4010	37800	26900	8330	11400	16990.0	12791.9	1.2
Lead	21600	153	15100	17600	28500	29800	18792.2	10823.8	0.7
Magnesium	7390	8740	4200	4220	1520	2060	4688.3	2867.7	0.8
Manganese	403	335	170	160	74.2	83.2	204.2	135.1	1.0
Mercury	1	2.3	1.7	0.37	0	0.34	1.0	0.9	1.9
Nickel	2200	14.6	878	787	1070	897	974.4	704.7	1.1
Potassium	207	37.8	271	192	118	289	185.8	94.8	0.6
Selenium	91.1	0	117	95.9	118	105	87.8	44.4	0.6
Silver	22.8	0	9.1	12	7.4	10.1	10.2	7.4	1.1
Sodium	4070	588	912	226	3100	857	1625.5	1567.4	2.0
Thallium	0.61	0	0.33	0.39	1.4	0.82	0.6	0.5	1.5
Vanadium	142	21.9	214	211	151	193	155.5	72.1	0.5
Zinc	154	11.2	31.6	70.8	25.8	25.7	53.2	53.3	2.2
Cyanide	1.1	0	4.5	0.9	2.5	1.6	1.8	1.6	1.7

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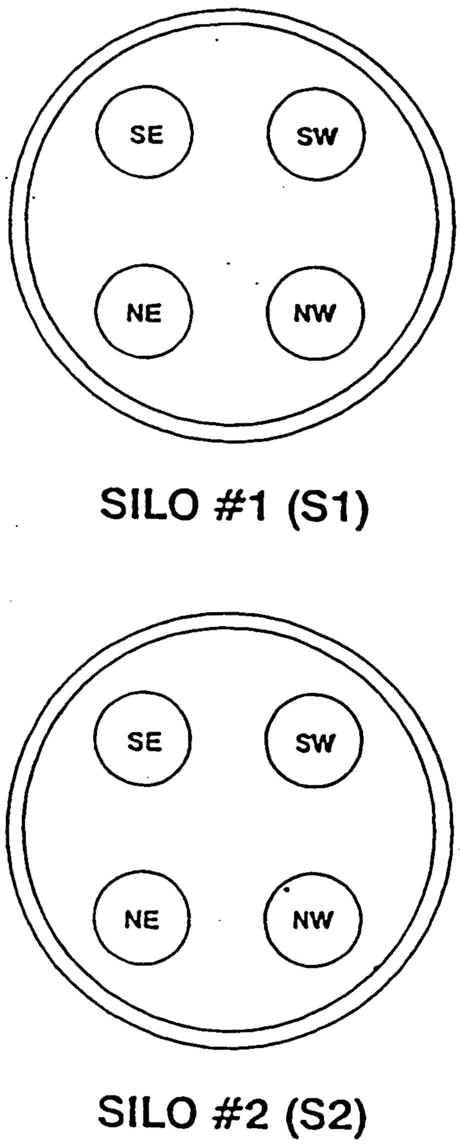

General sample nomenclature is as follows:

Silo Number - Manway I.D. - Zone I.D. - Section I.D.
Example: 2S1-SW-A-1 Indicates top section from Zone A of SW core taken from Silo #1 (Second Sampling Run)

FIGURE 2-1. IDENTIFICATION OF CORE SAMPLES

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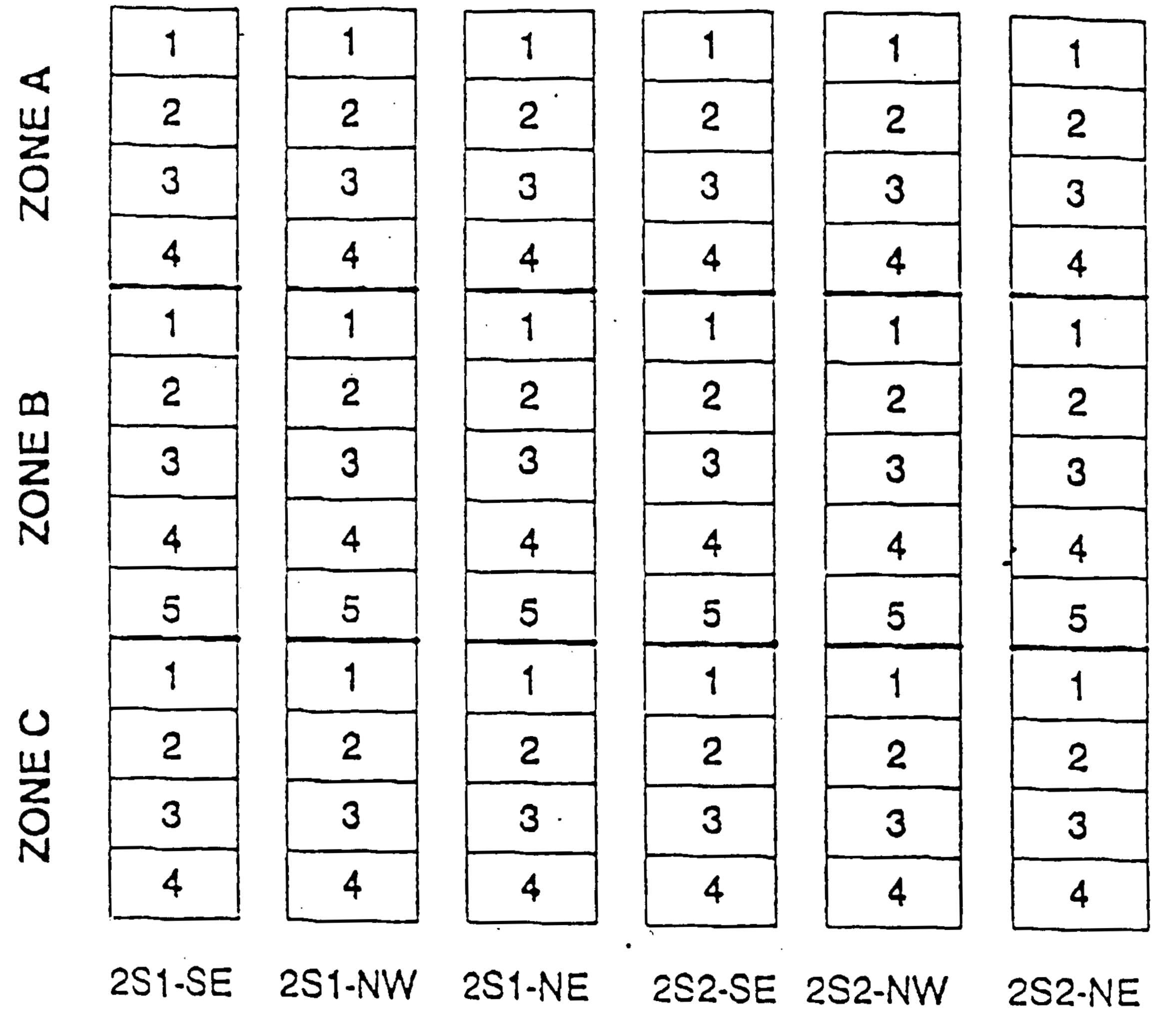

Sample core subsamples will be taken from all of the specified zones above. These zones will be determined by the one-third increment in which each manway is sampled. All sections will be 18 inches in length. A composite sample will be taken from each zone for such analytical tests as HSL inorganics, HSL organics, TCLP metals, TCLP organics, high rad, and radionuclides.

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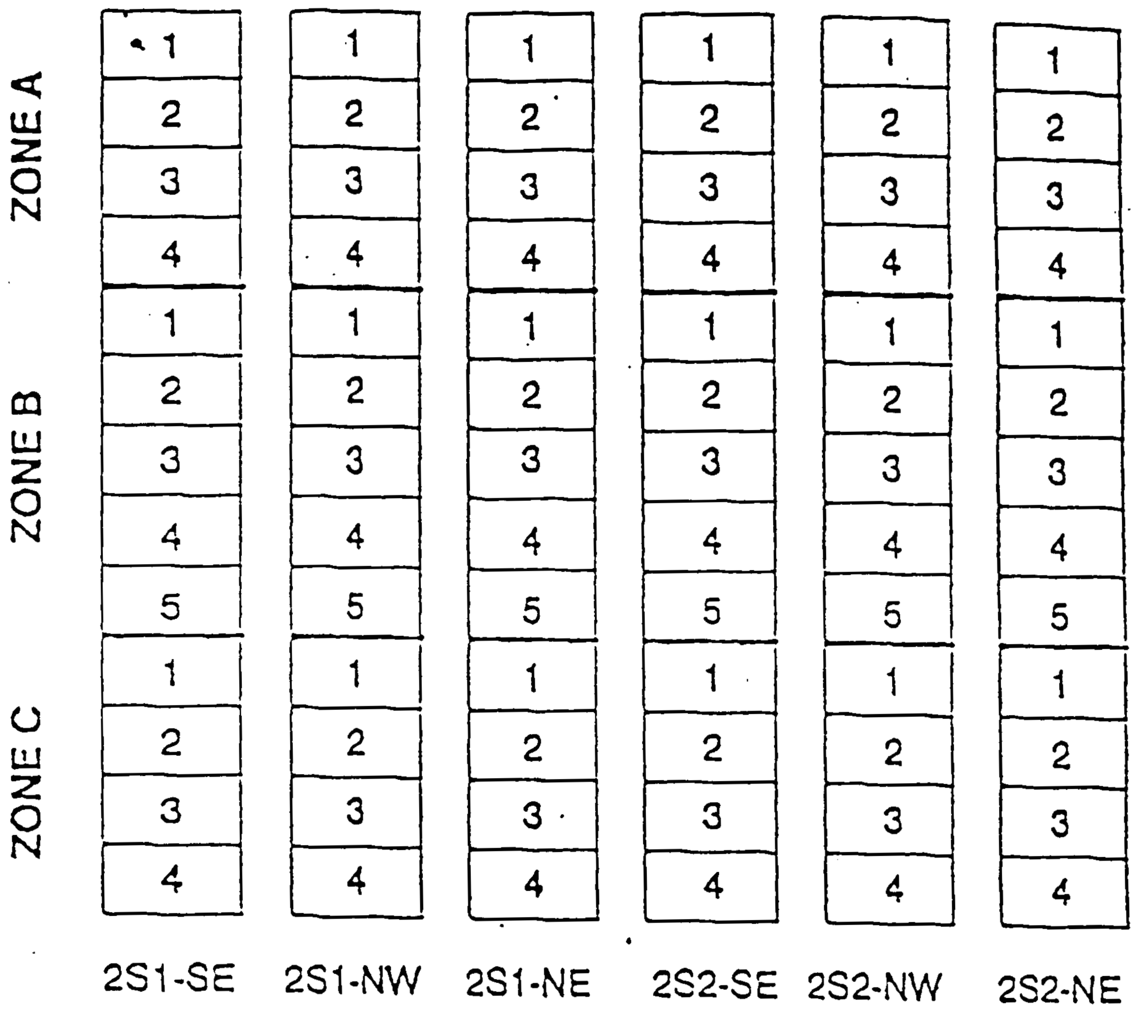
FIGURE 2-2. SECTIONING OF SE, NW, AND NE SAMPLE CORES



The SE, NW, and NE sample cores will be subsampled for engineering tests. Three composited samples from each silo will be made up of subsamples from the same horizontal layers found in each of the three specified cores (6 total). Criteria to select specific zones from each core for sampling will be based on the same zone criteria used in sectioning SE and NW cores less the radiologically most active zone criteria.

FIGURE 2-3. SUBSAMPLING OF SAMPLE CORES FOR ENGINEERING TESTS

At the direction of a geotechnical specialist, the core zones from the southeast and northwest manways will be subdivided into sections based on differences in observed physical characteristics. The reasoning is that those areas of material exhibiting distinctly different observable characteristics may represent areas with correspondingly different chemical and radiological characteristics. Plant process records indicate that the K-65 silos received material from different sources with varying physical characteristics.

Each zone will be sampled by compositing equal masses of material from sections within that zone. Each sample core will be removed from the silo in one-third increments, zones A, B, and C shall represent the one-third increments from top to bottom, respectively. In addition to the section samples, a sample will be taken from the section with the highest radiation reading based on a radiological scan in the examination trailer. This will provide a "worst case" condition from a radiological standpoint. One sample will be drawn from each core, a total of six samples for both silos.

No samples will be taken from the fourth core (southwest) from each silo because these cores are intended for long-term archiving.

It must be noted that the results of the visual characterization, field screening, or laboratory analyses could increase the number of vertical samples to be analyzed from a given core. The remaining sections of each core will be archived and can be retried for additional analyses, if deemed necessary. The need for additional vertical samples could be identified during the course of this sampling and analysis program, or could arise during future points in the remedial action process (e.g., to confirm a critical design assumption).

2.3 Recommended Number of Analyses

Sub-sampling from the three manways sampled from each silo will result in nine distinct samples from each silo, one sample set from each zone core. A total of 18 samples, therefore, will be collected from the two silos, along with 6 quality control samples which include 1 blind duplicate sample, 1 set of triplicate samples, 2 equipment rinsates, and 1 equipment rinsate blank. Handling of these samples is described in procedure DWP-002. Each sample will be analyzed for radiological parameters, Hazardous Substance List (HSL) inorganics, HSL organics plus tributlyphosphate (TBP), TCLP metals as defined in Section 3.7.1, and general chemistry parameters as requested for the treatability study as described in Table 3-2. TCLP organic analyses will be performed on those samples containing organic compounds as determined by the HSL organic analyses.

HSL Organic analytical preparation and PCB/Pesticide extractions shall be performed at WMCO facilities with IT Corporation assistance, for silo material samples with these analytical requirements. This will ensure that EPA protocol and CLP holding times will be met. After extractions have been completed, the HSL Organic and PCB/Pesticide samples will be sent to the ITAS Oak Ridge Radiological Laboratory for analysis. The remaining samples requiring HSL Inorganics and radiological parameters will be shipped to this laboratory at the end of the project.

Composite samples will be used where applicable for the physical testing program described in Section 3.7.2. Other physical testing described in Section 3.7.2 which requires an undisturbed sample will be acquired from a 5-inch section cut from the sample core for this purpose. The composite samples will be formed from individual samples taken from the same horizontal strata in each of the three sampled cores from a given silo. This compositing strategy will take advantage of the expected similarity of properties within each horizontal strata. Six composite samples are proposed, representing three horizontal layers in each of the K-65 Silos. The specific layers to be sampled will be those exhibiting the best combination of the following three properties: (1) present in all three cores at approximately the same depth; (2) relatively homogeneous within the layer but different from adjacent layers; and (3) of sufficient thickness to be of concern to the eventual evaluation of vertical heterogeneity. If no such layers are present, composite samples will be formed from comparable depths from the top, middle, and bottom of each core as determined by the visual characterization of the cores. If necessary to properly account for significant layering, more than three composite samples may be collected.

3.0 SAMPLING METHODOLOGY

Detailed operational procedures have been prepared for this sampling effort and are presented in Appendix A. These procedures have been written in a detailed step-wise fashion so that the K-65 Sampling Supervisor and sampling team members will have a clear understanding of the methodological approach. Included in the following sections are summaries of each major step in the sampling process: (1) Location Preparation, (2) Sampling Operations, (3) Sample Handling, (4) Decontamination Requirements, (5) Chain-of-Custody and Request for Analysis, (6) Sample Packaging and Shipping, and (7) Sample Analysis.

TABLE 2-4
CORE SECTIONS AND ANALYSES (RADIOLOGICAL AND CHEMICAL)

SAMPLE NO.	CORE SECTION SAMPLED	ANALYSIS REQUESTED
1	2S1-SE-A- 1. 2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
2	2S1-SE-B-1,2,3,4, & 5	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
3	2S1-SE-C- 1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
4	2S1-SE-R	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
5	2S1-NW-A- 1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
6	2S1-NW-B- 1,2,3,4,	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
7	2S1-NW-C-1,2,3,4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
8	S21-NW-D	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
9	2S1-NW-R	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
10	2S1-NE-A-1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
11	2S1-NE-B-1,2,3,4, & 5	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
12	2S1-NE-C-1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
13	2S1-NE-R	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
14	2S2-SE-A-1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
15	2S2-SE-B-1,2.3, 4 & 5	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
16	2S2-SE-C-1,2,3 & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
17	2S2-SE-R	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
18	2S2-NW-A-1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
19	2S2-NW-B-1,2,3,4,5	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
20	2S2-NW-C-1,2,3, & 4	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
21	2S2-NW-D	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
22	2S2-NW-R	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL

TABLE 2-4
CORE SECTIONS AND ANALYSES (RADIOLOGICAL AND CHEMICAL) (Continued)

23	2S2-NE-A-1,2,3, & 4	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
24	2S2-NE-B-1,2,3,4, & 5	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
25	2S2-NE-C-1,2,3, & 4	HSL INORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL
26	2S2-NE-R	HSL ORGANICS, HSL INORGANICS, TCLP ORGANICS, TCLP METALS, PCBs, PESTICIDES, RADIOLOGICAL

CORE SECTIONS AND ANALYSES (GEOTECHNICAL)

27	2S1-SE-A-1 THRU 4 2S1-NW-A-1 THRU 4	SEE TABLE 3-3
28	2S1-SE-B-1 THRU 5 2S1-NW-B-1 THRU 5	SEE TABLE 3-3
29	2S1-SE-C-1 THRU 4 2S1-NW-C-1 THRU 4	SEE TABLE 3-3
30	2S2-SE-A-1 THRU 4 2S2-NW-A-1 THRU 4	SEE TABLE 3-3
31	2S2-SE-B-1 THRU 5 2S2-NW-B-1 THRU 5	SEE TABLE 3-3
32	2S2-SE-C-1 THRU 4 2S2-NW-C-1 THRU 4	SEE TABLE 3-3

3.1 Location Preparation

3.1.1 Preparation of Support Facilities and Laydown Area

An enclosed, 40-foot long examination trailer with rear access doors will be used as the controlled handling area for the sample cores. The examination trailer and laydown area will be away from Silos 1 and 2 in an area of comparatively low background radiation. This location is necessary to increase the sensitivity of radiation-measuring instruments during radiological scanning of the cores. Controlled ventilation through a HEPA filter and two stage airlocks must be provided during sample cutting and packaging. In addition to the examination trailer, two administration trailers will be placed between Silos 3 and 4 and a sealand lab/break trailer will be placed east of the examination trailer. Temporary power will be required for the administration trailers and the lab/break trailer.

3.1.2 Delivery and Preparation of Sampling Equipment

All sampling equipment will be brought into the FMPC through the Main Security Gate and will be transferred through the plant to the laydown area. All incoming equipment will be inspected and inventoried before use. Procedure DWP-001 will be followed for preparing the sampling equipment for use.

3.1.3 Delivery and Setup of Crane

Sampling operations require the use of a 165-ton crane equipped with a 220-foot long boom (See Figure 3-1). Due to its size, the crane will be delivered to the site in pieces and assembled near Silo 4 at the site of the mock run. Setup and positioning of the crane will follow Procedure DWP-006. The crane vendor/supplier shall provide documentation of inspection and servicing of the crane to comply with Occupational Safety and Health Administration (OSHA), Section 1910.180 and 1926.550 and with all relevant national consensus (ANSI) standards before the unit is allowed on site. Any identified deficiencies must be corrected prior to use. Load testing will be performed and documented in accordance with WMCO Maintenance Work Instruction CRA-001.

The security fence in the immediate vicinity of the silos has been modified to allow access for the crane. Should access be required into gates other than normal silo access, high radiation area controls will be instituted for access. Only authorized personnel will be allowed access through the security fence.

3.2 Sampling Operations

Sampling operations will be conducted as four distinct activities. The activities are:

- Vibra-Corer field testing in soil north of Silo 4.
- Vibra-Corer field testing in the lime sludge ponds
- Mock sampling of Silo 4
- Sampling of Silos 1 and 2.

This progression of sampling was chosen because of the radiological and possibly hazardous nature of the K-65 residues in Silos 1 and 2. The testing in the soil will be performed to test the basic performance of the new Vibra-Corer Unit and Remote Throttle Control Assembly. The testing in the lime sludge ponds will be performed to test the performance of the Vibra-Corer in material similar to that found in the K-65 Silos. The mock sampling run will be conducted on Silo 4, which is empty, to demonstrate and refine the specialized sampling techniques, to test equipment operation, to train personnel adequately, and to provide documentation to the impact assessment project file. This sequence will further train the sampling personnel. The last activity will be the sampling of Silos 1 and 2.

3.2.1 General Sampling Procedure

The sampling team will consist, at a minimum, of the 14 persons listed below with training records documented:

- DOE Representative
- K-65 Sampling Supervisor, IT
- Crane Operator (subcontractor)
- Crane Rigger(s) (subcontractor/IT)
- Vibra-Corer operator (IT)
- Two sampling technicians (IT)
- Five Radiological Safety Technicians (RST),(WMCO/IT)
- Health Physics Supervisor (WMCO)
- Quality Assurance (QA) engineer (ASI)

In addition, a health physics technician must be present if the K-65 fence is breached. Before sampling Silos 1 and 2, the radon removal system will be operated by WMCO personnel in accordance with WMCO Procedure WMCO RE-S-01-001 on the silo to be sampled until the radiation level has been reduced to the prescribed acceptable level for sampling.

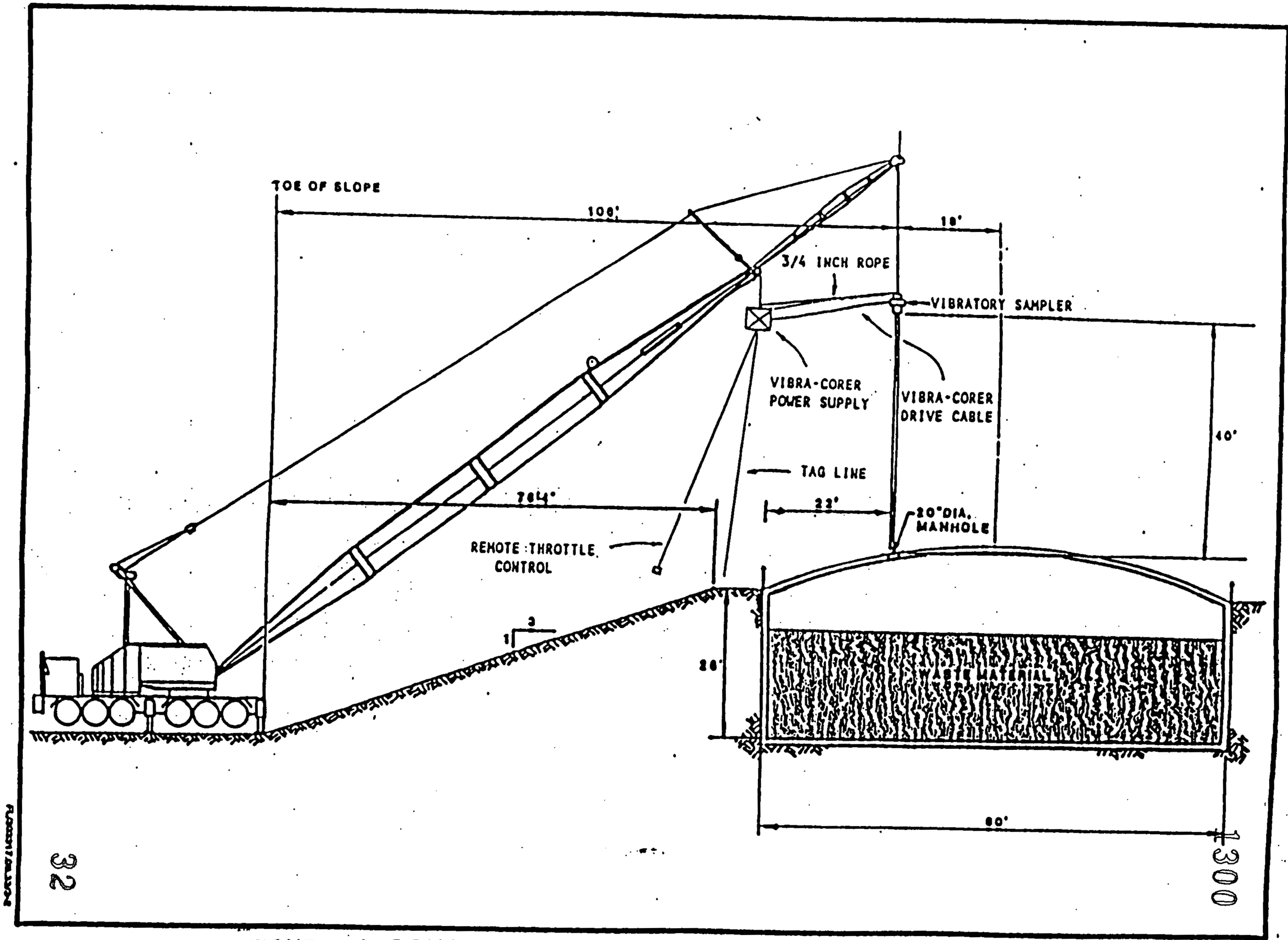


FIGURE 3.1 CONCEPTUAL POSITIONING OF CRANE AND SAMPLER

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A Crane Rigger in the Vibra-Corer pickup area will guide the crane operator when picking up the clean Vibra-Corer and when lowering the completed sample core onto a flatbed trailer in the pickup area (See Figure 3-2). Sampling personnel on the silo will guide the crane operator while positioning the Vibra-Corer over the open manhole during sampling operations, in accordance with Procedure DWP-001. Prior to this point, the manhole flanges on the silos will have been removed in accordance with Procedure DWP-001.

During the sampling of each silo, a 45-foot long polyester section of pipe sleeving will be connected to the manway glovebag and positioned above the manhole before lowering the Vibra Corer through the manhole. The Vibra-Corer unit will then be turned on and lowered to penetrate the residue, thereby collecting the sectioned core sample. When the sampling for the third (last) section and the vibra-corer has reached within one foot of the bottom of the silo, the vibrating mechanism will be turned off. As the Vibra Corer is withdrawn from the silo, the polyester sleeve will be extended over the core barrel. After withdrawal of the entire core barrel, the sleeve will be taped shut at the bottom. The Vibra-Corer containing the core sample will then be raised from the silo using the crane. If excessive forces are detected, crane boom movements may be required or the Vibra-Corer will be turned on and operated momentarily to relieve the binding forces.

As the crane lowers the core to the pickup area, the core will be placed on a specially designed trailer bed. The sleeved core will be transported by truck to the laydown area by the examination trailer. All manhole flanges will be replaced and resealed per Procedure DWP-001 after completion of the sampling program.

3.2.2 Field Testing in Soil

The Vibra-Corer will be tested in soil north of Silo 4 to evaluate the performance of the sampling device and associated equipment during a full penetration test. This test will determine those vibratory adjustments required for smooth and efficient operation of the Vibra-Corer.

A 40-foot section of the sampling tube with the liner and cutterhead will be used. The Vibra-Corer will be suspended from a boom truck or small crane and lowered into the soil to retrieve a soil sample. A penetration permit will be obtained from WMCO prior to testing. Results of testing shall be documented on the Field Activity Daily Log.

3.2.3 Field Testing in the North Lime Sludge Pond

The Vibra-Corer will be tested in the north lime sludge pond to test the capabilities of the sampling device in material similar to that found in the K-65 Silos. The lime sludge pond will be sampled at the north and east sides in an effort to retrieve continuous and undisturbed samples. These two locations will provide materials of different consistency in which to test the Vibra-Corer.

A 20-foot section of the sampling tube with the liner and cutterhead will be used. The Vibra-Corer will be suspended from a boom truck or small crane and lowered into the sludge pond to retrieve a sample. The crane will be located on the north bank and the east bank of the north lime sludge pond.

After determining the amount of material retrieved, the material will be returned to the Lime Sludge Pond. A penetration permit will be required from WMCO prior to testing. Results of testing shall be documented on the Field Activity Daily Log.

3.3 Sample Handling

When the silo sample cores are removed from the silos, the following activities will be performed:

- Capping, decontamination, and labeling of the Lexan core barrels (DWP-002);
- Visual inspection, video recording, and radiological scanning of cores (DWP-002);
- Analysis of radiological scanning data and reevaluation of number of samples required from each core;
- Sectioning the Lexan core, and packaging and shipping individual samples, (DWP-002);
- Labeling of the core and core sections with unique five-digit identification numbers (DWP-002); after completion of sectioning, all core sections will be accounted for;
- Capping, decontamination, and packaging the remaining core sections for long-term archiving (DWP-002);
- All waste generated will be handled in accordance with WMCO Procedure SOP-65-C-106.

3.4 Decontamination Requirements

During sampling, the sampling devices and some measurement equipment may become contaminated. All equipment used during sampling must be screened for external radiological contamination before leaving the regulated sampling site. The maximum radiological surface contamination limits for the equipment are shown in Table 3-1. WMCO Procedure SOP-1-C-915 will be followed for decontamination of these items.

Equipment to be used for more than one sample extraction must be decontaminated to reduce personnel exposure and cross contamination of samples. All equipment to be used for analytical sampling must be decontaminated prior to use by an alkonox wash, deionized water rinse, methanol rinse, O.1N hydrochloric rinse followed by a final deionized water rinse. Two equipment rinsate samples must be done with deionized water poured over the equipment used for the 20th and 22nd samples. A blank of the deionized water must also be submitted for analysis.

Sampling equipment that is to be reused will be decontaminated before use for resampling. All non-analytical sampling equipment will decontaminated using a approved cleaner and rinsed with deionized water. All analytical sampling equipment will be decontaminated using an alkonox was, deionized water rinse, methanol rinse, O.1N hydrochloric rinse, and deionized water rinse. Upon completion an equipment rinsate sample must be taken and submitted for analysis.

The sampling personnel will be responsible for decontaminating the equipment. Clean rubber gloves will be used for the decontamination activities. The RST will survey the equipment before and after cleaning to determine if the radiological contaminants have been removed. The procedures will be repeated a maximum of three times if necessary. If, after the third attempt, the equipment is not cleaned below the levels defined in Table 3-1, another piece of equipment will be used.

Gross decontamination conducted during silo sampling will be performed with an approved cleaner, followed by a wipe down with paper towels. Gross decontamination conducted in the sample trailer (outside of lexan tube) will be done with the use of damp paper towels.

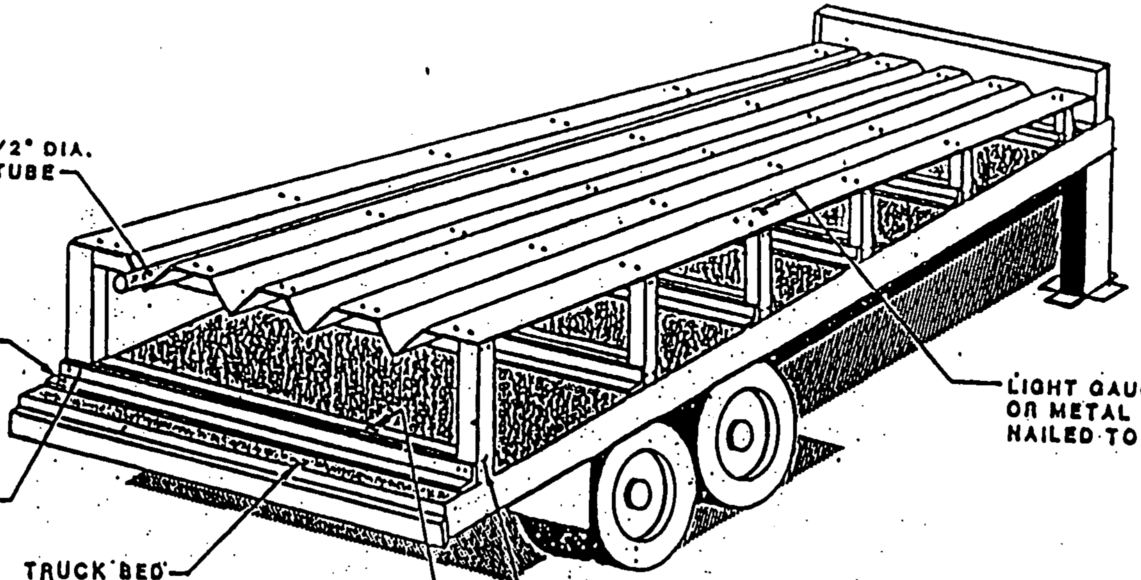

FIGURE 3-2. CONCEPTUAL SKETCH OF TRAILER-MOUNTED CORE HOLDER

TABLE 3-1

RECOMMENDED MAXIMUM CONTAMINATION
LIMITS FOR ITEMS GIVEN RADIATION CLEARANCE

Parameter	Recommended Limit (dpm/100 cm^2)[1]	(mrad/hr)
Alpha	200[2]	N/A
Beta/Gamma	1000[3]	0.05

[1]No 100cm^2 area to average greater than this value.

[2]Loose surface contamination as determined by swipe or "nondetectable" by audible response on a direct frisk.

[3]Fixed/loose contamination by direct frisk (provided background is < 300 cpm).

3.5 Chain of Custody and Request for Analysis

A formal Chain-of-Custody procedure will be implemented for the silo sampling program. A sample is defined as being "in custody" when:

- It is in the physical possession of the designated responsible party.
- It is in the view of the designated responsible party.
- It is placed in a secure area by the designated responsible party.
- It is in a secure area restricted to access by authorized personnel only.

The core samples collected from the silos will be labeled and numbered, and a Chain-of-Custody form will be completed. A separate Chain-of-Custody form will be completed for all zones or sections sampled, including those to be archived by WMCO, and a Request for Analysis Form will be completed for those zones or sections samples to be sent to the laboratory for analysis. Sample Chain-of-Custody and Request for Analysis Forms are shown in figures 3-3 and 3-4, respectively.

FERNALD RI/FS

CHAIN-OF-CUSTODY RECORD

R/A Control No. ____________

C/C Control No. 00150

PROJECT NAME/NUMBER ____________

LAB DESTINATION ____________

SAMPLE TEAM MEMBERS ____________

CARRIER/WAYBILL NO. ____________

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ____________

Possible Sample Hazards: ____________

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ____________
   Received By: ____________
2. Relinquished By: ____________
   Received By: ____________
3. Relinquished By: ____________
   Received by: ____________
4. Relinquished By: ____________
   Received By: ____________

WHITE - To accompany samples
YELLOW - Field copy

FIGURE 3-3.

1300

FERNALD
RI/FS

REQUEST FOR ANALYSIS

R/A Control No.
C/C Control No. ____________

PROJECT NAME ____________________
PROJECT NUMBER ____________________
PROJECT MANAGER ____________________
BILL TO ____________________
____
____

PURCHASE ORDER NO. ____________________

DATE SAMPLES SHIPPED ____________________
LAB DESTINATION ____________________
LABORATORY CONTACT ____________________
SEND LAB REPORT TO ____________________
____
____

DATE REPORT REQUIRED ____________________
PROJECT CONTACT ____________________
PROJECT CONTACT PHONE NO. ____________________

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal ________ Rush ________ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard ________ Flammable ________ Skin Irritant ________ Highly Toxic ________ Other ____________ (Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client ________ Disposal by Lab ________

FOR LAB USE ONLY

Received By ____________________ Date/Time ____________________

WHITE - Original, to accompany samples
YELLOW - Field copy

FIGURE 3-4

39

1300

All equipment to be decontaminated will be handled in an area designated for this purpose. Catch basins will be used to collect excess decontamination solutions. These solutions will be transferred to properly labeled 55 gallon drums. All paper towels, gloves, catch basins, shoe covers, protective clothing, etc. shall be disposed of as referenced in Section 7.

3.6 Sampling Packaging and Shipping

Shipment of samples off-site will be done in accordance with WMCO Procedures. Samples for shipment will be packaged using package type 37A or 39, depending on hazard class determined by the preliminary screening. Overpacks will be used as much as possible to consolidate packages for shipment of samples with compatible hazard classifications.

Department of Transportation (DOT) labeling for packages will comply with the requirements of 49 CFR, parts 170-179. The labeling class requirements will be determined by the hazard class assigned to the samples during screening. All samples will be transported by a licensed, sole-usage contractor to ensure prompt delivery of samples and to provide a tracking mechanism for undelivered sample shipments. All paperwork to accompany each sample will be inserted into a Ziplock plastic bag to be enclosed with the sample.

3.7 Sample Analyses

The K-65 samples will be analyzed for physical, chemical, and radiological parameters as described in the following subsections. The proposed number of samples to be selected for each type of analysis was presented in Section 2.2.

3.7.1 Radiological and Chemical Analyses

Selected K-65 samples will be analyzed for radiological and chemical constituents to characterize the materials for the evaluation of disposal options. Isotopes of non-positive hits for radionuclides shall have their detection limits reported. The required radiological analyses are listed below:

- Isotopic uranium
- Isotopic thorium
- Isotopic radium
- Pb-210
- Gamma spectroscopy
- Total uranium

40

All samples will also be analyzed for the following chemical parameters:

- HSL inorganics (See Table 3-2 for list of metals)

- HSL volatiles
- HSL semivolatiles
- HSL pesticides and PCBs (if positive hits, confirm by GC/MS)
- TCLP metals

Those samples found to contain organic compounds based on HSL organics analysis will be analyzed for organics by TCLP analysis.

Chemical analyses will be conducted using EPA Contract Laboratory Program (CLP) protocols when possible. CLP protocols will be modified only when conflicts arise between procedures established for handling radioactive materials and nonradioactive CLP procedures.

INORGANIC TARGET ANALYTE LIST (TAL)

Table 3-2

Analyte
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

3.7.2 Physical Analyses

Physical properties of the K-65 and metal oxide residues will be determined to predict the expected behavior of the wastes during treatment and/or disposal operations. The proposed physical analyses and ASTM Standard Procedures are provided in Table 3-3.

TABLE 3-3

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
Water Content Determination	ASTM D2216-80, "Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles
Atterberg Limits	ASTM D4318-84, "Standard Test Methods for Liquid Limit, Plastic Limit, and Plastic Index of Soils," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles
Specific Gravity Determination	ASTM D854-83, "Standard Test Method of Specific Gravity of Soils," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles
Grain Size Distribution with Hydrometer Analysis	ASTM D422-63, "Particle Size Analysis of Soils," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rocks; Building Stones Geotextiles

TABLE 3-3 (Continued)

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
One-Dimensional Consolidation	ASTM D2435-80, "One Dimensional Consolidation Properties of Soils," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles
Consolidated Undrained Triaxial with Pore Pressure	EM 1110-2-1906, "Engineering and Design, Laboratory Testing Manual," Department of the Army.
Standard Proctor	ASTM D698-78, "Test Methods of Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 kg) Rammer and 12 in (305 mm) Drop," 1987 Annual Book of ASTM Standards, Vol. 04.08 Soil and Rock; Building Stones; Geotextiles.
Modified Proctor	ASTM D1557-78, "Test Methods for Moisture Density Relationships of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 kg) Rammer and 18 in. (457 mm) Drop," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones, Geotextiles.
Maximum Index Density	ASTM D4253-83, "Test Methods for Maximum Index Density of Soils Using a Vibratory Table," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles.

TABLE 3-3 (Continued)

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
Minimum Index	ASTM D4254-83, "Test Methods for Minimum Index Density of Soils and Calculation of Relative Density," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock, Building Stones; Geotextiles
In Situ Soils Density Determination	No ASTM Designation

4.0 K-65 SILOS STRUCTURAL INTEGRITY

Due to environmental elements, the K-65 silo domes have deteriorated and are considered the weakest structural components of the silos. The placement of dome covers over the structurally deficient 20-foot center portion of the domes was considered only as a temporary remedial solution (1 to 2 years). Since final remediation plans for the K-65 silos will take at least 3 years to develop and implement, additional remedial actions to provide for continued safe containment of the K-65 residues are being considered.

The continuing concern regarding the structural integrity of the silo domes was instrumental in the development of the operational procedures for the K-65 Sampling Program. The use of cranes located away from the silos was dictated by the constraint on placing heavy equipment on the domes. The specified size of the crane was based on the need to maintain a factor of safety in relation to the momentum created by the weight of the sampling unit and the resistance forces during the sample withdrawal. This will minimize the risk of the crane overturning or failure of the cantilevered beam. A repositioning of the crane for each set of samples will keep the length of the arm at a minimum.

The probability of cable failure (resulting in a possible impact force on the dome by the falling sampling apparatus) is low considering the high tensile strength of the cable. Any significant resistance will be overridden by the start-up of the vibratory action of the Vibra-Corer, or by moving the boom to correct any angle in the load line.

Any loads that are on the domes during sampling will be kept at an acceptable level. The maximum number of sampling personnel on the dome at any given time will be limited to three individuals. The maximum weight limit for personnel and equipment on the silo domes is 700 pounds (Letter from R.B. Barber, Bechtel National to J.B. Craig, DOE). Recent silo sampling operations have shown that such loads can be supported. As an additional safeguard, no personnel or other loading will be allowed within the 20-foot central portion of the dome occupied by the plywood and steel cap. This portion is considered the most susceptible to structural failure due to the reduced thickness of the concrete in this area. It is also noteworthy that the snow load assumed under the worst-case structural analysis will not be of concern during the sampling program, thereby providing an additional factor of safety in the allowable loadings. As an additional safety precaution, safety nets will be installed in the immediate walking vicinity of the silo manways to minimize personnel injury in the event of a partial silo breakthrough.

5.0 FACILITY AND EQUIPMENT REQUIREMENTS

5.1 WMCO Facilities

WMCO will provide electric utilities to the examination, administration, and lab/break trailers. The location of the trailers is described in Section 3.1. The electrical requirements are 110 VAC and 220 VAC.

WMCO will provide training for contract personnel in FMPC safety and emergency procedures. They will also provide clothing in the form of coveralls and shoes, laundry services, locker facilities, and showers.

5.2 Equipment

The Operational Readiness Review Checklist provides a detailed listing of the minimum equipment requirements for the sampling program. The required health and safety equipment is listed in Plan-001, "Site-Specific Health and Safety Plan", in Appendix B.

5.2.1 Respiratory Equipment

5.2.1.1 Personnel Certification

All subcontractor personnel using any form of respiratory protection equipment at the FMPC must be properly medically certified, trained, and fit-tested before they may use such equipment.

Documentation of the above must be submitted by the subcontractor and approved before the use of such respiratory equipment. Personnel must be certified for and fit-tested with the same equipment they will be using at the FMPC.

5.2.1.2 Respiratory Equipment Certification

All respiratory equipment used on the project must be approved by the National Institute for Occupational Safety and Health (NIOSH) and properly maintained. An adequate supply of the equipment and all necessary spare parts must be kept at the FMPC site.

6.0 QUALITY ASSURANCE

Unless different methods have been approved by virtue of being incorporated in this addendum to the FMPC RI/FS Work Plan, all work and documentation associated with the K-65 Silos Resampling and Analysis is to be performed in accordance with the FMPC Quality Assurance Project Plan (QAPP), Volume 5 of the FMPC RI/FS Task 2 Report Work Plan Requirements documents.

05/09/91

FIGURE 8-1

K-65 RESAMPLING PROJECT

Activity	Orginal Schedule	Actual	Current Forcast
Mobilization	02/26/90	02/26/90	
Purchase Vibra Corer	02/09/90	03/05/90	
Vibra Corer Available	03/05/90	05/01/90	
Start Equipment Checkout	03/12/90	07/24/90	07/23/90
Mock Silo Sampling	03/26/90	08/13/90	08/13/90
Procedure Modification	09/10/90	09/27/90	09/27/90
Silo Net Mock-up	09/17/90	10/08/90	10/05/90
Start Silo Sampling S1-SW1	04/09/90	10/16/90	10/08/90
Start Silo Sampling S1-SW2		10/25/90	10/25/90
Sample Man-way #2 S2-SW1	04/16/90	11/07/90	11/05/90
Sample Man-way #2 S2-SW2	04/16/90	11/20/90	11/15/90
Sample Man-way #2 S2-SW3	04/16/90	11/27/90	11/27/90
Sample Man-way #3 S2-NE1	04/23/90	12/06/90	11/30/90
Sample Man-way #4 S2-SE"A"	04/30/90	12/11/90	12/03/90
Sample Man-way #4 S2-SE"B"	04/30/90	12/14/90	12/14/90
Start Berm Sampling	10/22/90	05/03/91	04/29/91
Complete Berm Sampling	01/31/91		05/24/91
Sample Man-way #4 S2-SE"C"	12/18/90		07/11/91
Sample Man-way S2-NW"A"			07/15/91
Sample Man-way S2-NW"B"			07/18/91
Sample Man-way S2-NW"C"			07/21/91
Sample Man-way S2-NE"A"	05/07/90		07/24/91
Sample Man-way S2-NE"B"	05/07/90		07/27/91
Sample Man-way S2-NE"C"	05/07/90		07/30/91
Sample Man-way S1-NW"A"	05/21/90		08/02/91
Sample Man-way S1-NW"B"	05/21/90		08/05/91
Sample Man-way S1-NW"C"	05/21/90		08/08/91
Sample Man-way S1-SE"A"	05/14/90		08/11/91
Sample Man-way S1-SE"B"	05/14/90		08/14/91
Sample Man-way S1-SE"C"	05/14/90		08/17/91
Sample Man-way S1-NE"A"			08/20/91
Sample Man-way S1-NE"B"			08/23/91
Sample Man-way S1-NE"C"			08/26/91
Start Demobilization	06/04/90		09/02/91
Egress Site	07/13/90		10/04/91

Options that will be used for Quality Control during the sampling operations include trip blanks, blind duplicates, triplicate matrix samples, equipment rinsates, and rinsate blanks.

Changes to this addendum must be approved before the changes are implemented, as required by Section 15 of the QAPP.

Specific QAPP descriptions, methods, or requirements that have been amplified, expanded or described differently in this addendum are:

- Schedule (Figure 8-1)
- Project Organization (Figure 8-2)
- Chain-of-Custody (Appendix C)
- Laboratory Analysis
- Field Procedures/Sampling Procedures (Appendix A & C)
- Equipment Calibration (Section 9.0)
- Preventive Maintenance (Section 9.0)
- Use of WMCO Procedures that impact the QAPP
- Decontamination Procedures (Section 3.4)

7.0 WASTE MANAGEMENT

Waste management, handling, and packaging requirements for the K-65 sampling program are provided in WMCO Procedure SOP-65-C-106. The generated waste will be handled as radioactive waste. These wastes will be packaged in appropriately labeled containers and transferred to WMCO for further handling and/or disposal. No liquid wastes, other than decontamination fluids, are expected to be generated during the sampling program. However, if any liquid waste is generated, it will be handled in accordance with WMCO provisions and transferred to WMCO for disposal after appropriate containment and packaging.

Individuals who will be performing and/or directing activities that produce, or have the potential to produce, waste materials will have appropriate training on WMCO waste management practices. This will ensure that the waste materials are handled properly and safely, as well as helping to minimize the volume of waste generated. These individuals will also have appropriate training and knowledge of performing waste characterizations.

8.0 MANAGEMENT PLAN

Figure 8-1 presents the proposed schedule for the sampling program.

The K-65 Sampling Management Organization governs all management responsibilities and activities for the K-65 Sampling Program as shown on the organization chart in Figure 8-2.

9.0 CALIBRATION AND PREVENTIVE MAINTENANCE

9.1 Calibration

Calibration of instruments and equipment used for the K-65 Silo Sampling will be in accordance with the QAPP, Section 8.0. Calibration requirements for instruments not addressed by QAPP, Table 8-3 are detailed in Table 9-1.

TABLE 9-1

FIELD EQUIPMENT CALIBRATION PROCEDURES

Instrument/ Equipment	Calibration Manufacturer	Calibration Reference	Frequency
Alpha Air Monitor (Model Alpha 6)	Eberline	Instruction Manual	Semi-Annual by Manufacturer (a)
Ludlum Model 177 and Model 3 Survey Meter with 44-9 GM	Ludlum	Ludlum Model 177 and Model 3 3 Survey Meter Instruction Manuals	Semi-Annual (a)

(a) Operational check daily prior to use.

9.2 Preventive Maintenance

Preventive Maintenance required for the K-65 Silo Sampling will be in accordance with Section 13 of the QAPP. Equipment for the sampling that will require Preventive Maintenance include the Vibra-Corer Sampling Device and the Vibra-Corer Power Supply. Refer to the Vibra-Corer Owner's Manual for required preventive maintenance and schedules.

10.0 FIELD ACTIVITY DAILY LOG

Members of the Project Staff working in field operations shall keep a daily log (Figure 10-1, Field Activity Daily Log) of project activities. Items to be included in the daily log, as appropriate, are:

- Field Activity Subject;
- General Work Activity;
- Unusual Events;
- Changes to plans and specifications;
- Visitors on site;
- Subcontractor progress and specifications; and
- Communication with WMCO, regulatory agencies, or others.

Copies of the daily log entries should be sent to the site manager and on-site technical manager on an approximately weekly basis. If the logs are not submitted as required, it is the responsibility of the site manager to contact the field personnel.

Department of Energy
Fernald Site Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6319

1300

MAY 29 1991

DOE-1420-91

Ms. Catherine McCord
Remedial Project Director
U.S. Environmental Protection Agency
Region V, 5HR-12
230 South Dearborn Street
Chicago, Illinois 60604

Dear Ms. McCord:

K-65 SILO RESIDUE SAMPLING AND ANALYSIS PLAN

Enclosed is the revised K-65 Silo Residue Sampling and Analysis Plan. Your review and comments are requested by June 28, 1991.

If you have any questions, please contact Randi Allen at FTS 774-6158.

Sincerely,

Jack R. Craig
Fernald Remedial Action
Project Director

FSO:Allen

Enclosure: As stated

cc w/encl.:

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APPENDIX A

DETAILED WORK PROCEDURES

K-65 SILOS SAMPLING PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to provide the steps for sampling K-65 Silos 1 and 2 using the Vibra-Corer Sampling Device.

2.0 APPLICABILITY

This procedure is applicable to the sampling operation at K-65 Silos 1 and 2 in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensuring that only trained personnel perform the sampling operation.

3.1.2 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.3 Provides operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensures sampling materials and equipment are available for operators usage.

OSR> 3.1.5 Ensures Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> 3.1.6 Ensures pocket dosimeters and TLDs are worn by all personnel involved in the sampling operations. (Finger Ring TLDs shall be worn by personnel handling samples).

3.1.7 Initiate and Implement Radiation Work Permit.

OSR> 3.1.8 Reports exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifies the IT Project Manager and WMCO Assistant Emergency Duty Officer (AEDO) of the circumstance.

3.1.9 Ensure a safety net has been placed and tied down around the manway to be sampled.

3.1.10 Contacting IT Health and Safety for explosive gas detection inside the silo.

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure nonconformances to the IT Supervisor.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

4.0 DEFINITIONS

4.1 Vibra-Corer Sampling Device - Solids sampling equipment consisting of an cable-driven head assembly connected to a pipe barrel with a threaded penetrating probe containing inner LEXAN sleeve used to extract core samples. If required, a cutter/catch assembly located at the bottom of the pipe barrel is used to penetrate and retain the sample residues.

4.2 Remote Throttle Control - A small wire cable within a reinforced nylon casing used for adjusting the throttle of the Vibra-Corer Power Supply. This will be used while on the silo dome when the power supply is suspended by the crane.

4.3 Air Vent Tube - Tygon tube attached to the Vibra-Corer Head and inserted into the Manway Glove Bag so that air pressure will not build up within the sampling pipe.

4.4 Pipe Sleeving - Wire reinforced neoprene coated polyester fabric which contains airborne radionuclides and minimizes radon gas dispersion during the sampling operation and during transport of the Vibra-Corer after the sample is extracted.

4.5 Manway Glove Bag - Plastic bag containing glove ports, which is attached to the silo manway and is used to contain airborne radionuclides and minimize radon dispersion during sampling operation. 55

4.6 Safety Net - A 4" mesh polypropylene rope net to be placed around each manway to be sampled to ensure personnel safety in the event of a dome puncture.

6.4 Safety glasses with side shields shall be worn unless other eye protection is specified.

OSR> 6.5 Respiratory protection provided by the IT Supervisor shall be worn.

OSR> 6.6 Anti-contamination clothing shall be worn when working on top of the silos.

6.7 Leather-palm gloves shall be worn when handling rough, sharp-edged material.

6.8 Nitrile gloves shall be worn when using the manway bag.

6.9 HEPA type filter vacuum cleaners or a vacuum system approved by WMCO IRS&T with a current (tested within last 6 months) DOP penetration test sticker shall be used for cleaning.

6.10 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 Area.

OSR> 6.11 Operator exposure as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mRem/week, per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.12 No sampling work with the manway uncovered shall be conducted on top of silos when the surface radiation is greater than 100 mr/hr.

OSR> 6.13 The number of personnel on the surface of the silos shall not exceed three and the maximum equipment/ personnel load shall not exceed 700 pounds.

6.14 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately by reported to the IT Supervisor.

6.14.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.14.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.14.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.15 Operate the Breathing Air System per DWP-003.

6.16 All 120 volt 15 & 20 amp circuits shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walk ways.

6.17 All portable lights shall meet NEC 305-4 (f) requirements and/or explosive gas testing shall be performed.

6.18 Disposal of contaminated items/equipment shall be in accordance with WMCO SOP-65-C-106, "Silo Waste Handling".

7.0 PROCEDURE

NOTE

A mock sampling operation shall be performed per DWP-004 on Silo 4 prior to sampling Silo Nos. 1 and 2

7.1 Pre-Operational Start-up.

7.1.1 If required, the IT Supervisor shall instruct the Operations Personnel to assemble the sampling barrels by completing steps 7.1.1.1 through 7.1.1.3.

7.1.1.1 Connect LEXAN tubes together and insert into the sampling barrel casing.

NOTE

If instructions in Steps 7.1.1.2 through 7.1.1.4 are seemed inappropriate by the Supervisor or if sampling barrels have already been assembled, proceed to Step 7.1.2.

7.1.1.2 Place the catcher with the tines in an upward position inside the cutter, if required.

7.1.1.3 Thread cutter assembly onto sampling barrel and tighten with two pipe wrenches.

7.1.2 As notified by the IT Supervisor, mark sampling barrels by completing steps 7.1.2.1 through 7.1.2.5. If sampling barrels are marked, proceed to Step 7.1.3.

7.1.2.1 Starting at the bottom of the assembled sampling barrel, mark the outer casing in one foot increments using a permanent ink marker by drawing a circle completely around the casing.

NOTE

Mark the entire 40 foot casing

7.1.2.2 Wrap 2 inch wide tape around the barrel at each foot marking.

NOTE

Ensure bottom of tape is placed at the foot marking.

7.1.2.3 Numerically identify each one foot marking on the tape using a permanent ink marker.

NOTE

Numbering shall start at the bottom of the cutting shoe as "O" feet.

7.1.2.4 Place 4 inch wide clear, adhesive tape over each foot marking.

7.1.2.5 Every 5 feet, wrap 4 inch red adhesive tape above the tape.

7.1.3 As notified by the IT Supervisor, encase the sampling barrel in pipe sleeving by completing Steps 7.1.3.1 through 7.1.3.2. If the sampling barrels have been encased in pipe sleeving proceed to Item 7.2.

7.1.3.1 Slide the pipe sleeving (45 foot length) over the end of the sampling barrel.

7.1.3.2 Tape the sleeve to the upper portion of the barrel casing using plastic vinyl tape. Tighten a hose clamp over tape.

7.2 Rigger and Operations Technician shall ready the Vibra Corer.

WARNINGS

The crane operator/rigger must complete a routine inspection of the crane at the beginning of each sampling operation shift.

CAUTION

CHECK WITH THE IT SUPERVISOR TO ENSURE VIBRA CORER HEAD IS BEING CONNECTED TO THE CORRECT LOAD LINE FOR THE MANWAY TO BE SAMPLED.

7.2.1 The rigger shall attach the crane lines to the sampling device with the Vibra Corer Head and drive cable attached.

7.2.2 The rigger shall also attach a 3/4" rope of predetermined length above the headache ball so that the other end can be attached to the second headache ball from the man lift.

7.2.3 The rigger shall signal the crane operator to slowly raise the sampling device off the flatbed truck to a vertical position, one to two feet off the ground.

7.2.4 The rigger shall disconnect the lower rigging from the sampling barrel assembly and attach it to the Vibra-Corer Power Supply with two tag lines attached.

7.2.5 The rigger shall then direct the crane operator to raise the Vibra-Corer Power Supply so that it can be connected to the drive cable.

7.2.5.1 Connect drive cable to power supply.

7.2.5.2 Connect loose end of the 3/4" rope above the power supply's headache ball.

7.2.6 Operations personnel shall start the power supply and check to ensure the throttle cable is working properly.

7.3 The Operations Technicians shall remove Manway Cover.

OSR> THE RADON TREATMENT SYSTEM SHALL BE OPERATED BEFORE REMOVAL OF THE MANHOLE COVER TO ENSURE THE SILO SURFACE RADIATION LEVEL IS BELOW 75 MR/HR.

OSR> THE SILO SURFACE RADIATION LEVELS SHALL BE LESS THAN 75 MR/HR, RADIOLOGICAL SAFETY APPROVAL MUST BE OBTAINED, AND DIFFERENTIAL PRESSURE FROM THE MANWAY VENT PIPE MUST BE NEGATIVE OR ZERO PRIOR TO REMOVAL OF COVER AND SAMPLING.

7.3.1 Remove the hose clamp connecting the Radon Treatment System piping to the radon system vent pipe, install containment bag.

7.3.2 Separate Radon System vent Piping from vent pipe inside containment bag. Twist and tape joint between pipes. cut tape in the center and separate the containment.

7.3.3 The manway glove bag shall be checked for leaks prior to use by slightly inflating the bag and checking for any leakage.

7.3.4 Place manway glove bag over the selected manway.

CAUTION

EXPLOSION-PROOF LIGHTING SHALL BE USED AND/OR EXPLOSIVE GAS TESTING SHALL BE PERFORMED.

7.3.5 Insert into the manway glove bag a droplight, wiping materials, retractable knife, and tools specified by the IT Supervisor.

7.3.6 Tape and/or attach with a hose clamp the manway end of containment glove bag securely to the skirt of the manway flange. An RST shall inspect glove bag installation.

7.3.7 Remove the C-Clamps securing the cover to the manhole.

7.3.7.1 If the sound of escaping gas is detected, re-secure C-clamps, evacuate the area and notify the IT Supervisor.

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7.3.7.2 Do not proceed with sampling operation until authorization is given by IT Supervisor.

WARNING

IF GAS IS ESCAPING, IMMEDIATELY
EVACUATE THE AREA

7.3.7.3 Three individuals are required for step 7.2.8 or two people with the assistance of the crane if the three technicians weight plus materials are greater than 700 pounds.

7.3.8 Carefully slide the manway cover over to create an edge for manual lifting.

7.3.9 Lift the cover and place inside the manway glove bag over to the side on a padded surface.

7.3.10 Lower drop light into the silo if required and secure with hook on manway flange.

7.3.11 Inspect the surface area directly below the manway for old containment bags or plastic debris.

7.3.11.1 If plastic debris is present which will impair sampling efforts, lower pronged bag removal device into manway.

7.3.11.2 Retrieve the debris and remove from silo and place inside manway bag.

7.3.12 Upon notification by the supervisor, lower camera assembly into Silo and place end bracket over manway opening. If camera is not used, proceed to 7.4.

7.4 Sampling (See Figure 1)

7.4.1 With the Supervisor's concurrence, the rigger shall signal the crane operator to slowly raise the sampling device and the power supply and to move them so that the sampling device is directly over the manway to be sampled and the power supply in near the berm.

7.4.2 Operations personnel shall guide the tag lines to the power supply so not to impede movement of the sampling barrel. 61

7.4.3 The crane operator shall lower the sampling device over the selected manway until the containment sleeve can be attached to the Manway Glovebag.

7.4.4 Operations personnel shall seal the pipe sleeving to the Manway Glove Bag with plastic vinyl tape at the lowest point on the pipe.

7.4.5 Operations personnel shall use a utility knife to cut the seal surrounding the area of the containment sleeve from inside manway glove bag.

7.4.6 The Air Vent Tube shall be inserted into the Manway Glove Bag and secured with tape.

7.4.7 Crane operator shall carefully lower the sampling device through the containment sleeve opening until it is approximately one foot from the surface of the K-65 waste.

7.4.8 On the dome, two operations technicians shall guide the sampling barrel so not to be in line with pre-IT resampling locations. Another operation technician will take hold of the Remote Throttle Control from the berm.

7.4.9 When conditions are correct and sampling can proceed, operations personnel on the dome shall instruct the crane operator to slowly lower the sampling device into the material to a depth of four to six inches.

7.4.10 The IT Supervisor will notify the throttle operator to activate the vibrating mechanism of the sampling device.

7.4.11 Vibra Corer Malfunction

7.4.11.1 If Vibra Core equipment malfunctions, stop operations and report incident to the supervisor. Describe operation prior to failure of equipment.

CAUTION

DO NOT PROCEED UNTIL DIRECTION FROM THE SUPERVISOR HAS BEEN GIVEN AND AN AUTHORIZATION TO PROCEED HAS BEEN RECEIVED

7.4.11.2 If the head is defective, transport the Vibra Corer to the laydown area. Remove, save, and label any sample collected. Remove and decontaminate sampler head and casing. Replace the head with an operating unit.

7.4.11.3 Attach the crane hook to the sampler head and hoist above manhole and continue sampling operation.

7.4.12 Technician shall start vibrating mechanism and set the throttle as directed by the Supervisor.

7.4.13 After the vibrating mechanism has been activated the crane operator will be instructed to lower the sampling barrel to a depth designated by the IT Supervisor.

7.4.13.1 Foot markings shall be at the manway flange opening.

7.4.14 Remove two-foot of silo crust material, as required.

7.4.14.1 When the two foot depth has been reached, the IT Supervisor will instruct the operations technician with the Remote Throttle Control to stop the vibrating mechanism.

7.4.14.2 The operations technician on the dome shall notify the crane operator to raise the sampling barrel so that only three feet remain inside the silo.

7.4.14.3 Lower crust retrieval device into the manway opening so it is below the sampling barrel.

7.4.14.4 Guide the crust retrieval device over the end of the sampling barrel until the cutting shoe is inside.

7.4.14.5 The operations technician holding the crust retrieval device will direct the technician controlling the power supply to lightly vibrate the Vibra Corer, causing the material to slowly evacuate the sampling barrel. 63

7.4.14.6 After crust material has been removed, the vibrations shall be stopped.

7.4.14.7 The crust retrieval device, with crust material inside, will be lifted into the manway glovebag.

7.4.14.8 An RST shall take radiation dose rate readings and cap the open end of the crust retrieval device.

7.4.14.9 Remove crust retrieval device using the pass through sleeve.

7.4.15 Operations personnel on the dome shall instruct the crane operator to lower the Vibra Corer until it is a few inches from the material surface.

7.4.16 Operations personnel shall guide the sampling barrel so that it is directly over the same hole it had been removed from previously.

7.4.17 The crane operator shall be instructed to slowly lower the Vibra Corer until it has reached the same depth that it had stopped at before.

7.4.18 The vibrating mechanism of the Vibra Corer shall be engaged again by the operations technician on the berm.

7.4.19 After the vibrating mechanism has been activated, the crane operator will be instructed to slowly lower the sampling barrel to a designated depth of 33 feet.

7.4.19.1 Foot markings shall be read at the manway flange opening.

7.4.20 When the designated depth has been reached, the Supervisor will instruct the throttle operator to stop the vibrating mechanism. The IT Supervisor shall document the depth of the Vibra-corer in the project log.

7.4.21 Operations technicians shall disconnect the air vent tube near the Vibra Corer head.

7.4.22 With the concurrence of the IT Supervisor, the rigger shall signal the crane operator to start removal of the sampling device and the raising of the power supply from the silo. As the sampling device is withdrawn from the manway, a radiation survey shall be performed by the RST on the sampling device. If gamma radiation levels exceed 200 mr/hr, notify the IT supervisor to evaluate additional ALARA considerations.

CAUTION

SAMPLING DEVICE SHALL BE REMOVED SLOWLY FROM SILO

CAUTION

DO NOT OPERATE THE VIBRATING MECHANISM DURING REMOVAL OF SAMPLING DEVICE

NOTE

As the barrel is raised, wipe the exterior to reduce bulk contamination

7.4.22.1 If the sampling device cannot be easily removed, activate the vibrating mechanism.

7.4.23 Operations personnel shall ensure containment sleeve is unfolding and following the barrel movement.

7.4.23.1 As the device nears the top of the silo, steady the barrel as necessary to prevent excessive swinging.

7.4.24 When the sampling device has cleared the top of the manway opening a minimum of 3 feet, the crane operator shall stop removal of crane line.

7.4.25 Operations personnel shall crimp and seal the containment sleeve below the corer barrel using plastic vinyl tape.

7.4.26 Operations personnel shall cut the containment sleeve at the center of the taped seal and tape and J-seal the exposed ends.

7.4.27 The tag lines holding the power supply shall be used to guide the unit so not to entangle with the sampling barrel.

7.4.28 Crane operator shall slowly raise the sampling device to clear the railing on the silo roof.

7.4.29 The rigger shall signal the crane operator to move the sampling device and power supply next to the elevated work platform so that the power supply can be shut off and disconnected.

7.4.30 The crane operator shall carefully move the vibra-corer and power supply near the flatbed trailer.

7.4.31 The crane operator shall lower the power supply with the Remote Throttle Control attached to the ground.

CAUTION

SLOWLY LOWER POWER SUPPLY TO THE GROUND

7.4.32 Rigger shall disconnect load line from the power supply and connect to the lower end of the sampling barrel.

NOTE

This must be done so as not to disturb the integrity of the pipe sleeving

7.4.33 Crane operator shall carefully position sampling device above the flatbed trailer and slowly lower the device horizontally, positioning the top of the core barrel and head assembly against the trailer bed and inside the core trough.

7.5.34 When the sampling device is securely in the trough, rigger shall signal crane operator to hold the position.

7.4.35 The rigger shall disconnect the sampling device from the crane.

7.4.36 An RST shall survey the core exterior to determine contamination levels prior to transport.

7.4.37 Tie a rope around the Vibra-Corer and secure to the flatbed trailer.

7.4.38 IT Supervisor shall notify the truck driver to transport the flatbed trailer to the Examination Trailer for disassembly of the Vibra-Corer. The truck will travel over the preplanned route and backed into the examination trailer airlock.

7.4.39 Repeat steps 7.4.1 through 7.4.38 as directed by the IT Supervisor if additional sample sections are to be collected.

7.5 Replacement of Manway Covers

7.5.1 If residue is present on manway cover or sealing surface, wipe from the outside of the flange inward, so material falls into the silo.

7.5.2 Replace gasket material on sealing surface of cover.

7.5.3 Carefully lift cover by hand and carry from holding area to flange. Lower cover into position.

NOTE

The IT Supervisor shall document the closing of the manway in the project logbook

7.5.4 Tighten C-clamps securely to manway cover, if necessary.

7.5.5 Remove the crust retrieval device using the pass through sleeve, if necessary.

7.5.6 Segregate waste and equipment such as paper towels and tools, etc.

7.5.7 To ensure material will not fall back onto silo dome, pull separated materials into independent glove sleeves and tape sleeves from outside the glove bag.

7.5.8 If loose solids are present, remove solids using paper towels.

7.5.9 After allowing approximately 4 hours to elapse for the decay of radon progeny, carefully umbilical the glovebag and remove the glove bag from the manway.

7.5.9.1 Place glove bag into a radioactive material waste drum.

7.5.10 RST shall survey for loose surface contamination.

7.5.10.1 Further decontamination efforts will be performed by operations personnel using a foaming cleaner and paper towels as dictated by contamination survey results.

7.5.11 Place containment bag and used Anti-C Clothing in "Radioactive Waste" container per WMCO Procedure SOP 65-C-106.

8.0 EMERGENCY REPAIR OF BREACH IN MANWAY GLOVEBAG

8.1 Stop work when breach is found.

8.2 Notify RST that a breach has been found.

8.3 Immediately place tape over breach in bag from the outside.

NOTE

THIS IS TO BE COMPLETED IMMEDIATELY REGARDLESS IF A RST HAS SEEN THE BREACH.

8.4 Notify the IT Supervisor and AEDO.

8.5 RST to obtain air samples down wind of immediate area, if necessary.

8.6 RST to perform contamination survey on glovebag and personnel.

8.7 If breach is larger than three inches, place a secondary herculite patch over the taped area.

8.8 After the breach has been sealed, notify the IT Supervisor and AEDO.

9.0 APPLICABLE FORMS

Figure 1 - "Silo Sampling Operations".

1300

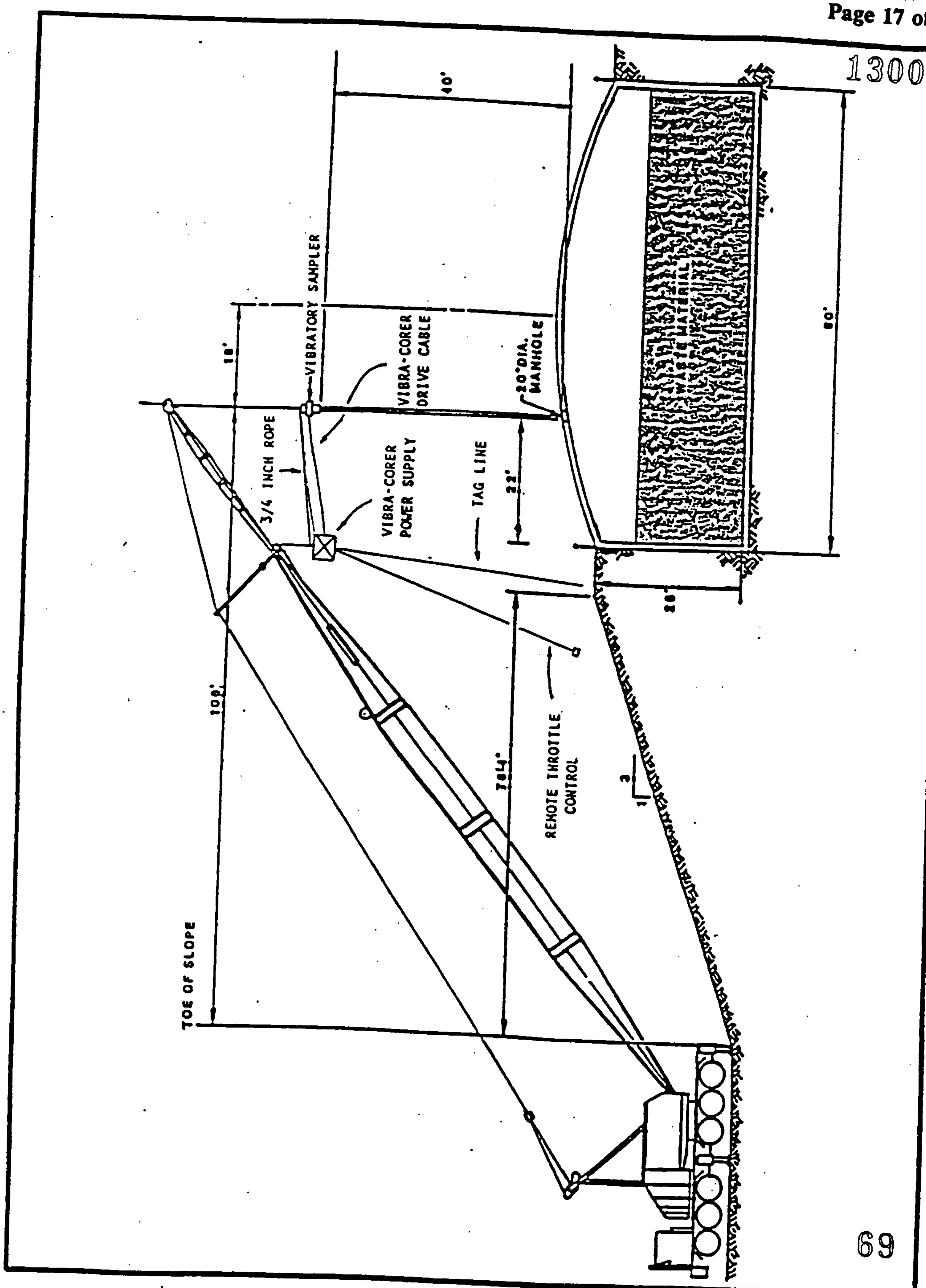

FIGURE 1 CONCEPTUAL POSITIONING OF CRANE AND SAMPLER

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SAMPLE CORE HANDLING PROCEDURE

1.0 PURPOSE

The purpose of this document is to establish the procedure for removing the sample core from the Vibra-Corer sampling device and cleaning, inspecting, sectioning, and packaging the sample core.

2.0 APPLICABILITY

This procedure is applicable to sample core handling at the Silo Area.

3.0 RESPONSIBILITIES

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Contacting IT/WMCO Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.2 Provide operators with the required respiratory protection and anti-contamination clothing.

3.1.3 Ensure that only trained personnel perform this procedure.

3.1.4 Ensure sectioning and/or packaging equipment is available.

3.1.5 Initiate and implement Radiation Work Permit.

OSR> 3.1.6 Reporting exceptional circumstances not addressed by this SOP in a "Minor Event Report" (Report to FMPC-704) and notifying the IT Project Manager and the Assistant Emergency Duty Officer of the circumstances.

3.1.7 The IT Supervisor is responsible to assure the ventilation system is operating prior to personnel entering the sample trailer.

OSR> 3.1.8 Ensures pocket dosimeters and TLDs are worn by all personnel involved in sampling operations. (Finger Ring TLDs shall be worn by personnel handling samples).

3.2 IT Operators shall be responsible for the following:

3.2.1 Compliance with this procedure.

3.2.2 Report unusual occurrences to the IT Supervisor.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

3.4 The IT Analytical Technician shall be responsible for assisting with the sectioning, labeling, and sample collecting of core sections.

3.4.1 IT Analytical Technician shall be responsible for reporting unusual circumstances to the IT Supervisor and AEDO.

3.5 WMCO Transportation shall be responsible for transporting sampling equipment to the WMCO decontamination area.

4.0 DEFINITIONS

4.1 IT Supervisor - For the purposes of this procedure, the word "supervisor" refers to the IT Supervisor in charge of the sampling.

4.2 Radiation Safety Technician (RTS) - IT/WMCO Health Physics Personnel supporting sampling operations.

5.0 REFERENCES

5.1 DWP-003, "Breathing Air System"

5.2 SOP 65-C-105, "Preparation of Silo Samples for Long Term Storage" 71

5.3 SOP 65-C-106, "Silo Waste Handling"

5.4 FMPC-704, "Minor Event Reporting".

5.5 Operational Safety Requirements for the Sampling and Analysis of the materials in the K-65 Silos 1 and 2.

5.6 Plan-001 - "Site-Specific Health and Safety Plan.

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A defined safety system is not involved.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified by WMCO IRS&T.

OSR> 6.3 Personnel shall wear respiratory protection provided by the supervisor.

OSR> 6.4 Anti-contamination clothing shall be worn when handling residues from the K-65 Silos.

6.5 Leather-palm gloves shall be worn when handling drums/boxes/containers, operating equipment, and when handling rough, sharp-edged, or contaminated material.

6.6 HEPA type filter vacuum cleaners with knock-out drum or a vacuum system approved by WMCO IRS&T with a current (tested within last 6 months) DOP penetration test sticker shall be used for cleaning.

OSR> 6.7 Personnel exposure as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mR/week per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit 3.0 Rem/year.

6.8 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT Supervisor.

6.8.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to Radiological Safety for evaluation and the WMCO AEDO.

6.8.2 The involved employees shall report to WMCO Medical Services at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample. 72

6.8.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.9 A Radiation Work Permit is required prior to handling sample cores.

6.10 A ventilation system with a roughing filter and HEPA filter in line will be operated while using the airlock or during personnel inhabitation of the sampling trailer. A continuous air monitor (CAM) will be installed on ventilation system exhaust to monitor for radioactivity release.

6.10.1 The ventilation system approved by WMCO IRS&T will be required to have a current (tested within the last 6 months) DOP penetration test for the HEPA filter sticker.

6.10.2 The ventilation system will have the capabilities of a minimum of six air changes per hour.

6.11 At no time during operation of the inspection trailer shall more than one door of an airlock be open at the same time.

7.0 PROCEDURE

<u>7.1 Removing the lexan tube from the Vibra Corer barrel.</u>

7.1.1 Move the Vibra-Corer barrel through the equipment airlock to the entrance of the Examination Trailer.

7.1.2 Operate Breathing Air System per DWP-003.

7.1.3 Unscrew the lower "cutting shoe unit" of the Vibra-Corer and place the unit in "radioactive waste" plastic bag to be saved for possible decontamination.

7.1.4 Place a plastic cap on the open end of the LEXAN plastic tube and tape in place.

7.1.5 Cut plastic containment sleeving at the area around 20 ft. mark on the Vibra-Corer barrel.

7.1.6 Push back the sleeving exposing the coupling joint at the 20 ft. mark on the Vibra-Corer barrel.

7.1.7 Place plastic sheeting and a catch basin below the exposed joint.

NOTE

Wipe down the exposed vibra-core barrel with damp paper towels after the containment sleeve has been pushed back and secured.

NOTE

If there is a possibility of liquid present in the sample, extra caution must be implemented to prevent the spread of contamination.

7.1.8 Remove the bottom Vibra-Corer barrel section from the top section.

7.1.9 Remove the coupling holding the lexan tube together, and place this coupling in the radioactive waste bag as per WMCO procedure SOP-65-C-106.

7.1.10 Cap and tape all the ends of the lexan tube exposed.

7.1.11 Pull the lexan tube out of the bottom section of the Vibra-Corer barrel into the Examination Trailer.

7.1.12 Move the bottom section of the Vibra-Corer barrel onto the next cradle on the flat-bed trailer.

7.1.13 If sample material is present in the lexan tube in the top section of the Vibra-Corer barrel, pull the lexan tube out of the barrel into the Examination Trailer.

NOTE

Each time a cut is made on the lexan tube, a new sawblade will be used.

7.1.14 Cut off the excess lexan tube 1.5 ft. above the top of the sample material. Cap and tape exposed lexan tube.

7.1.15 Cover all exposed ends of the Vibra-Corer barrels.

7.1.16 Close the rear doors of Examination Trailer.

7.2 Cleaning and Inspecting Cores

NOTE

The RST shall monitor contamination, airborne and radiation levels continuously throughout sample core handling

7.2.1 Mist deionized water on paper toweling, wipe down the exterior of the lexan tube with the damp paper towels to remove any gross contamination.

7.2.1.1 Place paper toweling used for step 7.2.1 in the radioactive waste bag as per WMCO SOP-65-C-106 procedure.

7.2.2 Obtain a sample numbering label (Refer to Figure 5) with the Silo No. and manway location.

7.2.3 The IT Analytical Technician shall affix the label with manhole identification tag number to the top of the clean lexan tube.

7.2.4 The IT Analytical Technician shall measure the length of the sample core, and record this in the sectioning log.

7.2.4.1 The IT Analytical Technician shall mark the top of the tube.

7.2.5 The IT Analytical Technician shall inspect and videotape the core.

7.2.6 The IT Analytical Technician shall note that videotaping has been done in the project log book.

7.2.7 During completion of inspection, video recording and radiological scanning, the LEXAN encased core shall remain in the inspection trough.

7.3 Sectioning and Labeling Core Sections

NOTE

An equipment rinsate sample shall be performed on all analytical sampling equipment prior to sampling.

7.3.1 The IT Analytical Technician shall record the visual description and measurements of the sample in the "Sectioning Plan", Figure 1.

7.3.8 Recap the top end of the LEXAN liner with a plastic cap and seal the end with plastic vinyl tape.

7.3.9 Cut through the LEXAN liner at the next section marker using a new blade for each cut.

7.3.9.1 Cut, tape and label 5 to 7 inch core sections identified as undisturbed geotechnical samples. Set these samples aside.

7.3.9.2 For zoned sample cores keep the cut sections of each zone together.

7.3.10 Securely cap and tape adjoining ends of the liner exposed by each cut.

7.3.11 After capping, rotate the core section to an upright position.

7.3.12 Wipe each section with paper towels and Alconox solution (lab soap) and affix a sample label near the top of the core section.

7.3.13 Sample labels (See Figure 2) assigned to the core shall be prepared by the IT Analytical Technician.

7.3.14 The IT Technician shall record the unique core sample number and core manhole tag number on the sample label and complete the appropriate line on the "Sample Collection Log" (See Figure 3) and the "Chain-of-Custody Record" (See Figure 4).

7.3.15 Protect the label with a overlay of clear tape.

7.3.16 Mark the Silo No., Manway Location, Zone and Section No. on each section with permanent markers.

7.3.17 Southwest core samples will be archived, therefore proceed to step 7.6 on southwest core samples.

7.4 Collecting Samples of Core Sections for Analysis.

NOTE

Operators shall work with one core section at a time.

7.4.1 Place plastic and blotter paper on the sample workup table. Place the proper amount of mixing bowls and other materials needed on the sample workup table as directed by the IT Analytical Technician.

7.4.2 Obtain the correct number of sample bottles and place these on the sample workup table.

NOTE

A QC blind duplicate sample will be taken from a zone composite from the northwest core on Silo #2. QC triplicate samples will be taken from the southeast core of section sample in Silo #1 and a northeast core section sample of Silo #2.

7.4.3 The IT Analytical Technician shall attach sample bottle labels to the sample bottles.

NOTE

The sample bottle label shall duplicate the sample core label number.

7.4.4 The IT Analytical Technician shall record the core sample label number in the Sample Collection Log.

7.4.5 Place plastic and blotter paper on top of the work area.

NOTE

A new piece of plastic and blotter paper will be used for each core section. Do not used material spilled for analytical samples.

7.4.6 Remove the tape sealed caps from the lexan core section.

7.4.7 Remove from 1 to 2 inches of material from each open end of the core section, place material removed in a radioactive waste container per WMCO Procedure SOP-65-C-106.

7.4.8 A 2-inch wooden dowl or a 2 1/2 inch stainless steel plunger will be used to remove the silo material from the lexan tube. A new dowl or plunger shall be used for each section to minimize sample cross contamination.

7.4.9 Place the wooden dowl or stainless plunger into the lexan tube and push the material out of the lexan tube into a stainless steel mixing bowl.

7.4.9.1 Repeat steps 7.4.8 and 7.4.9 with the opposite end of the core section.

7.4.9.2 Repeat steps 7.4.8 to 7.4.9 as directed by the IT Analytical Technician until all sections of the zone have been completed as required for the silo core at hand.

NOTE

Latex gloves must be changed each time a new section/zone sample is handled.

7.4.9.3 For northwest and southeast core samples that are receiving chemical analysis, before each zone is composited, an equal amount of material must be removed from each section within the zone, and place this material into the sample bottle labeled HSL Volatiles and HSL PCB/Pesticides for that zone.

7.4.9.4 Once the HSL Volitiles and HSL PCB/Pesticides have been obtained from each sample core, these sample bottles will be placed in a cooler containing blue ice packs.

NOTE

Upon completion of Step 7.5, the HSL Organic and HSL and HSL PCB/Pesticides samples in the cooler will be transported to the WMCO facility where extractions will be performed on these samples. A chain-of-custody and request-for-analysis shall accompany these samples to the extraction lab.

7.4.10 For northwest and southeast core samples that are receiving chemical analysis, each section within each zone will be composited to form a zone composite.

NOTE

All samples to be weighed, shall be weighed on a calibrated balance in the examination trailer. A calibration check shall be done prior to any weighing and recorded on the sample collection log.

7.4.10.1 For northwest and southeast samples that are receiving engineering analysis, in addition to the 5" section in step 7.3.9.1, 4500 grams of material from the horizontal strata composite. Fifteen kilograms must be collected from each sample core.

NOTE

All composite samples will be a homogeneous mixture of the sections required within the zone. All mixing will be done on the sample workup table. Only one composite will be mixed at a time, all sections shall be composited on a weight (mass) basis, opposed to that of a volume basis.

7.4.10.2 For northwest and southeast core samples, that are receiving treatability analysis, 1 to 2 kg per zone core composite is required.

7.4.10.3 For the northwest, northeast, and southeast core samples, a single high-radiation sample will be taken from the area indicated in step 7.3.4.1. This sample will be 30 grams.

7.4.11 Before placing mixing bowls containing sample material on work bench, wipe the outside of the bowls with damp paper towels.

7.4.12 Place paper toweling into the radioactive waste container, as per WMCO SOP-65-C-106 Procedure.

7.4.13 Mix all samples requiring composite.

NOTE

If any liquid is present in the sample material, collect a 40 ml VOA bottle and a 500 ml amber bottle of this liquid, if possible. Mix the rest of the liquid into the material to be composited for that zone/strata. Record this in the sample collection log.

7.4.14 All sample cores requiring chemical analysis shall have 30 gram aliquots placed into the sample bottles as directed by the IT Analytical Technician.

7.4.15 Place sample aliquots as mentioned in steps 7.4.10.1 through 7.4.10.6 into the proper sample bottles as directed by the IT Analytical Technician.

7.4.16 Place all items not to be reused from the silo core sampling into the radioactive waste container as per WMCO SOP-65-C-106 Procedure.

7.4.17 Any item that will be reused will be decontaminated following RI/FS Work Plan Addendum SAP Section 3.4.

7.4.18 Vacuum any loose, spilled material with HEPA vacuum.

7.4.19 IT Analytical Technician shall check sample numbers against sample collection log.

7.4.20 Place any unused sample material from the mixing bowls into 1 liter Amber bottles labeled for long-term storage.

7.4.21 Mist deionized water onto paper towels, wipe down the outside of all bottles containing silo core sample material.

NOTE

If samples contain liquids, the sample bottle caps should be taped to the sample bottles using electrical tape.

7.4.22 Dry sample bottles with paper towels, place all paper toweling used in steps 7.4.28 and 7.4.29 in a radioactive waste container as per WMCO SOP-65-C-106 Procedure.

7.4.23 The RST shall monitor sample bottles for radiation/contamination and record this reading on the sample bottle labels. This step should be performed in a low-background area, if practical.

7.4.24 If the RST finds contamination, repeat steps 7.4.22 and 7.4.23 as necessary.

7.4.25 Place custody tape on each sample bottle and cap. If the samples are from the southwest manway to be archived, custody tape will be placed over both caps on the lexan tube.

7.4.26 Clean up work area, all materials used for sampling shall be considered radioactive waste and disposed of in a radioactive waste container as per WMCO SOP-65-C-106 Procedure. Vacuum up any loose material or dust generated during sampling.

7.5 Packaging Sample Bottles for Shipment.

7.5.1 Place blotter paper on work table area.

7.5.2 Place sample bottles to be shipped for analytical purposes on the work table.

7.5.3 Place the sample bottle in a plastic sample bag and heat seal the bag.

7.5.3.1 Label 1 qt. empty can the same as the sample bottle.

7.5.4 Pour packing material into a 1-qt. empty can. Place bagged sample bottle in can.

7.5.5 Pour packing material around and on top of bagged sample bottle in can. Secure lid on can.

7.5.6 Repeat steps 7.5.3 through 7.5.5 until all sample bottles and the engineering samples are packaged for shipment.

7.5.7 The RST shall monitor the shipping cans for radiation and record reading on can label. This step should be performed in a low-background area, if practical.

7.5.8 Place custody tape over the cap and can.

7.5.9 Put any paper, gloves, etc. used in repackaging the sample bottles in the radiation waste container as per WMCO SOP-65-C-106.

7.5.10 Using the HEPA filtered vacuum cleaner, vacuum dust that may have occurred from packing procedures.

7.5.11 The Analytical Technician will notify the IT Supervisor that the shipping containers are ready for transfer to the storage area for shipment to the Analytical Laboratory. WMCO will complete the final packaging for shipment of all samples.

NOTE

Analysis on Engineering and Treatability samples will be conducted in WMCO facilities.

7.6 Repackaging Core Sections

7.6.1 Clean the core section with deionized water, Alconox solution, and paper towels. Dry with paper towels. Monitor the core section for loose contamination.

7.6.2 Place the core section in a plastic sample bag and heat seal the bag.

7.6.3 Place bagged core section in long-term storage containers, on end, top up with packaging material as per WMCO Procedure SOP-65-C-105.

7.6.3.1 IT Supervisor will check to make sure that storage container, is properly labeled in accordance with its contents.

7.6.4 Roll up the disposable paper in the repackaging work area.

7.6.5 Place paper, used work gloves in the "Radioactive Waste" plastic bag per WMCO Procedure SOP 65-C-106.

7.6.6 Using the HEPA filtered vacuum cleaner, remove visible dust. Turn off vacuum cleaner when finished.

7.6.7 Notify IT Supervisor that core sections are ready for long-term storage.

7.7 Decontamination of Equipment

7.7.1 If sampling equipment is to be reused, notify IT Supervisor that sampling equipment is ready for movement to designated decontamination area.

7.7.2 IT Supervisor shall request WMCO Transportation to move sampling equipment for decontamination.

7.7.3 WMCO shall perform a gross decontamination as per WMCO Procedure SOP-1-C-915.

7.7.4 Equipment shall be transported back to site by WMCO transportation by direction of IT Supervisor.

7.7.5 General sampling equipment shall receive additional decontamination as prescribed in Section 3.4, decontamination procedures, as directed by the IT Supervisor.

7.7.6 Analytical sampling equipment shall receive additional decontamination as prescribed in Section 3.4, decontamination procedures, as directed by the IT Analytical Technician.

NOTE

An equipment rinsate shall be performed on all analytical sampling equipment using deionized water as directed by the IT Analytical Technician. These rinsates shall be performed on a rate of one rinsate for every ten samples.

8.0 DISPOSAL OF SAMPLING EQUIPMENT

8.1 When the IT Supervisor or IT Analytical Technician determine that equipment is no longer suitable for sampling, disposal of this equipment shall follow WMCO Procedure SOP-65-C-106.

NOTE

The RST shall monitor contamination, airborne and radiation levels periodically throughout equipment disposal handling.

8.2 Cover entire work area with plastic sheeting. Place tools needed for disposal in work area.

8.3 Decontaminate equipment prior to cutting with an approved cleaner, then wipe down with paper towels.

8.4 Cut the containment sleeving and lexan tubes into 3 to 6 ft. lengths depending on size of the container.

8.5 Place cut lengths as a unit in a metal container that is lined with plastic and uncalcined diatomaceous earth per WMCO Procedure SOP-65-C-106.

8.6 Cut metal Vibra-Corer barrels into 3 to 6 ft. lengths depending on the size of the container.

8.7 Place cut lengths as a unit in a metal container that is lined with plastic and uncalcined diatomaceous earth per WMCO Procedure SOP-65-C-106.

8.8 Smaller analytical sampling equipment will be disposed of in radiation waste bags as per WMCO Procedure SOP-65-C-106.

8.9 Place paper toweling, work gloves, hacksaw blades, plastic sheeting or any other items used in procedure in a radiation waste bag as per WMCO Procedure SOP-65-C-106/

8.10 Notify IT Supervisor that disposal work has been completed and that waste containers may be moved.

8.11 IT Supervisor will notify WMCO Transportation that waste containers are ready to move to WMCO holding facilities.

9.0 APPLICABLE FORMS

9.1 Figure #1, "Sectioning Plan"

9.2 Figure #2, "Analytical Sample Bottle Label"

9.3 Figure #3, "Sample Collection Log"

9.4 Figure #4, "Chain-of-Custody Record"

9.5 Figure #5, "LEXAN Tube Label"

INTERNATIONAL TECHNOLOGY CORPORATION

PAGE ____ OF ____
CHECKED BY ____

SECTIONING PLAN

DATE STARTED: ____
TIME STARTED: ____
SILO NO. ____
MANWAY LOCATION: ____

DATE COMPLETED: ____
TIME COMPLETED: ____
TOTAL LENGTH OF CORE: ____

ZONE	SECTION	LENGTH OF SECTION	NOTES	FOR ARCHIVE PURPOSES

CORE SECTIONS ARE TO BE APPROXIMATELY 18 INCHES IN LENGTH

SIGNATURE ____ DATE/TIME ____

SECTIONING PLAN
Figure 1

SILO #1 RESIDUES ANALYTICAL SAMPLE

COLLECTOR:	______	I.D. NO.:	______
DATE COLLECTED:	______	SILO NO.:	______
TIME COLLECTED:	______	MANWAY:	______
GROSS WEIGHT:	______	ZONE:	______
TARE WEIGHT:	______	SECTION:	______
SAMPLE WEIGHT:	______	ANALYSIS REQUIRED:	______

ANALYTICAL SAMPLE BOTTLE LABEL
Figure 2

1300

IT FERNALD RI/FS

DATE						
TIME						
PAGE ____ OF ____						
PAGE						
PROJECT NO.						

FIGURE 3

SAMPLE COLLECTION LOG

PROJECT NAME ______________________

SAMPLE NO. ______________________

SAMPLE LOCATION ______________________

SAMPLE TYPE ______________________

COMPOSITE ____ YES ____ NO

COMPOSITE TYPE ______________________

DEPTH OF SAMPLE ______________________

WEATHER ______________________

CONTAINERS USED	AMOUNT COLLECTED

COMMENTS:

PREPARED BY: ______________________

FERNALD RI/FS

CHAIN-OF-CUSTODY RECORD

R/A Control No. ____________

C/C Control No. ____________

PROJECT NAME/NUMBER ____________ LAB DESTINATION ____________

SAMPLE TEAM MEMBERS ____________ CARRIER/WAYBILL NO. ____________

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ____________

Possible Sample Hazards: ____________

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ____________

   Received By: ____________

2. Relinquished By: ____________

   Received By: ____________

3. Relinquished By: ____________

   Received by: ____________

4. Relinquished By: ____________

   Received By: ____________

90

WHITE - To accompany samples
YELLOW - Field copy

1300

INTERNATIONAL TECHNOLOGY CORPORATION

SILO #2 RESIDUES ANALYTICAL SAMPLE

COLLECTOR:	________	I.D. NO.:	________
DATE COLLECTED:	________	SILO NO.:	________
TIME COLLECTED:	________	MANWAY:	________
GROSS WEIGHT:	________	ZONE:	________
TARE WEIGHT:	________	SECTION:	________
SAMPLE WEIGHT:	________	ANALYSIS REQUIRED:	________

LEXAN TUBE LABEL
Figure 5

BREATHING AIR SYSTEM PROCEDURE

1.0 PURPOSE

To provide the procedure for operating and monitoring the Breathing Air System.

2.0 APPLICABILITY

This procedure is applicable to the operation of the Breathing Air System during silo sampling and sample core handling in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.2 Providing personnel with the required respiratory protection and anti-contamination clothing.

3.1.3 Ensuring that only trained personnel perform the steps of this procedure.

3.1.4 Initiating and implementing Radiation Work Permit.

OSR> 3.1.5 Reporting exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifying the IT Project Manager and WMCO AEDO of the circumstances.

3.2 IT Operators shall be responsible for complying with this DWP and reporting any unusual occurrences to the IT Supervisor or in the Supervisors absence, the IT Project Manager and WMCO AEDO.

4.0 DEFINITIONS

4.1 Breathing Air System - A twenty-foot tube trailer containing approximately 45,000 ft.^{3} of breathing air used to supply personnel through a regulator and manifold system for the sampling process.

4.2 IT Supervisor - For the purposes of this procedure, the word "Supervisor" refers to the IT Supervisor in charge of the silo sampling.

5.0 REFERENCES

Plan-001, "Site-Specific Health and Safety Plan"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A defined safety system is not involved.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified by IRS&T.

OSR> **6.3** Respiratory protection provided by the IT Supervisor shall be worn when required.

6.4 A sampling crew member shall be specifically assigned to monitor air pressures.

6.5 All breathing air connections shall be surveyed for contamination by an RST prior to connection to the system. Connections found contaminated shall be properly disposed.

6.6 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT Supervisor and the AEDO. The Supervisor shall immediately report the circumstance of possible radioactive materials intake to Radiological Safety for evaluation. The involved employees shall report to Medical Services at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample. The Supervisor shall consider the circumstances to be a Minor Event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.7 Breathing air lines shall not exceed 300 ft. in length from the manifold.

6.8 The air in the breathing system shall be Grade D quality or better.

7.0 PROCEDURE

7.1 Set-up

7.1.1 Attach the high/manifold pressure regulating valve to the "male" trailer connection.

7.1.2 Check to ensure the Manifold Pressure Regulating Valve is closed.

7.1.3 Connect the Main Breathing Air Line to the Pressure Regulating Valve.

NOTE

Ensure all connections of the Breathing Air Line matrix have been tightened.

7.1.4 Slowly open one of the four main air valves at the rear of the tube trailer.

7.1.5 Record the Main Pressure Gauge reading in the "Breathing Air System Log" (See Figure 2).

7.1.5.1 If the Main Pressure Gauge reading is less than 500 psig, notify the IT Supervisor.

NOTE

Full compressed air cylinders are 2800 psi pressure

7.2 Monitoring

7.2.1 Adjust Manifold Pressure Regulating Gauge to read as dictated by the pressure chart (See Figure 1)

7.2.2 Record the main and manifold pressure gauge readings every 15 minutes on the "Breathing Air System Log".

7.2.3 If the main pressure drops below 500 psig during the silo sampling operation during the sample core handling procedure, complete the following:

7.2.3.1 Notify IT Supervisor of the low pressure situation.

7.2.3.2 Notify airline users of a possible air flow interruption.

7.2.3.3 Quickly close the open "main air valve" located at the rear of the tube trailer.

NOTE

The closing of one valve and the opening of another should take about twenty seconds and the airline users have approximately two minutes of air in their suits.

7.2.3.4 Slowly open the next in line "main air valve".

7.2.3.5 Notify airline users of the reestablishment of air service and confirm there was not an interruption.

7.2.3.6 Tag out valve of the empty air tubes.

7.3 Shutdown

7.3.1 At the end of each daily sampling/core handling operation, close main pressure valve and pressure regulating valve.

7.3.1.1 If directed by the IT Supervisor, disconnect airlines from tube trailer and cap.

8.0 APPLICABLE FORMS

8.1 Figure 1, "Pressure Chart"

8.2 Figure 2, "Breathing Air System Log"

FIGURE 1

PRESSURE CHART

Length (Feet)	No. of Sections	Pressure Range/(psig)
25-50	1 or 2	20-34
75-100	1-4	25-45
125-175	2-6	30-50
200-275	2-6	38-55

RADON MONITORING AND SAMPLING CHECKLIST FOR K-65 SILOS

1.0 OVERVIEW

This procedure addresses the Radon Monitoring Plan for the sampling of the K-65 Silos. Training on this procedure will be conducted for the Radiological Safety Technicians on the Radon Monitoring Plan. This training session will be documented. Training of the operations personnel will be conducted on the K-65 Silo Sampling Procedures and will be documented in the project files.

2.0 SITE PREPARATION PRIOR TO STARTING THE SAMPLING OPERATION

Section 1.0 of the checklist which follows this procedure is intended as a checklist for items that must be completed each work day prior to starting the sampling of the K-65 Silos. The appropriate person must sign the checklist Signature Sheet in the K-65 Silo Sampling Checklist (Attachment 1) for each step in Section 1.0 at the beginning of each work day. The checklist also identifies Operational Safety Requirements (OSR) for the sampling efforts. The IT Supervisor is responsible for obtaining all signatures. All work performed inside the K-65 High Radiation Area during the site preparation must be done under the cognizance of an RST and the IT Supervisor. All Health and Safety requirements will be documented on the Radiation Work Permit (RWP). All radiation readings taken by the RST will be documented on Health Physics forms. Acceptability of these readings will be noted in the K-65 Silo Sampling Checklist. WMCO will operate the Radon Reduction System and is responsible for OSR requirements to that system's operation.

2.1 Prior to Starting the Sampling Operation

NOTE

Any sampling work on the silos must be initiated between 4:00 a.m. and 2:00 p.m.

2.1.1 Prior to starting the initials equipment staging, the Radon Treatment System must be operated with sufficient cool down period, usually <u>two hours</u>, so the radon daughters that have plated out on the inside of the piping have decayed to safe levels approved by the RST. Also, it is the responsibility of the IT Supervisor to assess weather conditions and its impact on radon concentration prior to initiating sampling activities.

OSR> 2.1.2 Each day, prior to any workers entering onto the silo dome, the RST is to take radiation dose readings on the surface of the dome. See Table 1, page 3 of 3 for Location Numbers 24-31. Each reading should be documented with the date, time, silo number, location, dose rate and RST signature. If the dose rates are above 100 mrem/hr, the Radon Treatment System must be operated (see WMCO Radon Treatment System Operation Plan) prior to starting the sampling operation.

OSR> **2.1.3** Each work day, the IT Supervisor must make sure that proper anti-contamination clothing, protective gloves, full-face air purifying, and full-face forced air respirators and SCBA equipment are available at the construction site in quantities sufficient for the job. The IT Supervisor is responsible for supplying the anti-contamination clothing, protective gloves, full-face air purifying respirators, full-face forced air respirators, SCBA equipment, and additional safety gear.

2.1.4 Prior to the initial equipment staging and before each work day, the IT Supervisor is to make sure that the following items are located at the construction site and functioning properly:

1) Portable Eyewash Bath
2) K-65 Emergency Phone
3) Emergency Pull Box
4) 2 X ABC Fire Extinguisher (at least 10 lbs)
5) First Aid Kit
6) Radios

2.1.5 Each work day, an RST must check to make sure that the RGM-2 units or equivalent around the silos are operating properly and that all air samplers including the WLM units that will be used by the RST during the sampling are operating properly and are located in the proper locations (See Section 4.0).

2.1.6 Each work day, prior to removing any manway cover or flange assembly, the IT Supervisor is responsible for having the breathing air equipment and air lines located in the proper place and functioning properly. The IT Supervisor will determine the wind speed and direction from Security (6295). If the wind speed is excessive as determined by the IT Supervisor, sampling activities will stop until the wind has subsided.

2.1.7 Also, if a thunderstorm or severe weather is eminent, sampling activities will not begin or continue and will follow shutdown steps outlined in Table 7.

2.1.8 Sampling activities will not begin unless the following minimum personnel are present:

Crane Spotter (1)
Crane Operator (1)
Sample Technicians (2)
IT Supervisor (1)

2.1.9 The RST will check each person prior to entering the K-65 high radiation area during site preparation to see if the Self-Reading Pencil Dosimeters (SRPD) and Thermo Luminescent Dosimeters (TLD) are being properly worn, if the anti-contamination clothing is being properly worn by each person. The requirements for entering the high radiation area for each person during site preparation will be the same as the requirements set for each person during the staging of equipment (see Section 3.1). All personnel who handle the silo materials shall wear Finger Ring TLDs.

3.0 SILOS SAMPLING

Section 2.0 of the checklist is intended as an overview that will be followed during the sampling operations. The plan includes requirements that must be met by all personnel during the staging of the equipment. All items listed in Section 2.0 must be completed with the Checklist Signature Sheet filled out before starting the sampling operation. All work performed inside the K-65 high radiation area during the equipment staging must be done under the cognizance of an RST and the IT Supervisor. All Health and Safety requirements will be documented on the IT Radiation Work Permit (RWP).

3.1 Protection Requirements for Personnel Section 3.1 explains the requirements in protective clothing, radiation monitoring devices, and respiratory protection that will be met by each person entering the K-65 high radiation area during the sampling operation. The RST will check each person prior to gaining access in the high radiation area to assure all the following requirements have been met.

3.1.1 Before entering the K-65 high radiation area, each person must be wearing the proper anti-contamination clothing. Each person will be wearing disposable anti-contamination suit and hood. The hands will be covered by rubber gloves with cloth liners that are approved by the RST. Work gloves will be placed over the rubber gloves when handling equipment and tools. Nitrile gloves will be worn when working in the manway glove bag or when exposed to high levels of radon gas. Each worker will be wearing the proper safety boots. Each worker shall have the anti-contamination suit properly taped at the wrist, ankle, zipper, and hood so no flesh is exposed. All openings or tears in the anti-contamination clothing will be taped closed with duct tape and approved by the RST.

OSR> **3.1.2** Each person entering the K-65 high radiation area must be wearing a TLD and SRPD badges properly. The RST will read the SRPD each time a person exits the high radiation area or at a minimum of every two hours to assure each individual is within the allowable whole body exposure limits. The allowable whole body exposure limits for personnel involved with the equipment staging will be 300 mrem/week. Personnel who will handle silo sampling material shall wear Finger Ring TLDs. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

3.1.3 While the manway covers are secured, each person will, at a minimum, properly wear a full-face air purifying respirator when inside the high radiation area.

3.1.4 When the manway covers are ready to be removed, each person in the K-65 high radiation area must be wearing a full-face forced air respirator and will continue to wear this respirator until all manway covers are secured again.

3.1.5 When the manway covers are ready to be removed, each person outside the K-65 high radiation area up to 50 meters or 164 feet from the high radiation area must, as a minimum, wear a full-face air purifying respirator. Each person while in this area will continue to wear any respirator until all manway covers are secured again. Personnel beyond 50 meters from the K-65 high radiation area are not required to wear any respiratory protection.

3.1.6 If the breathing air equipment malfunctions while the manway covers are removed, all personnel will immediately leave the K-65 high radiation area and replace the full-face forced air respirator with a full-face air purifying respirator up to 50 meters or 164 feet from the high radiation area. At any time when the supplied air is disconnected, cover connection ends with tape or plastic. A smear sample will be taken by the RST before the connections can be re-used to ensure no contamination was present. These readings will be documented in Table 5 Radiological Survey Report (FMPC-OSH-1933-1). The IT Supervisor will inspect the breathing air equipment to see if the equipment can be repaired quickly. If not, personnel must reinstall and secure the cover on the manway using SCBA equipment.

3.1.7 The following criteria for respiratory protection will be followed for Working Level (WL) grab sampling during the sampling operations:

0 to 0.075 WL: No respirator is required
0.075 to 16.5 WL: Full-face air purifying respirator
16.5 to 660 WL: Full-face forced air respirator
greater than 660 WL: SCBA equipment

3.2 K-65 SILOS DOME LOAD LIMITATIONS

Section 3.2 explains the load limitations for each silo dome surface and dome cap. Each person must be familiar with these limitations and must follow these limitations throughout the project.

3.2.1 All equipment and material supplies must be staged in such a way that no forces act on the berm within three feet of the silo walls. Staging of equipment and material supplies must be accomplished in such a way that no weight is placed on the 12 inch PVC piping for the radon treatment system.

OSR> 3.2.2 The maximum amount of combined personnel and equipment load that can ever be placed on the silo surface (excluding the dome cap) during the sampling cannot exceed 700 pounds and all weight applied by the equipment will be distributed to avoid point loading.

OSR> 3.2.3 No more than three people total are allowed on the silo dome. A minimal amount of workers should be on the dome surface at all times. At no time will personnel be allowed on the dome center cap area.

3.3 MANWAY COVER REMOVALS

NOTE

Prior to the manway covers being removed, all personnel must be in the proper respirator, anti-contamination clothing, and TLD and SRPD badges as described in Section 3.1

OSR> 3.3.1 The RST must have taken radiation dose rates on the surface of the dome at the four manways per silo prior to removing any manway cover. If any dose rate is above 100 mrem/hr, no manway cover will be allowed to be removed. The Radon Treatment System will have to be operated before any manway cover can be removed.

OSR> 3.3.2 During the sampling operation, dose rates will be taken every two hours at locations 24-27 (when sampling Silo 1) and 28-31 (when sampling Silo 2) and will be documented in Table 1 Radiation Survey Results.

3.3.3 Prior to removing the manway, a manometer will be attached to the silo by the IT Supervisor to check the pressure inside the silo. If the silo is pressurized, the removal of the manway covers will not begin. The pressure inside the silo must be at equilibrium or in a vacuum prior to proceeding with the removal to the manway pipe covers. Log pressure readings in Table 3.

4.0 RADON MONITORING

Two short-term interpretation monitoring techniques will be employed during the sampling of each silo while the manway covers are removed. Each of the two techniques area discussed in Sections 4.1 - 4.2 The monitoring locations are shown in Table 1 Radiation Survey Results, page 3 of 3.

4.1 WORKING LEVEL GRAB SAMPLING

Working Level grab samples will be collected using a portable, battery powered air pumps with a small filter located next to the manways. Working Level grab samples will be collected immediately after the manway covers are removed and during the sampling operation. The Working Level grab samples will be used to determine if the proper respiratory protection is being used for that area. These samples will be taken in accordance with WMCO Procedure EM-2-020, "Environmental Radon Monitoring".

The Working Level grab samples will be collected in the immediate vicinity of the manways, at the base of the berm downwind, and at the Work Area during the sampling operation. All Working Level grab samples will be taken downwind at the designated spots. The Working Level grab samples will be taken, before start of work, hourly when the manway covers are removed, and at 2 hours after the sampling has been completed and the manways have been covered and secured for a silo.

4.2 RADON GAS MONITORS (RGM-2)

4.2.1 Continuous radon gas monitoring is conducted at the K-65 fenceline using alpha scintillation devices known as RGM-2 or equivalent devices. The location of the RGMs are approximately east and west of each of the K-65 Silos' fenceline as shown in Table 1, Radiation Survey results (Page 3 of 3).

4.2.2 Determine the average of the maximum readings for each of the RGM-2 units for the prior month. Record these values and an average of the values under the column entitled "Operating Limits" in Table 6, "Radon Gas Monitor Readings".

4.2.3 Every hour while the manway covers are off, the RGM-2 unit readings will be checked and recorded in Table 6 Radon Gas Monitor Readings.

4.2.4 If the average RGM-2 unit readings for one hour or readings from an individual RGM-2 unit for two consecutive hours exceed the average of the maximum individual RGM-2 readings from the previous month, the following actions shall be taken:

4.2.4.1 Reinstall the manway covers.

4.2.4.2 The RST should immediately take downwind Work Level grab samples to verify and measure whether any radon release had occurred.

4.2.4.3 Do not proceed with sampling or restart the radon treatment system without approval from an RST.

Silo Number_______
Manway Location___

K-65 SILO SAMPLING CHECKLIST

To be signed and dated when completed. All tables referred to this checklist are attached as example only except for Table 3 Manometer Readings. The RST's will document all radiological data in their logs. Copies of these logs will be subsequently reproduced and placed in project file.

1.0 Preparations

>OSR 1.1 The K-65 Radon Reduction System has been operated to reduce radiation levels on the silo dome to less than 75 mR/hr. When surface radiation levels climb to 100 mR/hr, sampling operations will be suspended and the Reduction System reactivated.

_____________ _______ __________
IT Supervisor Date Time

>OSR 1.2 Two gamma specific radiation meters readings in units of mR/hr are placed on the silo dome during sampling operations. Instruments are to be monitored every two hours during sampling operations and results recorded in supervisor's logbook. Meters have been calibrated within six months of the start of sampling and have been response checked within the last 30 days.

_____________ _______ __________
IT Supervisor Date Time

1.3 Safety equipment present:

__ Anti-C clothing
___ Gloves (Nitrile and Latex/Rubber)
___ Full-face air purifying respirators/cartridges
___ Full-face air-supplied respirators & air tanks charged & ready
___ SCBA equipment

_____________ _______ __________
IT Supervisor Date Time

Silo Number_______
Manway Location___

1.4 Additional safety items:

___ Portable eyewash bath
___ K-65 Emergency Pull Box
___ 2-Fire Extinguisher
___ Emergency Telephone
___ Radios
___ First Aid Kit

_______________ _______________ _______________
IT Supervisor Date Time

1.5 At least 4 Radon Gas Monitors (RGM -2 or equivalent) have been checked that they are operating properly and are at proper locations. Air samplers are properly placed and operational.

_______________ _______________
IT Supervisor Date

1.6 Wind Direction _____________ Wind Speed ________________ No ensuing thunderstorm - otherwise shutdown sampling operations per Table 7.

_______________ _______________
IT Supervisor Date

>OSR 1.7 a. Minimum manpower required present to begin sampling.

Crane Spotter (1)
Crane Operator (1)
Sample Technicians (2)
IT Supervisor (1)

b. Minimum manpower to transport samples.

Truck Driver (1)
Sample Technicians (2)

_______________ _______________
IT Supervisor Date

Silo Number______
Manway Location___

>OSR 1.8 All personnel wear all required clothing and safety equipment.

____ a. Anti-C Clothing/Hoods/Booties
____ b. Respirators
____ 1. Air-purifying full-face - silo manways closed
____ 2. Air-supplying - silo manways open
____ c. Pencil dosimeters (SRPD)
____ d. Badge dosimeters (TLD)
____ e. Finger ring dosimeters (TLD)
RST ______________ Date ______________

1.9 WMCO Security notified at (6295).

______________ ______________
IT Supervisor Date

1.10 WMCO EOC notified.

______________ ______________
IT Supervisor Date

1.11 WMCO Public Affairs notified.

______________ ______________
IT Supervisor Date

1.12 Crane is properly located.

______________ ______________
IT Supervisor Date

1.13 Radiation Work Permit in place.

______________ ______________
IT Supervisor Date

Silo Number_______
Manway Location___

>OSR 1.14 Personnel exposures are limited to 300 mR/wk, and 3.0 R/yr. (site), 5.0 R/yr (DOE)

_______________ _______________
IT Supervisor Date

1.15 Breathing air system is available and is operated per DWP-003 - Breathing Air System. Pressures are monitored and recorded every 15 minutes.

_______________ _______________
IT Supervisor Date

>OSR 1.16 Entrance to the Radon Treatment System is properly posted and access restricted. System external ducting has been inspected for integrity.

_______________ _______________
IT Supervisor Date

>OSR 1.17 Maximum number of personnel on the silo dome is limited to three (3) or less.

_______________ _______________
IT Supervisor Date

1.18 Personnel involved in sampling operations have completed the required training, including WMCO Radiation Worker Training.

_______________ _______________
IT Supervisor Date

OSR> 1.19 OSR Violations and other DOE reportable events will be reported in accordance with FMPC-703, "Unusual Occurrence Reporting" and FMPC-704, "Minor Event Reporting System".

_______________ _______________
IT Supervisor Date

OSR> 1.20 Silo safety net(s) installed per DWP-007, K-65 Silo Safety Net Application.

_______________ _______________
IT Supervisor Date

Silo Number_______
Manway Location___

2.0 Sampling Operations

2.1 Sample Points are properly marked with metal tags wrapped around the manway nozzles with metal wires.

________________ ________________
IT Supervisor Date

2.2 Sampling Equipment has been prepared per DWP-001, Silo Sampling.

________________ ________________
IT Supervisor Date

2.3 Acceptable Working Level grab sample before start of work taken and tabulated in Table 2 Air Sample Report.

________________ ________________
RST Date

2.4 Manometer readings acceptable for Flange Removal tabulated in Table 3.

________________ ____________________
Reading Technician/Date/Time

2.5 Radon gas monitors (RGM-2 or equivalent) checked and recorded hourly in Table 6 when manway covers are off in Table 1 Radiation Survey Results. An average for one reading or an individual reading for two consecutive readings cannot exceed average of maximum individual readings for the previous month.

________________ ________________
RST Date

>OSR 2.6 Dome surface dose rates taken every two hours at locations 24-27 (when sampling Silo 1) and 28-31 (when sampling Silo 2) and recorded in Table 1 Radiation Survey results.

________________ ________________ ____________
RST Date Time

Silo Number_______
Manway Location___

2.7 Acceptable Working Level grab sample will be taken every hour tabulated in Table 2 Air Sample Report when manway cover is removed.

____________	____________	____________
IT Supervisor	Date	Time

2.8 Remove Manhole Flange, and set up containment bag per DWP-001, Silo Sampling. Time of manway removal will be documented in the Supervisor's Logbook.

____________	____________
IT Supervisor	Date

2.9 Obtain samples of residues per DWP-001, Silo Sampling.

____________	____________
IT Supervisor	Date

2.10 Replace manway cover per DWP-001, Silo Sampling.

____________	____________	____________
IT Supervisor	Date	Time

2.11 Acceptable Work Level grab samples tabulated in Table 2 Air Sample Log.

____________	____________	____________
IT Supervisor	Date	Time

OSR> 2.12 Pencil dosimeters read at a minimum of every two hours and recorded in Dosimeter log at the end of the workday or upon exit of controlled area. Airline connections smear surveyed documented in table 5 prior to reentry to control area.

____________	____________
RST	Date

2.13 Remove containment bag per DWP-001, Silo Sampling.

____________	____________
IT Supervisor	Date

Silo Number_______
Manway Location___

2.14 Transport of Equipment is per DWP-001.

_______________ _______________
IT Supervisor Date

2.15 Conduct initial on-site core handling and inspection per DWP-002, Sample Core Handling.

_______________ _______________
IT Supervisor Date

2.16 Section and package the sample cores per DWP-002, Sample Core Handling.

_______________ _______________
IT Supervisor Date

2.17 Acceptable Working Level grab samples taken before, after and every two hours during the sectioning of the cores documented in the Table 2 Air Sample Log.

_______________ _______________
RST Date

>OSR 2.18 Pencil dosimeters read at a minimum of two hours and documented in Dosimeter Log.

_______________ _______________
IT Supervisor Date

2.19 At end of each day, printout from Radon Monitoring Equipment attached to Radiation Survey Forms.

_______________ _______________
IT Supervisor Date

2.20 Store the cored sections in Archive Storage per WMCO Procedures.

_______________ _______________
IT Supervisor Date

Silo Number_______
Manway Location___

2.21 Working Level Samples are taken two hours after sampling (manways closed) documented in Table 2 Air Sample Report.

______________________ ____________________
IT Supervisor Date

Silo Number ________
Manway Location ________

TABLE 1. RADIATION SURVEY RESULTS

RADIATION SURVEY RESULTS

NUMBER	LOCATION	Background	Start	2nd Hour	4th Hour	6th Hour	8th Hour
	TIME						
			GAMMA READING				
1	TAPE MARK, WEST K-65 FENCE						
2	TAPE MARK, WEST K-65 FENCE						
3	TAPE MARK, WEST K-65 FENCE						
4	TAPE MARK, WEST K-65 FENCE						
5	TAPE MARK, WEST K-65 FENCE						
6	TAPE MARK, WEST FENCE, TREATMENT SYSTEM						
7	TAPE MARK, WEST FENCE, TREATMENT SYSTEM						
8	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
9	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
10	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
11	ROOF OF TREATMENT SYSTEM						
12	ROOF OF TREATMENT SYSTEM						
13	ROOF OF TREATMENT SYSTEM						
14	TAPE MARK, EAST FENCE, TREATMENT SYSTEM						
15	TAPE MARK, EAST FENCE, TREATMENT SYSTEM						
16	TAPE MARK, EAST K-65 FENCE						
17	TAPE MARK, EAST K-65 FENCE						

DATE: ________

BY: ________

Instrument: ________

Serial No.: ________

K-65 SILO SAMPLING CHECKLIST

Silo Number __________
Manway Location __________

TABLE 1. RADIATION SURVEY RESULTS Page 2 of 3

RADIATION SURVEY RESULTS

	TIME	Background	Start	2nd Hour	4th Hour	6th Hour	8th Hour
NUMBER	LOCATION		GAMMA READING				
18	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
19	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
20	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
21	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
22	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
23	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
24	CONTACT, SILO [illegible] DOME SURFACE						
25	CONTACT, SILO #1 DOME SURFACE						
26	CONTACT, SILO #1 DOME SURFACE						
27	CONTACT, SILO #1 DOME SURFACE						
28	CONTACT, SILO #2 DOME SURFACE						
29	CONTACT, SILO #2 DOME SURFACE						
30	CONTACT, SILO #2 DOME SURFACE						
31	CONTACT, SILO #2 DOME SURFACE						

DATE: __________

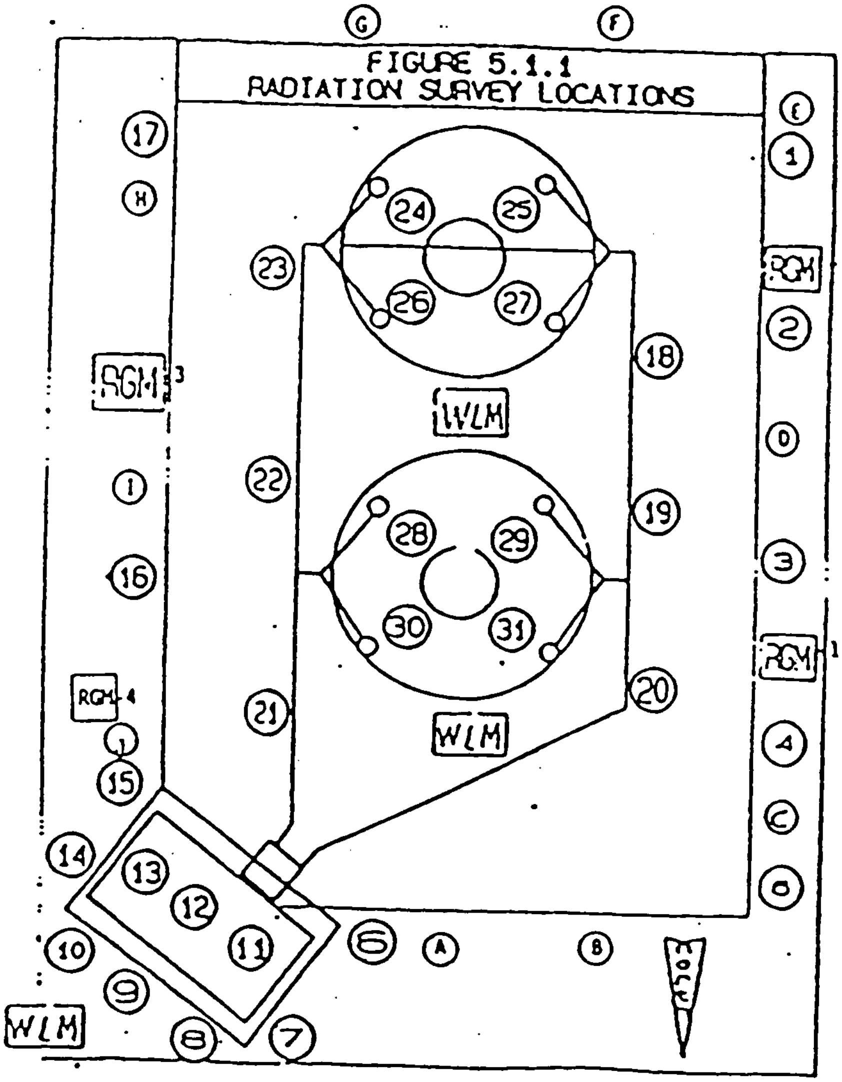
BY: __________

Instrument: __________
Serial No.: __________

K-65 SILO SAMPLING CHECKLIST

Silo Number ________
Manway Location ________

TABLE 1. RADIATION SURVEY RESULTS Page 3 of 3



K-65 SILO SAMPLING CHECKLIST

FMPC
RADIOLOGICAL SAFETY
AIR SAMPLE REPORT

SAMPLE COLLECTION DATA

SAMPLE NUMBER: | SAMPLE MEDIUM: | PUMP NUMBER: | COLLECTOR'S INITIALS: | SAMPLE TYPE: ☐ BZ ☐ GA

SAMPLE START: DATE: TIME: | SAMPLE END: DATE: TIME: | FLOW RATE: START: END: ☐ L/min ☐ m³/min

CONTAMINANT: | RUN TIME: HOURS: [ ] X 60 = MINUTES: [ ] + EXTRA MIN.: [ ] = TOTAL MIN.: [ ] | AVG. FLOW: | PUMP COUNTER: START: END: | AIR VOLUME:

SAMPLE COUNT RECORD

	INST. NO.	BKGD.	EFF.	TIME	DATE	GROSS COUNTS	COUNT TIME	ACTIVITY µCi/cc	RST	HOUR OF COUNT
1α								. E-		
1β, γ								. E-		
2α								. E-		
2β, γ								. E-		
3α								. E-		
3β, γ								. E-		
4α								. E-		
4β, γ								. E-		
5α								. E-		
5β, γ								. E-		
6α								. E-		
6β, γ								. E-		
7α								. E-		
7β, γ								. E-		

OTHER SAMPLE DATA

BUILDING/PLANT: | LEVEL: | COORDINATES: | PLANT JOB NO.:

PRODUCTION IDENTITY:

SPECIFIC LOCATION:

VENTILATION/UNUSUAL OCCURENCES:

ZONE: ☐ 1 ☐ 2 ☐ 3

MINIMUM RESPIRATORY PROTECTION REQUIRED: ☐ HALF FACE ☐ FULL FACE ☐ AIRLINE WITH FULL FACE ☐ RWP REQUIRED FOR ENTRY

GA SAMPLE DATA

HEIGHT ABOVE FLOOR (ft.): | EQUIPMENT:

DISTANCE (ft.): DIRECTION (N,S,E,W): FROM EQUIPMENT:

BZ SAMPLE DATA

EMPLOYEE NAME: | BADGE NO.: | JOB CLASSIFICATION:

RESPIRATOR TYPE: | OTHER PERSONAL PROTECTION:

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FMPC-2751 (REV. 4/19/89)

FILE COPY

K-65 SILO SAMPLING CHECKLIST

Silo Number ____________
Manway Location ________

TABLE 3
MANOMETER READING

DATE	TIME	READING (INCHES)	TECHNICIAN
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------

NOTE: Pressure readings on the manometer must read zero or indicate a vacuum prior to manway removal.

Silo Number ________
Manway Location ________

F M P C	RADIATION PROTECTION RECORDS DIRECT READING DOSIMETER LOG					
DOSIMETER SERIAL	ISSUED		READ		READING - mR	RADIATION MONITOR SIGNATURE
	DATE	TIME	DATE	TIME		

REMARKS:

Name	Badge Number	Shift/Building	Period Covered From ________ to ________ Mo/Day/Yr. Mo/Day/Yr.

FMPC-ES&H-2754-1 (1/29/87)

TABLE 4. DIRECT READING DOSIMETER LOG

Silo Number ____________
Manway Location ____________

TABLE 6. RADON GAS MONITOR READINGS

RADON GAS MONITOR READINGS

	TIME	Operating Limits	Start	1st Hour	2nd Hour	3rd Hour	4th Hour
RGM-1							
RGM-2							
RGM-3							
RGM-4							
RGM Average							

RST: ____________
Serial No.: ____________
Location: ____________
Time: ____________

K-65 SILO SAMPLING CHECKLIST

TABLE 7. OPERATIONAL SHUTDOWN STEPS

The following steps will be taken if inclement weather is ensuing, an abnormal occurrence is experienced, or minimum manpower required become unavailable.

STATUS	SHUTDOWN STEPS
During preparation stage (before manhole cover removal)	Stop preparation activities. Store all sampling items in secure location.
Vibra-Corer is being lifted by crane into silo.	Have crane operator stop movement of Vibra-Corer and lower Vibra-Corer onto flatbed trailer. Replace manhole cover per DWP-001.
Vibra-Corer is being removed from the silo.	Continue removal of the Vibra-Corer and have the crane operator replace the unit on the flatbed trailer. Replace manhole cover per DWP-001.
Vibra-Corer is being transferred to the flatbed after sampling.	Continue positioning of the Vibra-Corer onto the flatbed. Replace manhole cover per DWP-001.

SET-UP AND POSITIONING OF THE CRANE PROCEDURE

1.0 PURPOSE

This procedure defines the progression of steps to be followed during setup and positioning of the crane used to support the Vibra-Corer Sampler during sampling of the K-65 Silos 1 and 2. The crane must be used to eliminate undue stress and weight on the domed roofs of the silos by the sampling equipment. The crane must be relocated three times during the sampling program.

2.0 APPLICABILITY

This procedure applies to setup and positioning of the crane used during sampling of the FMPC K-65 Silos 1 and 2. The mock sampling run on Silo 4 will also be performed in accordance with this procedure.

3.0 RESPONSIBILITIES

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensure this procedure is performed with only properly trained personnel who are experienced in use of the crane.

3.1.2 Contact Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.3 Provide operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensure Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> 3.1.5 Ensure pocket dosimeters and TLDs are worn by all personnel.

3.1.6 Initiate and implement Radiation Work Permit. 120

OSR> 3.1.7 Report exceptional circumstances not addressed by this procedure in a "Minor Event Report" - (Refer to FMPC-704) and notifying the Assistant Emergency Duty Officer (AEDO) and IT Project Manager of the circumstances.

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure non-conformances to the IT Supervisor and AEDO.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation and contamination) specified by procedure and/or as instructed.

3.3.4 Reporting any unusual occurrences to the IT Supervisor and/or AEDO.

4.0 <u>DEFINITIONS</u>

4.1 Vibra-Corer Sampling Device - Solid sampling equipment consisting of a cable-driven head assembly connected to a pipe barrel with a threaded penetrating probe containing inner LEXAN sleeve used to extract long core samples. If required, a cutter/catcher assembly located at the bottom of the pipe barrel is used to penetrate and retain the sample residues.

4.2 IT Supervisor - For the purposes of this procedure, the word "supervisor" refers to the IT Supervisor in charge of sampling.

4.3 Project Manager - The Project Manager is the senior IT member of the K-65 Resampling Team.

4.4 Operations Technician/Personnel - IT Personnel performing the sampling operation.

4.5 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.6 Rigger - IT Personnel designated by the IT Supervisor to provide signals to the crane operator, control of suspended loads and making all necessary attachments of load lines to loads.

4.7 Crane Operator - Subcontracted personnel responsible for proper operation, upkeep and maintenance of the crane and all associated equipment.

5.0 REFERENCES

5.1 Occupational Safety and Health Standards for Construction Industry, 29 CFR Part 1926.

5.2 Plan-001, "IT Site-Specific Health and Safety Plan".

5.3 WMCO Maintenance Work Instruction CRA-001, Cranes and Hoists Inspection.

5.4 DWP-001, "Sampling Procedures".

5.5 DWP-004, "Mock Silo Sampling Procedure".

5.6 FMPC-704, "Minor Event Reporting".

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 Setup, inspection, and operation of the crane must be per OSHA standards, Sections 1910.180, 1926.550, and all relevant national consensus standards (i.e., ANSI). Load testing must be performed and documented in accordance with WMCO Maintenance Work Instruction CRA-001, "Cranes and Hoists Inspection" and verified by the Supervisor.

OSR> 6.2 Protective clothing and dosimetry will be worn in accordance with Plan-001, "Site-Specific Health and Safety Plan".

6.3 Accessible areas within the swing radius of the rotating superstructure of the crane will be barricaded to prevent an employee injury.

6.4 Crane clearance from any electrical distribution or transmission lines will be maintained in accordance with the following OSHA requirements and approved by WMCO Fire and Safety:

- Lines rated 5kV or below, minimum clearance between the lines and any part of the crane or load will be 10 feet.

- Lines rated over 5kV, minimum clearance will be 10 feet plus 0.4 inch for each kV over 5kV, or twice the length of the line insulator, but not less than 10 feet.

- In transit with no load, the equipment clearance will be a minimum of 4 feet for voltages less than 50kV; 10 feet for voltages over 50kV, up to and including 345kV; and 16 feet for voltages between 345kV and 750kV.

6.5 The crane is being used to support the weight of the sampling equipment and to minimize stresses to the domed roofs of the silos. The limited structural integrity of the silos should be considered throughout the sampling program and particularly during the operation of the crane. At no time should the crane load rest on the surface of the dome.

6.6 At no time should personnel walk on or equipment be laced on the center cap of the silo.

6.7 Review of safety and operational procedures has taken place with personnel involved.

6.8 Safety glasses with side shields shall be worn unless other eye protection is specified.

OSR> 6.9 Respiratory protection provided by the IT Supervisor shall be worn as dictated by conditions and procedures.

OSR> 6.10 Anti-contamination clothing shall be worn as dictated by conditions and procedures.

6.11 Leather-palm gloves shall be worn when handling rough, sharp-edged, or contaminated material.

6.12 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 area.

OSR> 6.13 Operator exposures as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mRem/week per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.14 The number of personnel on the surface of the silo shall be limited to three and the maximum equipment/personnel load shall be limited to 700 pounds.

6.15 Operate the Breathing Air System per DWP-003. 123

6.16 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT

Supervisor.

6.16.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.16.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.16.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.17 All 120 volt 15 & 20 amp. circuit shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walkways.

7.0 PREREQUISITES

7.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

7.2 Fuel truck located for fueling crane at its three positions per Figure 1.

7.3 Crane components for assembly and maintenance on site.

7.4 Adequate access and travel roads around the silos.

7.5 Tool truck, small assembly crane, and other equipment required for primary crane assembly per sub-contractor's recommendations.

7.6 Electrical transmission lines which cross the travel route of crane de-energized or moved sufficiently out of the way per OSHA requirements during crane movement.

7.7 Security fence breached at locations per Figure 1.

8.0 PROCEDURES

8.1 Locate crane components, small assembly crane, and required general tools in the assembly area.

8.2 Barricade accessible areas within swing radius of the rotating superstructure per sub-contractor's recommendations.

8.3 Assemble crane per manufacturer's instructions.

8.4 Fill fuel tank with fuel oil. Be sure to ground both systems properly prior to fuel transfer.

8.5 Inspect equipment, machinery, and cable prior to use. Make repairs or replacements as required before proceeding. Notify the IT Supervisor of any unusual circumstances. Perform and document load testing per WMCO Maintenance Work Instruction, CRA-001, "Cranes and Hoists".

8.6 Locate crane sequentially beginning with position No. 1 per Figure 1.

NOTE

Crane will be relocated three times throughout the sampling program. It should travel along the routes designated in Figure 1. Travel route and access area should be barricaded when relocating the crane

8.7 Set outriggers, if applicable.

8.8 Position boom above corresponding sequential manhole per Figure 1 to establish correct positioning.

NOTE

The IT Supervisor will inspect crane position and give authorization to proceed. Record authorization in the project logbook

8.9 Swing boom to a location designated in Procedure DWP-001, "Silo Sampling" or DWP-004, "Mock Silo Sampling" as appropriate for hook up to sampler. Secure crane, do not proceed without confirmation from the Supervisor.

9.0 APPLICABLE FORMS

Figure 1, "Sampling Area Lay-Out/Crane Route"

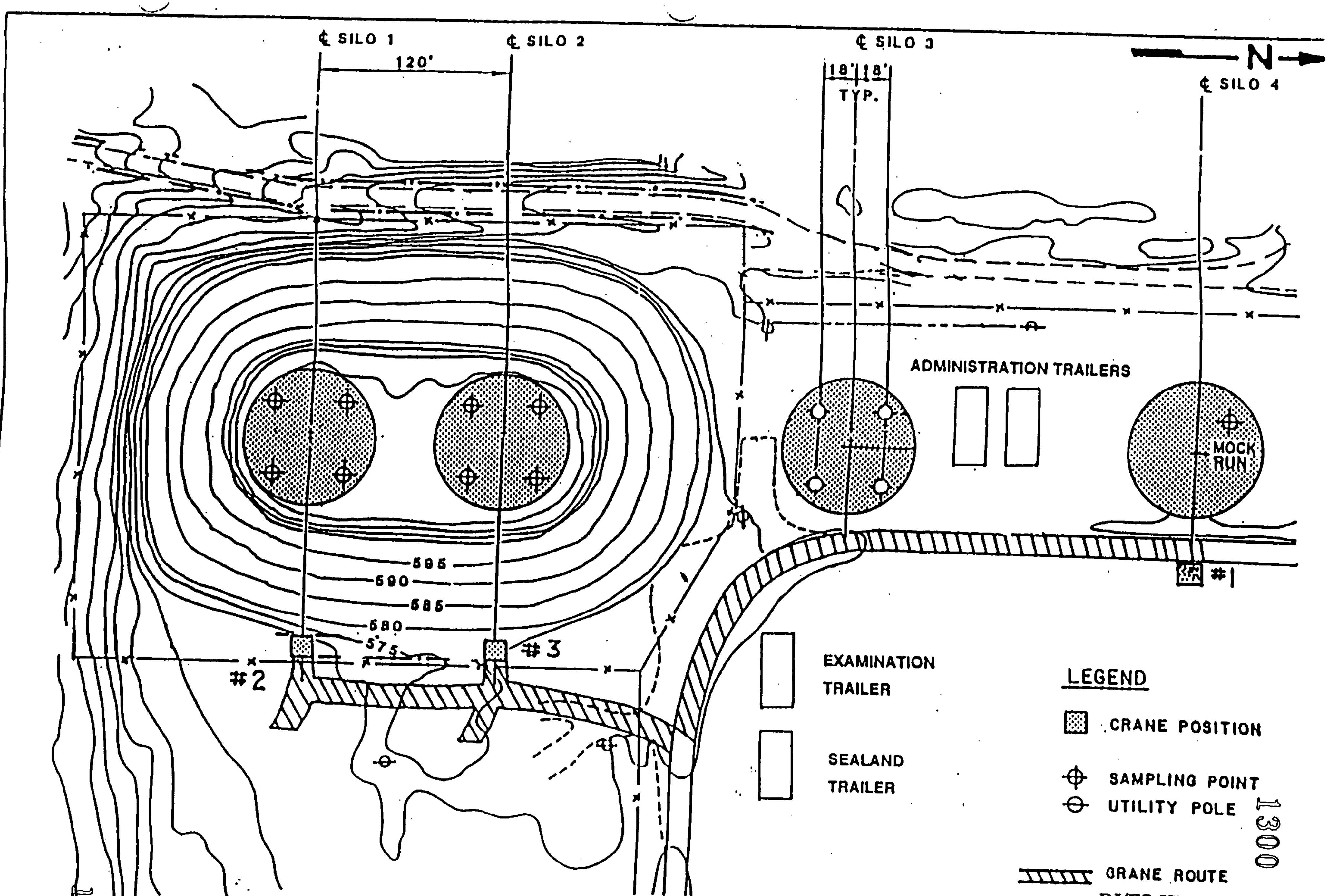


FIGURE 1. SAMPLING AREA LAY-OUT/CRANE ROUTE

1300

K-65 SILOS SAFETY NET APPLICATION

1.0 PURPOSE

The purpose of this procedure is to provide the steps for applying safety nets to the domes of the K-65 silos 1 and 2.

2.0 APPLICABILITY

This procedure is applicable to the safety net application on the domes of the K-65 Silos 1 & 2 in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensuring that only trained personnel perform the net application.

3.1.2 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

3.1.3 Provides operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensures nets and equipment are available for technicians usage.

3.1.5 Ensures Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> **3.1.6 Ensures pocket dosimeters and TLDs are worn by all personnel involved in the sampling operations.**

3.1.7 Initiate and Implement Radiation Work Permit.

OSR> **3.1.8 Reports exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifies the IT Project Manager and WMCO Assistant Emergency Duty Officer (AEDO) of the circumstance.**

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure non-conformances to the IT Supervisor.

OSR> 3.3 **Radiation Safety Technicians (RST) shall be responsible for:**

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

4.0 DEFINITIONS

4.1 Safety Net(s)-double strand 0.158 inch polypropylene mesh rope and 0.625 inch frame rope with a 4 inch opening. The Safety Net(s) outside dimensions are 15' x 30'. These nets are to be used as a safety device to minimize personnel injury in the event of a silo structural break.

4.2 Fall Arrest Block - Self-contained spring loaded drum with up to 39 feet of retractable cable. This unit has a braking system much like a seat belt and will lock in the event of a sudden jerk caused by a trip or fall. The Fall Arrest Block will be connected between one of the cranes headache balls and a full body harness worn by personnel on the silo domes. The block will be used during Safety Net application and RTS ducting removal.

4.3 RTS Ducting Glove Bag - Plastic bag containing glove ports which is attached to the RTS ducting at the silo manway connection, to contain airborne radionuclides during ducting removal.

4.4 IT Supervisor - For the purposes of this procedure, the word "Supervisor" refers to IT Supervisor in charge of the silo sampling.

4.5 Project Manager - The Project Manager is the senior IT member of the K-65

Resampling Team.

4.6 Operations Technician/Personnel - IT Personnel performing the sampling operations.

4.7 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.8 Tie-Down Posts - 1 1/2" I.D. pipe cut to length to secure safety nets.

5.O REFERENCES

5.1 DWP-003, "Breathing Air System"

5.2 WMCO SOP 65-C-106, "Silo Waste Handling"

5.3 FMPC 704, "Minor Event Reporting"

5.4 Plan-001 - "Site-Specific Health and Safety Plan"

5.5 DWP-006, "Set-up and Positioning of the Crane"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 At no time shall personnel walk on or place equipment on the center cap of the silo.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified.

6.3 A Fall Arrest Block shall be used when applying a safety net.

OSR> **6.4 Respiratory protection provided by the IT Supervisor shall be worn.**

OSR> **6.5 Anti-contamination clothing shall be worn when working on top of the silos.**

6.6 Leather-palm gloves shall be worn when handling rough, sharp-edged or contaminated material.

6.7 Nitrile gloves shall be worn when using the RTS ducting glove bag.

6.8 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 Area.

OSR> 6.9 Operator exposure as determined from Self-Reading Pocket Dosimeters (SRPD) shall not exceed 300 mRem/week, per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.10 The number of personnel on the surface of the silos shall not exceed three and the maximum equipment/personnel load shall not exceed 700 pounds.

6.11 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorportion shall immediately by reported to the IT Supervisor.

6.11.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.11.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.11.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.12 Operate the Breathing Air System per DWP-003.

6.13 All 120 volt 15 & 20 amp circuits shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walk ways.

7.0 PROCEDURE

7.1 Set-up crane per "DWP-006" at Silo 1 as it would be for silo sampling.

7.1.1 Move to Silo 2 Crane Pad after completing safety net applications of Silo 1.

7.2 After materials have been gathered for RTS ducting removal, the crane operator shall move the crane boom over the berm near manway where safety net is to be applied.

7.3 Operations Technicians on silo berm shall signal the crane operator to lower the headache ball so Fall Arrest Blocks can be attached.

7.3.1 Snap shackles of the Fall Arrest Blocks into headache ball hook.

NOTE

Check with the IT Supervisor to ensure the correct load-line for corresponding manway location

7.4 Snap the other end of the Fall Arrest Blocks to the full-body harness worn by operation technicians on dome.

7.5 Removal of RTS Ducting

NOTE

Visually inspect RTS manway isolation valve and ensure it is in the shut position

7.5.1 Place RTS ducting glove bag around manway connection with screw driver inside.

7.5.2 Tape and seal glove bag around ducting connection.

7.5.3 Loosen hose clamp around RTS ducting with the screw driver.

7.5.4 Carefully separate RTS ducting from manway connection.

7.5.5 Gather center of the glove bag, twist and tape.

7.5.6 Cut tape in the center and separate the glove bag.

7.5.7 Move the RTS ducting so not to interfere with the safety net application.

7.6 Egress to berm area and gather safety net.

NOTE

Ensure net is folded for easy application to the dome to minimize radiation exposure

7.7 Application of Safety Net to Silo Dome (See Figure 1)

7.7.1 Carefully unfold safety net with tie lines attached.

7.7.2 Lay three foot net opening over manway flange so that it lies flat on the dome.

7.7.3 Stretch net out to ensure its position is satisfactory.

7.7.4 Egress to silo berm

7.8 Unsnap Fall Arrest Blocks from full-body harnesses.

7.9 Signal crane operator to lower Fall Arrest Blocks to ground outside silo area.

7.10 Rigger shall connect seven tie down posts to the load-line.

7.11 Crane operator shall set the tie-down posts on the berm.

7.12 Tie-Down of Safety Net

7.12.1 Drive tie-down posts into the berm at designated locations so tie lines can be attached.

7.12.2 Attach one end of the 1/2 ton come-a-longs to tie-down posts.

7.12.3 Attach free end of come-a-long to loops in tie lines.

7.12.4 Tighten tie lines using the come-a-longs until safety net is sufficiently stretched out.

7.13 Replacement of RTS Ducting

7.13.1 Acquire a new RTS ducting glove bag

7.13.2 Retrieve RTS ducting from where it was placed for safety net application.

7.13.3 One operations technician shall hold the ducting near the manway connection and the other shall place the glove bag over the covered ends.

7.13.4 Tape and seal glove bag.

7.13.5 Carefully remove the tape and old glove bag covers from both ends of the ducting so they are open within the glove bag.

7.13.6 Carefully slide the RTS ducting onto the manway connection.

7.13.7 Replace hose clamp and tighten

7.13.8 Remove tape and RTS glove bag from connection.

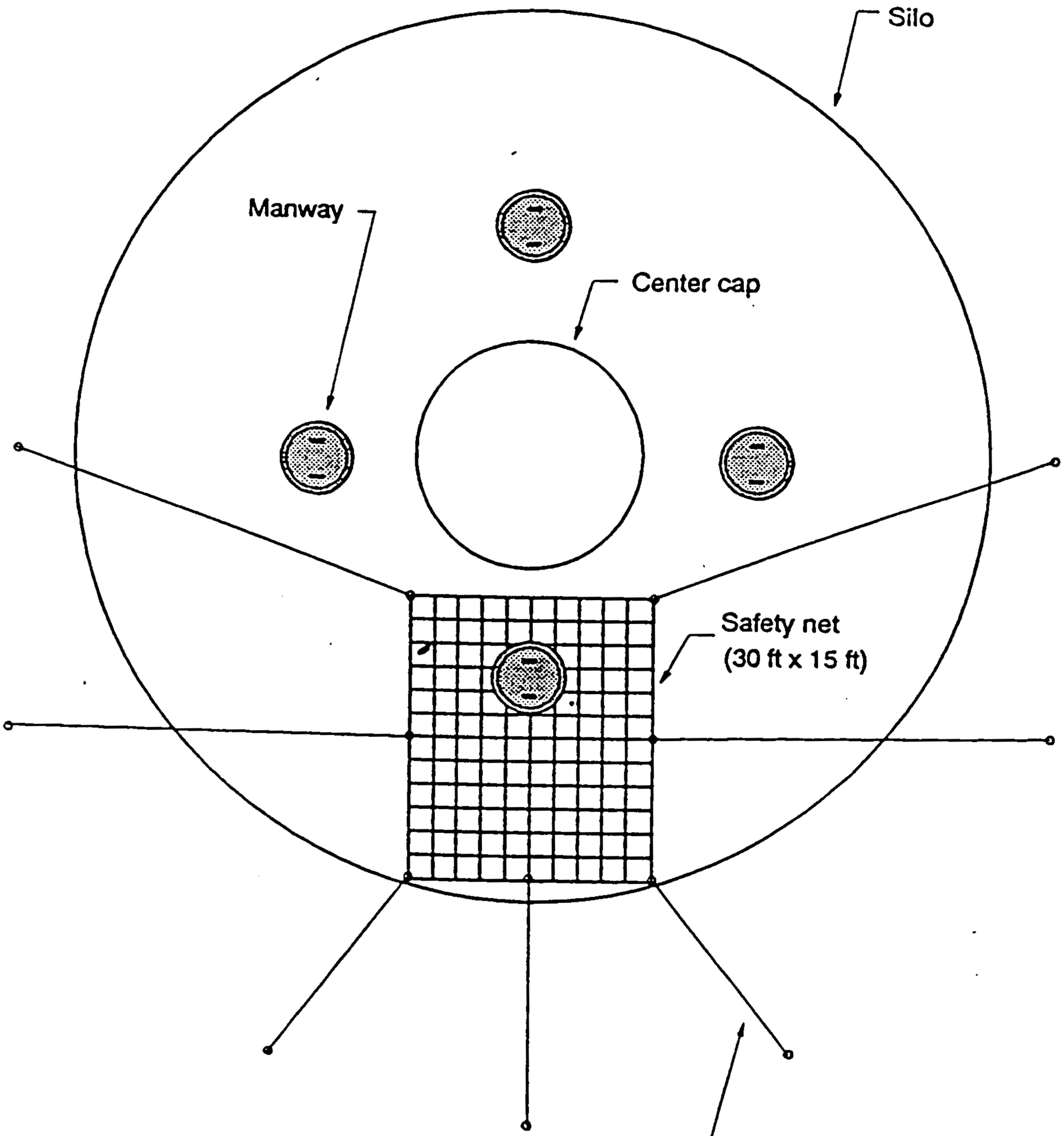
7.13.9 Seal open end of used RTS glove bag and dispose of per WMCO Procedure SOP-65-C-106.

7.14 Repeat steps 7.2 through 7.13.9 until all eight safety nets have been applied to the silo domes.

8.0 APPLICABLE FORMS

Figure 1 - "Silo Safety Net (Typical)"

1300



FL/30317.09.33/NET

FIGURE 1 SILO SAFETY NET (TYPICAL)

APPENDIX B

PROGRAM PLANS

SITE SPECIFIC HEALTH AND SAFETY PLAN

for the

FEED MATERIALS PRODUCTION CENTER

RESIDUE SAMPLING OF THE K-65 SILOS 1 AND 2

Table of Contents

1.0 INTRODUCTION

The Advanced Sciences, Inc. (ASI)/IT Corporation (IT) Team has been tasked by the Department of Energy (DOE) to perform the K-65 Silo Resampling effort at the Feed Materials Production Center (FMPC) in Fernald, Ohio. The FMPC is currently operated by Westinghouse Materials Company of Ohio (WMCO) for the DOE. K-65 Silo History is presented in Section 2.0.

The K-65 Silo residue will be sampled utilizing a Vibra Corer Sampler (primary method) or by combining both a Vibra Corer Sampler and a hollow stem auger (alternate method). The purpose of this sampling is to obtain an undisturbed and representative samples to provide reliable and defendable data for the Remedial Investigation/Feasibility Study (RI/FS) for cost effective and safe remedial actions.

This Site Specific Health and Safety Plan (HSP) applies specifically to the IT/ASI resampling effort. Copies of this plan with applicable procedures attached will be distributed to each member of the sampling team and will be reviewed in pre-sampling training sessions.

1.1 Policy

All reasonable precautions will be taken by IT and it's subcontractors to ensure Health and Safety of workers and the general public in a cost-effective manner. IT and its subcontractors will comply with all federal, state, local, and DOE Health and Safety Regulations and Requirements. Evidence of compliance will be provided by the monitoring records generated from this program.

All personnel that participate in the resampling effort and will work at the K-65 area are required to read, understand and comply with the provisions of this HSP and area required to sign the consent form presented in Figure 1-1.

1.2 Site Arrangement/Route to WMCO Infirmary

Figure 1-2 details the site arrangement of support trailers and anticipated exclusion areas. Figure 1-3 designates the route to be taken to the WMCO Infirmary in the event of a medical emergency.

Figure 1-1
Health and Safety Plan Consent Form

This Site-Specific Safety Plan was produced for the use of IT employees and IT subcontractors. It was intended for the Feed Materials Production Center, Fernald, Ohio and for:

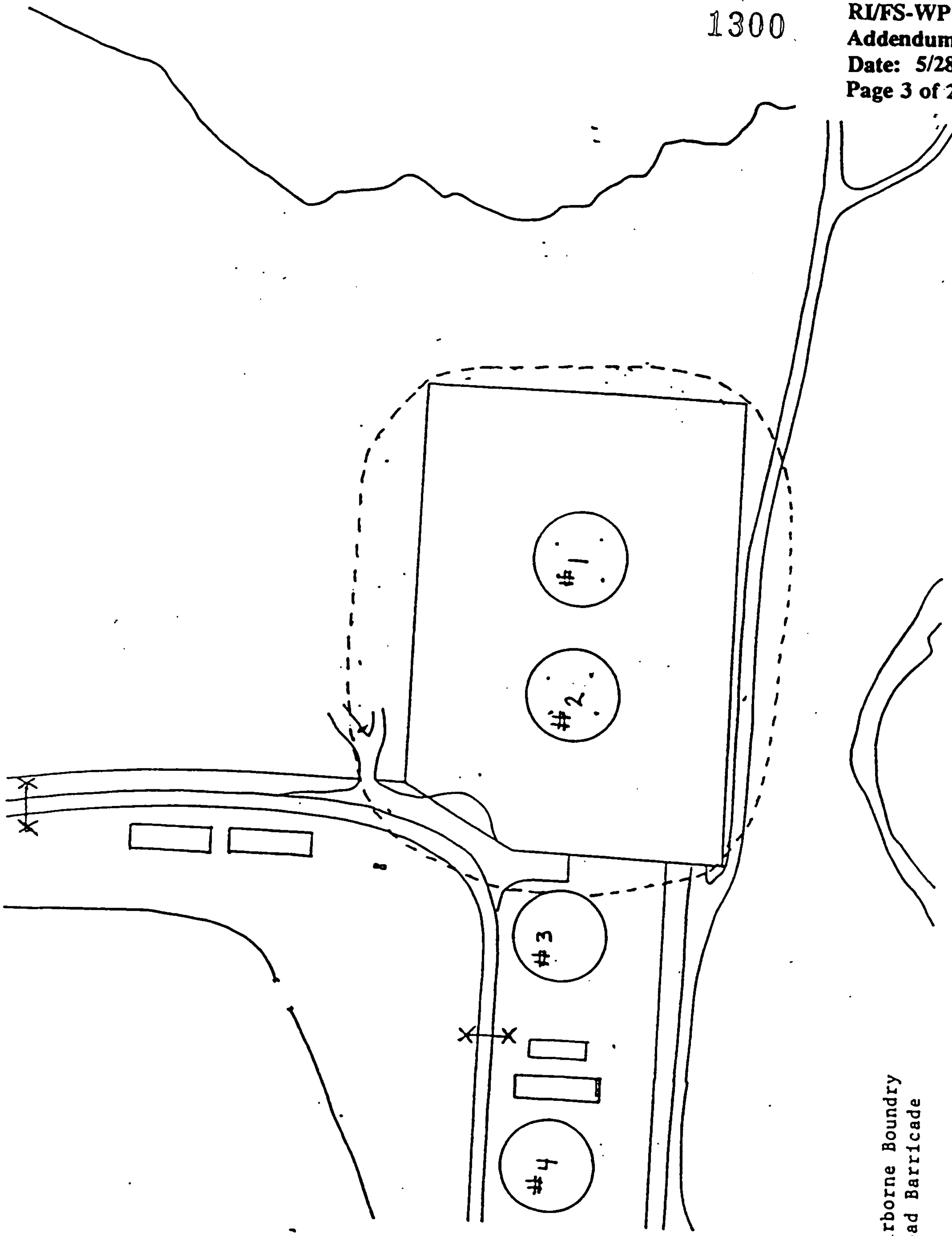
K-65 Silo Resampling using a Vibra Corer Sampler (primary method) or using the alternate method.

The undersigned persons have read and understood the attached Site-Specific Safety Plan and agree to follow its provisions* 1:

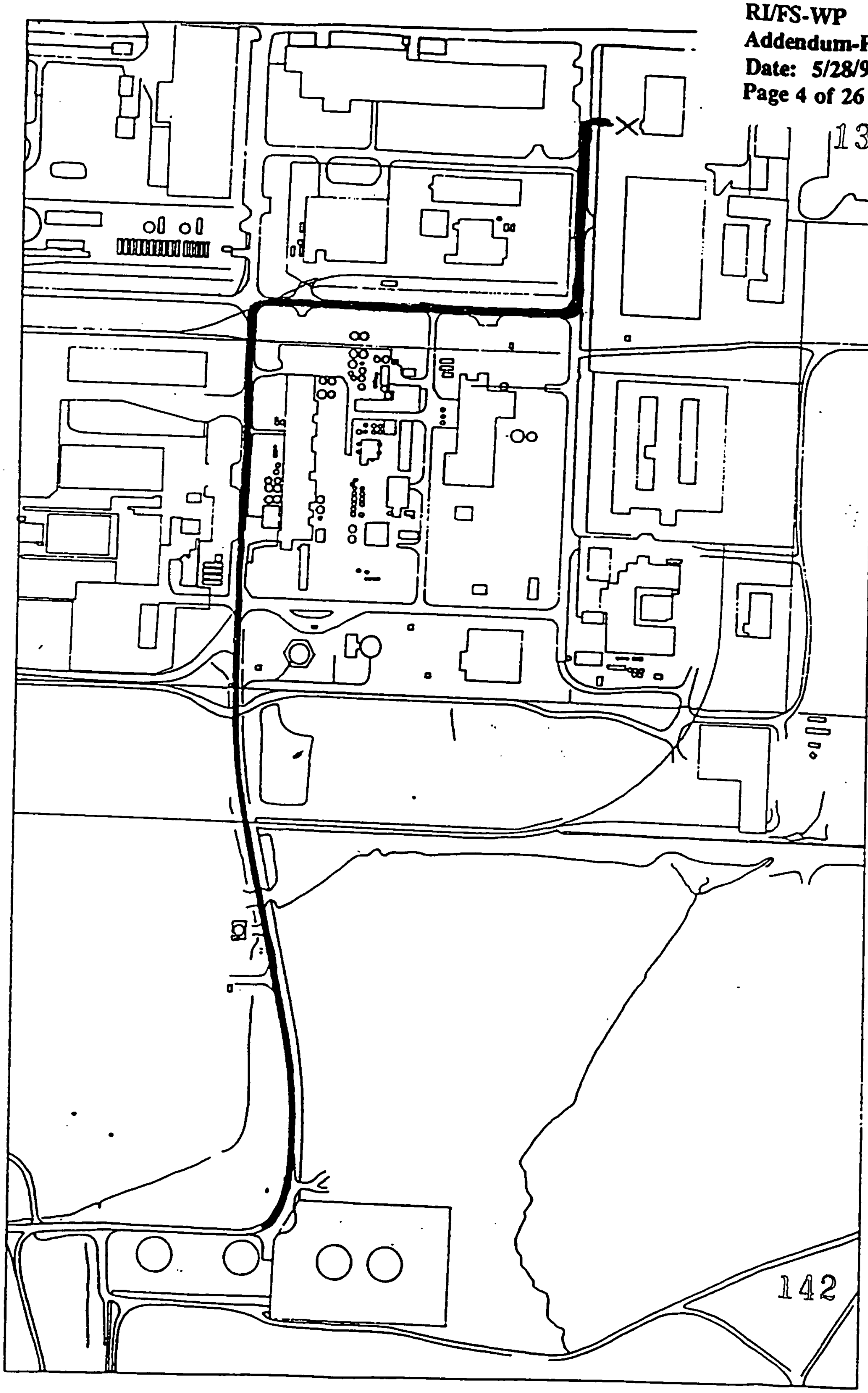
Name (lettered)	Signature	Date

*1 Compliance with the provisions of this HSP may be audited through announced or unannounced site visits. Be sure that you are implementing the provisions of the safety plan and documenting the reasons of the Safety Plan and documenting the reasons for field actions/changes when they area necessary.

FIGURE 1-2 BARI ED AREAS



------- = Airborne Boundry
X-----X = Road Barricade



ROUTE TO WMCO INFIRMARY

FIGURE 1-3

2.0 SITE HISTORY

The silos to be sampled are located west of the Production Area within the Plant Security Fence. The two reinforced concrete K-65 Silos were constructed in 1951 and 1952. The silos are cylindrical, 36 feet high (26 feet and 8 inches at the dome well) and 80 feet in diameter and are covered with a concrete dome.

The K-65 Silos (Silos 1 and 2) are used for the storage of radium-bearing residues formed as by-products of uranium ore processing. The K-65 Silos received the waste residues primarily between 1952 and 1958. The sources include slurry from the FMPC; 25,000 drums from a plant in St. Louis, Missouri; and 6000 drums from Niagara Falls, New York. The K-65 Silos also received a small quantity of soil excavated from a drum-handling area previously located to the east of and adjacent to, Silo 3.

The FMPC slurry was reported to contain an average concentration of radium of 311 mg per ton; the St. Louis drums, an average radium concentration of 500 mg per ton; and the New York drums, an average radium concentration of 624 mg per ton. Based on these values, it is estimated that the K-65 Silos may contain as much as a combined total of 4.6 kg, or approximately 4600 Ci, of radium. This value differs from previous estimates of between 1.6 and 1.7 kg of radium in the silos.[1] The silos are also estimated to contain 11,200 kg of uranium. Radon flux measurements made in 1984 at various locations on the dome exterior ranged from 13 pCi/M^2/sec to greater than 3 X 10^7 pCi/m^2/sec.

Table 2-1 provides analytical results from three previous sampling efforts of the refined slurry.

Approximately 40 percent of the waste is composed of silicates. Other constituents comprising 1 percent or more of the waste include calcium, iron, magnesium and lead. No data are available regarding organic constituents.

The materials in the K-65 Silos have continuously generated radon gas. The gas accumulates under the silo dome, where it decays or escapes to the environment. The silos exchange gas with the surrounding atmosphere by diffusion through the concrete and release through existing cracks in the concrete. Gamma exposure rates were measured near the storage silos in 1986 and 1987 by Weston and WMCO, respectively. The results show a radiation field from Silos 1 and 2. More detail on the strength of the field can be found in the Addendum No. 2 to the Remedial Investigation/Feasibility Study (RI/FS) Health and Safety Plan (Revision 3), dated June 6, 1988.

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[1] "Feasibility Investigation for Control of Radon Emission from the K-65 Silos," WMCO, July 10, 1987, Section 2.2.2.

TABLE 2-1
Characteristics of K-65 Residues

	Silo 1	Silo 2	Average
Radionuclides	pCi/g	pCi/g	pCi/g
Th-228	425	568	496.5
Th-230	29700	28000	28850.0
Th-232	436	614	525.0
Ra-226	145000	74400	109700.0
Ra-228	1570	715	1142.5
Pb-210	83800	167000	125400.0
U-234	676	885	780.5
U-235/236	46	52	49.1
U-238	636	784	710.0
U-Total (ppm)	1910	2350	2130.0
Inorganics	ppm	ppm	ppm
Aluminum	811.1	1229.2	1020.1
Antimony	0.0	2.3	1.1
Arsenic	49.9	427.5	238.7
Barium	4031.4	3866.5	3949.0
Beryllium	1.6	2.5	2.1
Cadmium	3.6	6.8	5.2
Calcium	4112.9	61301.7	32707.3
Chromium	61.6	38.3	49.9
Cobalt	767.9	820.2	794.0
Copper	266.3	457.2	361.7
Iron	21538.6	16990.0	19264.3
Lead	59742.9	18792.2	39267.5
Magnesium	3130.0	4688.3	3909.2
Manganese	105.2	204.2	154.7
Mercury	0.8	1.0	0.9
Nickel	1380.6	974.4	1177.5
Potassium	319.6	185.8	252.7
Selenium	156.7	87.8	122.3
Silver	11.0	10.2	10.6
Sodium	5361.4	1625.5	3493.5
Thallium	0.2	0.6	0.4
Vanadium	126.3	155.5	140.9
Zinc	53.8	53.2	53.5
Cyanide	1.9	1.8	1.8

Note: Data from 1989 WMCO Sampling-Data currently being validated.

As early as 1956, external deterioration of the K-65 Silos was observed. By 1963, large areas of concrete spalling occurred, exposing reinforcing wires which corroded and cracked. In 1964, an asphaltic sealant was applied to the external walls, and an earthen embankment was constructed around the silos to counterbalance the internal load and to reduce direct radiation from the residues in the silos. A structural evaluation of the silos (Camargo, 1985) concluded that the base slabs and walls are structurally stable under existing static loads and have a life expectancy of 5 to 10 years. The centermost 20- foot diameter portion of the dome was determined to be structurally unsound for any load greater than the existing static dead load, and there is no assigned life expectancy. Severe dome cracks have a high probability of eventually occurring due to weathering processes and may lead to partial dome collapse.

Several interim stabilization projects have recently been implemented on Silos 1 and 2. A radon removal system has been installed to reduce radon gas levels in the dome during recent and future remediation activities. The center dome portion has been covered with a 30-foot diameter plywood cap to provide secondary containment in the event of collapse of this section. The exterior dome surfaces have also been coated with rigid foam to provide weather protection and insulation.

3.0 Task Specific Hazard Assessment

The following hazard assessment is based on historical information. The field team routinely reassesses the hazards before starting work to insure that conditions have not changed. All newly identified hazards will be addressed with the IT Health and Safety Department to determine the degree of hazard and if any changes to the Safety Plan are needed. No hazardous concentrations of organic chemicals are expected. Monitoring for exposures to chemicals, such as lead and silicates, will not be necessary because of the very low expected exposures. The on-site Health and Safety Officer will determine if chemical monitoring is necessary once operations begin.

3.1 Physical Hazards

- Radiological Hazards
  - External
  - Internal
- Work on Silo Domes
- Heat Stress
- Crane Operations
- Noise

3.2 Chemical/Radiological Hazards

Contaminant	DAC[2]	Action Limit	Action
Radium-226	$3E^{-10}$ uCi/ml	$7.5E^{-11}$ uCi/ml	APR[1]
Thorium-230	$3E^{-12}$ uCi/ml	$7.5E^{-13}$ uCi/ml	APR[1]
Uranium-235/238	$2E^{-11}$ uCi/ml	$5.0E^{-12}$ uCi/ml	APR[1]

Contaminant	Action Limit	Action
Radon-222	0-0.075 WL	No respirator required
	0.075 - 1.65 WL	Full-face air purifying respirator required
	1.65 - 33 WL	Full-face air supplied air respirator required greater than 33 WL:
	>33 WL	Supplied air bubble suit.

Contaminant	PEL[3]
Lead (Inorganic)	50 µg/m³
Silicates	5 mg/m³ (respirable dust)
Silica (Crystalline)	0.1 mg/m³

1) APR - Air Purifying Respirator
2) DAC - Derived Air Concentration
3) PEL - Permissable Exposure Level

* NOTE: For long-lived alpha activity where the radionuclides are unknown, the Action Limits specified for Thorium-230 shall be used.

3.3 Routes of Entry

All of the identified work site contaminants are gaseous or particulate in nature. The primary routes of entry are inhalation and ingestion. Direct contact may result in exposure if compounds are water soluble, therefore residue will be handled as if soluble compounds are present.

3.4 Will Site Activities:

Disturb Surface Soil? Yes
Disturb Subsurface Soil? No
Use Heavy Equipment? Yes
Enter Confined Space? No
Disturb Containerized Matter? Yes
Sample Surface Water? No
Sample Lagoons? No
Use Boat? No
Involve Radioactivity? Yes
Involve Trenches? No

3.5 Physical Hazards

All crane operations shall be in accordance with OSHA regulations contained in 29 CFR part 1926.

In accordance with the recent (April 1990) structural analysis performed by Bechtel National, Inc., no more than three (3) individuals or a combined equipment and personnel load of seven hundred (700) pounds will be allowed on silo domes. Safety nets will be installed as per DWP-007, K-65 Silo Safety Net Application, as an added safety precaution to minimize personnel breakthrough on the silo domes.

4.0 Monitoring

4.1 Goals

Air monitoring will be performed to insure that contaminant concentrations in the breathing zone do not exceed the concentrations specified by established exposure levels. The air monitoring program will consist of radon and radon progeny monitoring and monitoring for long-lived particulates, such as Radium-226 and Thorium-230.

IT policy requires engineering controls or the use of Personnel Protective Equipment (PPE) to limit on-site exposures to the action limits values. It is advisable to keep exposures to chemicals as low as possible since there is insufficient data to predict the combined effects of most chemical mixtures.

4.2 Monitoring Equipment and Frequency of Monitoring
Airborne Radioactive Contaminant Monitoring
(Internal Radiation Hazard)

Several methods will be employed to monitor for airborne contaminants for this project. A description of these methods and the instrumentation required is given below.

4.2.1 Radon Monitors

Continuous radon gas monitoring will be provided by WMCO at the K-65 fenceline using alpha scintillation devices known as RGM-2 and/or similar devices to be specified by WMCO. Hourly while manway covers are removed, the RGM-2 readings are checked and recorded per DWP-005 - Radon Monitoring and Sampling Checklist for K-65 Silos. Action limits for the RGM-2 and Actions to be taken are delineated in DWP-005, Section 4.2.

4.2.2 Working Level Grab Sampling (Radon Progeny)

Working Level Grab Samples will be collected utilizing a portable, battery powered air pump (BZA) with a 37 mm membrane filter with an 8 mm pore size. At a minimum, grab samples will be taken before start of work, upon removal of manway covers, hourly when covers are removed, at 2 hours after manways are covered, and hourly during sample core handling in the sample trailer. Samples shall be drawn in the vicinity of the manways and downwind from the manway or in the work area during sample core handling. Samples should be taken in the worker's breathing zone to draw samples representative of the air to which the worker is exposed. Grab samples will be taken and calculated per WMCO Radon Air Sampling Procedure.

4.2.3 Long-Lived Airborne Radioactivity Sampling

As determined by the Health Physics Department, samples will be drawn to determine the amount of long-lived airborne radioactivity to which workers are exposed. This may be performed by recounting the grab samples discussed in 4.2.2 above or by obtaining a high-volume air sample.

Samples are to be recounted 5 days after they are drawn. High-volume samples and grab sample long-lived counts will be in accordance with WMCO procedure SP-P-35-026-Occupational Air Sampling.

4.2.4 Continuous Air Monitors (CAMs)

Eberline Alpha-6 continuous air monitors calibrated for Radon-222 progeny will be used as required to support sampling operations. The Alpha-6 will specifically be used to monitor the ventilation system exhaust from the sampling trailer. Alpha-6 CAMs will be operated in accordance with the Eberline Alpha-6 CAM Technical Manual.

4.3 External Radiation Hazard Monitoring

4.3.1 Radiation Surveys

External radiation hazards are identified by Health Physics Personnel as they perform the survey required for the Radiation Work Permit. A Health Physics Technician will monitor exposures in all areas which exceed the 2 mR/hr action limit. Measures such as increasing shielding, increasing distance or reducing exposure time will be taken to minimize exposures in keeping with good ALARA (As Low As Reasonably Achievable) practices. Radiation areas and high radiation areas will be posted and controlled in accordance with DOE Order 5480.11. Additional requirements for radiation surveys during sampling operations are described in DWP-005, Radon Monitoring and Sampling Checklist for K-65 Silos. Radiation surveys shall also be performed during operations in which radiation levels could vary significantly (i.e. Vibra Corer Removal, Sample Core Handling, Radon Reduction System Operation).

4.3.2 Personnel Dosimetry

All personnel involved in the sampling operations are required to wear personnel dosimetry when at the work site. Personnel will be issued Self-Reading Pocket Dosimeters (SRPDs) and Thermoluminescent Dosimeters (TLDs). Personnel exposure will be controlled by SRPD readings so as not to exceed 300 mR/wk. SRPD readings shall be recorded daily at a minimum and more frequently as operating procedures dictate. TLDs shall be read on a monthly basis or more frequently as SRPD readings dictate (80% of weekly exposure limit). Personnel who will handle sample material shall wear Finger Ring TLDs supplied by WMCO. Personnel are limited to whole body exposures of 5.0 Rem/year (DOE) and 3.0 Rem/year (site).

4.4 Surface Contamination

As described in Section 5.0, IT personnel will wear protective clothing as dictated by site procedures and radiation work permits for Contamination Areas. Supplemental, disposable outer-clothing will be donned upon entrance to and removed upon exit from Contamination Areas to prevent spread of contamination.

Contamination exposure to workers inside Contamination Areas will be controlled through several measures, as follows:

- Frequent area contamination monitoring.
- Use of respiratory protection and protective clothing.

- Administratively limiting removable contamination levels, as follows:

  -Removable surface contamination will be limited to the following:

  Breakroom and Office Trailers (surveyed daily)

  < 100 dpm/100 cm^2 beta-gamma above background
  < 20 dpm/100 cm^2 alpha above background

  Once the levels are reached, the area will be decontaminated.

  Work Areas

  500 cpm alpha > background - Use Air Purifying Respirator
  5000 cpm beta-gamma>background - Use Air Purifying Respirator

4.5 Containment

Physical containment of radioactive material will be maintained in two levels (primary and secondary) whenever practicable. Primary containment will consist of existing storage vessels, Vibra-Corer, Sample Trailer and drums/boxes. Secondary containments will be temporary enclosures constructed around the primary containments. In most cases, secondary containments will allow Operators access to work areas. These areas will be ventilated when possible with a draft fan/filtration system to carry away and trap fugitive radionuclides.

Secondary containments consist of temporary room enclosures, glovebags, and sleeving which will allow operators entry and access to the radioactive materials. The boundaries formed on erection of these containments will serve two functions -- physically, as negative pressure enclosures when ventilated, and administratively, as Contamination Areas.

Tent-type airlocks will be erected on the sampling trailer to control contamination during trailer entry/exit. Several secondary containments will be installed for sampling operations. Tent containments will be field constructed using a steel frame and vinyl sheeting construction. Glove bags will be erected on the silo manways to provide containment during Vibra Corer Sampling. The Vibra Corer itself, will be sleeved in plastic during sampling operations.

Contamination Areas will be limited in size to maximize ventilation effectiveness and minimize efforts to control and eventually decommission contaminated areas. All entrances and exits are designed to minimize transient or casual exposure. All areas entrances and exits will be posted with the appropriate warning information and if needed, roped off.

5.0 Personal Protective Equipment

All employees in the sampling operation will wear the following personal protective equipment:

ITEM	PPE NEED	JUSTIFICATION
APR	Y	Required if action levels are exceeded
Supplied Air Respirator	Y	Required if action levels are exceeded or for work on dome with manway cover removed
Cartridges - Combination OV, AG, HEPA	Y	
Hearing Protection	Y	Required if action levels are exceeded (85 db)
Hard Hat	Y	Minimum Requirement
Plastic Booties	Y	
Totes	O	Optional
Gloves	Y	
Inner Gloves	Y	
Leather-Palm Gloves	Y	For handling sharp edges

ITEM	PPE NEED	JUSTIFICATION
Nitrile Gloves or equivalent	Y	For use in glovebag or when exposed to high radon levels
Plain Tyvek	Y	For work not involving radon exposure
Saranex Tyvek (sealed seams)	Y	For work on silo dome
Process Coverall	Y	
Safety Glasses	Y	Minimum Requirement (Unless when wearing bubble suit)
Safety Goggles	N	Optional
Safety Shoes	Y	Minimum Requirement

6.0 Site Access

6.1 Site Control

A Site Control Program has been developed to control worker exposure to radioactive and hazardous materials and to prevent the spread of contamination. The FMPC Site Access is controlled by WMCO Security. Access to the K-65 Silo Area is also controlled by WMCO Security. Site maps posted at various locations identify the various areas of contamination encountered at the FMPC.

The K-65 Sampling Work Site will have access restricted during operations via road blocks and boundary ribbon. Only properly authorized and trained personnel will be allowed access. One access/egress control point area will be established for the sampling area. Personnel will be required to read and sign the Radiation Work Permit (RWP) Figure 6-1, wear the proper dosimetry (TLD and SRPD), and proper protective clothing.

6.2 Bioassay Program

A bioassay program will be implemented to monitor employees for internal radiation exposure, to provide guidance to the Health and Safety Staff on internal exposure control, and to determine the amount and distribution of internally deposited radioactive material should an intake occur as a result of project operations.

1300

RADIATION WORK PERMIT

IT CORPORATION

RWP NUMBER

TO BE FILLED OUT BY REQUESTOR

REQUESTED BY ____ DATE ____

TASK DESCRIPTION:

MANHOURS IN AREA ____ NUMBER OF WORKERS ____

TO BE FILLED OUT BY HP PERSONNEL

SURVEY FREQUENCY	HEALTH PHYSICS REQUIREMENTS COMPLETED BY
REMARKS:	GENERAL AREA DOSE RATE mR/hr — DATE/ TIME OF SURVEY
	JOB SPECIFIC DOSE RATE — DATE/ TIME OF SURVEY
	CONTAMINATION LEVEL dpm/100cm^2
	AIRBORNE ACTIVITY (uCi/ml or WL)

ANTI-C's	RESPIRATORY PROTECTION	MONITORING
☐ HOOD	☐ FULL FACE ☐ BUBBLE SUIT	☐ TLD
☐ BUBBLE SUIT	☐ ORGANIC VAPOR CARTRIDGE	☐ EXTREMITY TLD
☐ COVERALLS	☐ PARTICULATE CARTRIDGE	☐ TLD and SRPD
☐ PLASTIC SLIP ONS	☐ SUPPLIED AIR	
☐ RUBBER BOOTS	☐ SCBA	☐ ____
☐ COTTON GLOVES	**MISC**	**SPECIAL**
☐ RUBBER GLOVES	☐ SAFETY GLASSES	☐ ____
☐ LAB COAT	☐ FACE SHIELD	☐ ____
☐ PLASTIC SUIT	☐ SAFETY SHOES	☐ ____
	☐ HARD HATS	☐ ____

PROTECTION REQUIREMENTS, SPECIAL INSTRUCTIONS ____

ADDITIONAL INSTRUCTIONS AND REQUIREMENTS: (SHIELD, DECONTAMINATION, HEPA FILTERS, ETC...) ____

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APPROVAL

HP TECHNICIAN ____ DATE ____ TERMINATION DATE ____

HP SUPERVISOR ____ DATE ____

FIGURE 6-1

All individuals who work with radioactive materials as part of this project or who frequent any project area where there is a significant probability of intake will participate in the bioassay program.

The bioassay program for this project will be composed of three standard bioassay methods: Analysis of air monitoring data, in-vivo gamma spectrometry (whole body/lung counting), and urinalysis.

Air samples for radioactive materials will be taken as required by approved procedures. 24-Hour urine samples shall be obtained prior to start of sampling activities for a baseline and at project completion. Whole body counts shall be performed after the initial entry into the silos to determine if respiratory protection is adequate.

6.3 Medical Monitoring

In accordance with 29 CFR 1910.120 OSHA requirements, all IT and subcontractor field personnel are required to participate in a medical monitoring program which includes:

- A Baseline Medical Examination
- Annual Medical Examination
- Medical Examinations may be required after potential exposures
- Respirator Physical

6.4 Training Requirements

All IT and subcontractor personnel assigned to site tasks will be trained in accordance with the K-65 Silo Sampling Training Plan and will meet OSHA and Site-Specific Training requirements including:

- 40 Hour OSHA Training
- 8 Hour Annual Refresher Training
- 8 Hour Supervisory Training (Supervisors)
- 24 Hour Supervised Field Experience
- Review of Site-Specific Hazards and Procedures (Tailgate Safety Meetings)
- WMCO Radiation Safety Training
- Respirator Training and Fit Test
- K-65 Silo Sampling Project Detailed Work Procedures

7.0 Exposure Symptoms

Exposure to low levels of radioactivity do not produce acute exposure symptoms. Such exposures may cause delayed effects such as cancer. Since any radiation exposure may involve some degree of risk, exposures are to be kept As Low As Reasonable Achievable, (ALARA).

8.0 Site Entry Procedures

___ The site crew will radio CONTROL daily to establish radio contact, location, start time and stop time.

___ Procure Radiation Work permit, for daily operations.
- Identifies degree of radiological hazard
- Limits allowable work time.
- Specifies minimum PPE requirements

___ All equipment is required to undergo a safety inspection by WMCO Fire and Safety Personnel upon initial entry to the FMPC.

___ Perform tailgate meeting to familiarize team with site specific hazards. Identify contamination zones and break area. Discuss alternate communications signals (if applicable).

___ Rezero and issue SRPD's

___ Calibrate instruments and log calibrations.

___ Visually scan the site for signs of contamination.

___ Perform respirator check out and fit test prior to use.

___ Enter potentially contaminated areas with monitoring.

___ Monitor for radiation using radiation meters for alpha and beta/gamma.

___ Use buddy system.

Teams of at least two individuals will be used for all activities within a Contamination Control Area. Team members will monitor each other for signs of heat stress or other distress and will render aid, if required.

NOTE: The IT Site Safety Officer and any member of the Field Team have the authority to stop work when imminent or serious safety hazards or conditions exist. Restart of work will be allowed only after the hazard or condition has been abated or reduced to a level deemed acceptable by the SSO (or his designated representative) and Project Manager.

9.0 Emergency Contact List

Fire - 738-6511 or RADIO CONTROL

Ambulance - 738-6511 or RADIO CONTROL

Hospital - 738-6511 or RADIO CONTROL

WMCO Industrial Hygiene - 738-6207 or Radio 357

WMCO Radiation Safety - 738-6889 or Radio 355

WMCO Fire & Safety - 738-6235 or Radio 303

Utility Engineer (AEDO) - Radio 202

Department of Energy - 738-6009

Project Contacts

IT Project Manager - Dick Boyd (W) 1-646-5068 (H) 245-0291
Beeper - (800) SKY PAGE - PIN # 2673610

IT Site Health & Safety Officer (SSO) - Stephen Duce (W) 1-513-738-3100 (H) 541-8359

IT Ops. Supervisor - Doug Moore (W) 1-646-5068 (H) 742-3401
Beeper - (800) SKY PAGE - PIN # 2673609

WMCO Health Physics Supervisor - Don Spahr (W) 738-6672
Beeper 844-5893

10.0 Site Exiting Procedure

10.1 Contamination Detection

All site personnel are required to decontaminate themselves and then confirm the effectiveness of the decontamination. The effectiveness will be determined by frisking with a hand-held radiation monitor. A Radiation Safety Technician (RST) shall monitor any visitors to the site.

Personnel monitoring will be performed using portable survey instruments equipped with either a GM Detector (Beta/Gamma) or a Zinc Sulfide Scintillation Detector (Alpha). For beta/gamma monitoring, the detector will be held within 1/2 inch of the surface being frisked and surveyed at a rate of 2 to 3 inches per second. Background levels while frisking for beta/gamma contamination must be less than 300 counts per minute (cpm). In cases where background exceeds 300 cpm, monitoring will be performed using alpha scintillation detectors. For alpha contamination monitoring, the detector should be held as close as possible to the surface being frisked (not in contact) and surveyed at a rate of 1 to 2 inches per second. All personnel will perform a whole body frisk upon exit from a contamination area.

In the event that contamination can not be removed to below the action level (100 cpm beta/gamma or detectable alpha above background), contact Health Physics personnel. Health Physics should be notified of any contamination incidents.

Vehicles and other equipment use on-site must be monitored for contamination (and decontaminated if necessary) before moving them to non-contaminated areas. Health Physics Personnel will determine when the equipment is safe to move to clean areas.

10.2 Decontamination

Decontamination reduces contaminant concentrations to acceptable levels, but does not generally remove it totally. Try to avoid contamination where possible by making minimum contact with the contaminant.

Personnel: Remove disposable protective equipment, wash hands, face and any other exposed skin. Detergent and water should be used to gently scrub skin surfaces which have contacted potentially contaminated wastes. The effectiveness of decontamination must be confirmed by frisking or the use of hand and foot monitors.

Heavy Equipment: Heavy equipment generally requires decontamination at the WMCO Decontamination Pad. Frisking and/or wipe tests will be performed to confirm the effectiveness of decontamination.

11.0 Sampling Derived Wastes

Sampling derived wastes are wastes generated in the performance of on-site activities and will be handled in accordance with WMCO Procedure SOP 65-C-106. These wastes include, but are not limited to:

- Disposable PPE such as Tyvek Coveralls, Gloves, and Booties
- Excess sample materials
- Used Glovebags and decontamination materials

All potentially contaminated waste materials resulting from site activities will be collected and placed in drums or other containers specified by WMCO. Protective clothing will be placed in plastic bags and disposed of as compactable, potentially contaminated waste through WMCO. Wastes will be segregated as much as practicable to aid in disposal.

Sampling derived wastes are the property of the client and are to be left on-site.

12.0 Confined Space Entry

No Confined Space Entry is permitted. Explosion-proof lighting shall be utilized inside the K-65 silos and/or explosive gas testing will be performed.

13.0 Personal Protective Equipment

This discussion of personal protective Equipment is generic in nature. Specific site requirements are presented in Section 5.0.

13.1 Level-B

Hardhat (optional)
Face Shield (optional)
Self-Contained Breathing Apparatus (Airline or bottled air) Disposable Coveralls: Saranex, Tyvek or equivalent
Inner Gloves: Latex or PVC
Outer Gloves: (Chemical resistant): Nitrile, Butyl, etc.
Chemical Resistant Boots
Latex Booties (optional)
Level-B PPE is to be worn in any of the following environments:

- Atmospheres containing chemicals having poor warning properties
- Unknown atmospheres
- Air concentrations exceeding 3X exposure standard
- Contaminants do not pose significant threat of exposure through skin absorption

13.2 Level-C

Hardhat (optional)
Face Shield (optional)
Air Purifying Respirator Cartridges (Organic Vapors, Acid Gas, Pesticides, Radionuclides, Particulates)
5-Minute Escape Apparatus (optional)
Disposable Coveralls: Saranex, Tyvek or equivalent
Inner Gloves: Latex or PVC
Outer Chemical Resistant: Nitrile, Butyl, etc.
Chemical Resistant Boots
Outer Disposable Booties: Latex
Level-C is intended to be used where:

- o Contaminants have good warning properties
- o Cartridges are approved for use with the contaminant
- o Oxygen concentrations are between 19.5 and 25%
- o Toxic contaminant concentrations are not IDLH
- o Concentrations are known and continuously monitored
- o Contaminant concentrations do not exceed 3X exposure

Cartridges will be changed:

- o Daily
- o If color indicator shows that the cartridge is spent
- o If breakthrough is detected

13.3 Level-D

Hardhat (optional)
Eye Protection: Safety Glasses or Goggles
Coveralls
Work Boots
Work Gloves

Level D PPE is basically a work uniform and provides no protection against chemicals. Level D is intended for sites where there is no risk from contaminants which can enter the breathing zone. Since most nonvolatile chemicals can adhere to particulates and be suspended in the air, Level D is generally not permitted on contaminated sites. Level D can be used to work in areas where there is not risk of contamination. Level D is not street clothes.

14.0 Calibration of Monitoring Equipment

It is the designated Site Safety Officer's duty to ensure site monitoring equipment is properly calibrated and functioning normally. An on-site instrument log will be maintained by Health Physics Personnel and contain the following information:

- Certificate of Calibration or NBS Traceable Standard (semi-annual)
- Record of daily efficiency/function check using a check source for radiation meters

15.0 Heat Stress

Heating of the body occurs from three sources:

1. Radiant heating from heat sources or sunlight
2. Convective heating from contact with a warmer object or liquid
3. Metabolic heating caused by activity

Cooling occurs through three mechanisms:

1. Respiration: The air we exhale is warm. As the body overheats, the respirations become more rapid.

2. Radiation: Heat is released at the surface of the skin. As the body overheats, the surficial blood vessels dilate and allows more heat to be lost

3. Evaporation: Perspiration is released to the skin surface and evaporates. The skin is cooled by evaporative cooling

Personal Protective Equipment reduces the body's ability to shed excess heat through radiation and evaporation. Personal Protective Equipment can also act like a greenhouse and collect radiant heat.

This means that heat stress can be a serious problem to hazardous waste site workers. The following discussion is intended to familiarize personnel with the symptoms of heat stress.

Heat stress is a progressive condition. Its mildest form is a slight elevation of body temperature. Normal body temperature is generally near 98.6° F. Working in high temperatures may elevate the temperature to 100°-101°F. By the time that the body temperature reaches 101°F, the worker generally has a headache. This is not a serious condition and can be treated through increased rest periods and cool fluid intake. The worker should not be allowed to work until the body temperature has been reduced to below 99°F.

If work continues when the first symptoms occur, the person may develop Heat Cramps. Heat Cramps are brought about by long exposure to heat. The outside temperature does not have to be much higher than the "normal" environment. The person perspires heavily, often drinking large quantities of water. As the sweating continues, salts are lost by the body bringing about painful muscle cramps.

Treatment: Any heat related emergency will be immediately reported to the WMCO medical department for subsequent treatment. The worker should be given rest, cool fluids, and removed from work for at least the remainder of the day. The person is likely to have an increased susceptibility to heat for the next few days.

Heat Exhaustion

Heat Exhaustion symptoms include a near normal body temperature and profuse sweating. The temperature may reach 103°F.

Treatment of Heat Exhaustion

Remove the person from field work. Have the person rest in a cool area such as an air conditioned car or shaded area. Provide cool liquids to drink. Avoid beverages which contain caffeine or alcohol. Do not allow the victim to go back to work for at least one or two days.

Heat Stroke

Heat Stroke is a life threatening condition. The person's body temperature regulating mechanism fail and his body cannot rid itself of excess heat. heat stroke symptoms include high body temperatures and HOT DRY SKIN. Most cases of heat stroke are reported on hot humid days.

HEAT STROKE VICTIMS MUST BE TRANSPORTED TO A HOSPITAL FOR IMMEDIATE TREATMENT. The individual must not be allowed to drive himself, since cases are on record where the victims condition worsens, he lapses into unconsciousness and dies. Heat stroke victims are not to return to field work without the physician's consent.

Prevention of Heat Stress

Become acclimatized to heat for several days whenever possible. Work in the cooler portions of the day. Early morning hours and evening hours are cooler.

Take frequent breaks and consume at least one pint of cool fluid every hour. Replenish electrolytes through the consumption of diluted drinks. The body loses more water than electrolytes. Concentrated salt, electrolyte, or juices can make you more suspectable to heat stress.

Monitoring:

Heat Stress Monitoring should be performed whenever temperatures exceed 80°F and respiratory protection is required.

Body Temp.: less than 99°:	Continue Work
Body Temp.: > 99°-100.3°F	Reduce rate of work or take more frequent breaks. Consume more cool fluids.
Body Temp.: > 100.4°F	Remove from work until temperature reduced to 99°F or less.
Pulse Rate: > 110 bpm	Remove from work until pulse rate falls below 110 beats per minute.

If the body temperature exceeds 100.4° or the pulse rate exceeds 110 bpm at rest the person must not continue to work. These conditions have been found to prevent most heat related illnesses. Occasionally, high heat conditions combine with poor eating, sleeping and drinking habits has resulted in heat stroke occurring in less than 20 minutes.

Table 15-1 lists signs and symptoms of heat stress.

Table 15-1
Signs and Symptoms of Heat Stress

- **Heat Rash** may result from continuous exposure to heat or humid air.

- **Heat Cramps** are caused by heavy sweating with inadequate electrolyte replacement.

  Signs and symptoms include:
  - muscle spasms
  - pain in the hands, feet and abdomen

- **Heat Exhaustion** occurs from increased stress on various body organs including inadequate block circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- **Heat Stroke** is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include:

  - red, hot, usually dry skin
  - lack of/or reduced perspiration
  - dizziness and confusion
  - strong, rapid pulse
  - coma

16.0 Area Emergencies/Contingency Plan

All area emergencies involving the sampling evolutions will be handled in accordance with WMCO procedure SOP-65-C-201.

17.0 Chemical/Radiological Releases and Spill Containment

The proposed operations pose a possibility for spilling or releasing hazardous materials. Potentially spillable materials include gasoline and diesel fuel. There is also a possibility that the core itself may release radioactive materials. Spills of radioactive material will be handled in accordance with WMCO procedure SOP-65-C-201. If a minor spill of diesel fuel of gasoline (<1 gal) occurs, personnel will take steps to control or clean the release such as shoveling contaminated soil into a drum. If a large release in the form of a spill greater than one gallon, or vapor cloud is observed, involved personnel will immediately withdraw at least 300 feet upwind and notify WMCO emergency services.

Radio to "CONTROL" - Control will dispatch the necessary personnel to handle the situation.

If possible, the following information should be included in the notification:

- Cause of release if known
- Location of release
- Time of release
- Chemical identify
- Quantity involved
- If there is radioactive involvement
- If materials are leaving the area as a vapor/gas
- If there is fire involvement
- The number of known exposures or injuries (if any)

Additional information may be requested such as:

- What has been/is being done to minimize the hazard.
- Degree of hazard to responders based on your knowledge of the contaminants.

ATTACHMENT 1

K-65 SILO SAMPLING TRAINING PLAN

K-65 SILO SAMPLING TRAINING PLAN

1.0 Purpose

This plan outlines the personnel training required to perform the resampling of the K-65 Silos at the Feed Materials Production Center (FMPC), Fernald, Ohio. The resampling is a joint effort between International Technology Corporation (IT), IT Subcontractor Personnel, Advanced Sciences Incorporated (ASI) and Westinghouse Materials company of Ohio (WMCO). All personnel involved with on-site activities will be trained in accordance with this Training Plan prior to start of the K-65 Silo Sampling Operations. Site-Specific Training shall be conducted by site-staff and technical personnel.

2.0 OSHA Training Requirements

Personnel involved with site operations shall be trained and certified in accordance with 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. This training will consist of:

- 40-Hour OSHA Training
- 8-Hour Annual Refresher Training
- 8-Hour Supervisory Training (Supervisors)
- 24-Hour Supervised Field Experience

3.0 Site-Specific Training

Personnel involved with site operations shall be trained on site-specific plans, procedures and practices prior to sampling the K-65 Silos. This training will include:

- Site-Specific Health and Safety Plan (to include Hazard Assessment, Personnel Protective Equipment, ALARA Practices, Safe use of Engineering Controls and Equipment, Names of Primary and Alternate Site Health and Safety Personnel).

- WMCO Radiation Safety Training

- K-65 Silo Resampling Detailed Work Procedures 166

- Respirator Training and Fit Test

- Daily Tailgate Safety Meetings
- Other WMCO Training (Criticality, Emergency Preparedness, Site Orientation, etc.)

4.0 Mock-Up Training

A mock-up training session will take place in accordance with DWP-004, "Mock Silo Sampling". This training will provide for a operational check of sampling equipment, test the Detailed Work Procedures for suitability to work being performed and familiarize personnel with personnel protective equipment and operating procedures. This will reduce the amount of time required for the actual sampling thus assisting in attaining ALARA goals.

5.0 Recordkeeping

Records and certificates of training shall be maintained in the project file and will be made available to the client upon request. All personnel participating in site activities shall have a completed Table 1, Record of Personnel Training, on file prior to the start of the K-65 Silo Resampling.

Table 1
Record of Personnel Training

Name ______________________ Company ______________________

SS # ______-______-________

1.0 OSHA Training

Requirements	Completion Date or N/A *
1.1 40-Hour Hazardous Materials Course	____________
1.2 8-Hour Annual Refresher Training (If required)	____________
1.3 8-Hour Supervisory Training (If required)	____________
1.4 24-Hour Supervised Field Experience	____________

2.0 Site-Specific Training

Requirements	Completion Date
2.1 WMCO Radiation Safety Training	____________
2.2 Detailed Work Procedures	____________
2.3 Respirator Training and Fit Test	____________
2.4 WMCO Indoctrination (Criticality Safety, Emergency Preparedness, etc.)	____________
2.5 Site-Specific Health & Safety Plan	____________

3.0 Mock-Up Training

3.1 Mock-Up Training
3.2 Revised Procedure Training (If required) ____________

Reviewed By ______________________________
Safety Supervisor

* N/A - Not Applicable

APPENDIX C

MISCELLANEOUS PROCEDURES

APPENDIX C

1.0 CHAIN-OF-CUSTODY PROCEDURES

1.1 Field Sampling

The following will be used in the chain-of-custody process for sample tracking and field activities:

- Sample identification and labeling
- Sample chain-of-custody form
- Sample collection log; and
- Laboratory request for analysis form

1.1.1 Sample Identification and Labeling

All samples will be adequately marked for identification from the time of collection and packaging through shipping and storage. Marking will generally be made on the sample container (jar, bottle, etc.) but may be applied directly to the sample, or on a tag or label attached to the sample or container, depending on the type of sample and its intended use. Sample identification will include, as appropriate:

- Project name and number
- Sample ID number
- Sample location (silo number, manway location, zone location)
- Sample date and time
- The initials of the individual(s) performing the sampling
- Gross weight, sample weight and tare weight
- Preservatives used

An example of the sample label is illustrated in Figure 1-1. A sample numbering system will be established for the purpose of identifying the samples according to the location and type.

FERNALD
RI/FS

DATE					
TIME					
PAGE ____ OF ____					
PAGE					
PROJECT NO.					

SAMPLE COLLECTION LOG

PROJECT NAME ____________________

SAMPLE NO. ____________________

SAMPLE LOCATION ____________________

SAMPLE TYPE ____________________

COMPOSITE ______YES ______NO

COMPOSITE TYPE ____________________

DEPTH OF SAMPLE ____________________

WEATHER ____________________

CONTAINERS USED	AMOUNT COLLECTED

COMMENTS:

PREPARED BY: ____________________

1.1.2 Chain-of-Custody Record

Documentation of the sample chain-of-custody is provided by the use of a chain-of-custody record that includes the sampling location, the type and amount of samples collected, the date and time of sample collection, the name(s) of the person(s) responsible for sample collection, the date and time of all custody transfers, the signature of the person relinquishing and accepting sample custody, and other pertinent information.

Chain-of-Custody procedures document sample possession from the time of collection to disposal. A sample is considered in custody if it is:

- In one's physical possession
- In view, after being in physical possession
- Locked so that no one can tamper with it, after having been in physical custody; and/or
- In a secured area, restricted to authorized personnel

Chain-of-Custody record will be initiated in the field and will accompany each group of samples during shipment to the laboratory. Each time custody of the sample changes, the new custodian will sign the record and indicate the dates of transfer. An example of the chain-of-custody record is included in Section 1, Figure 3-4.

For samples that are directly transported to the WMCO Extraction Facility, the original chain-of-custody form shall be kept in possession of the person delivering the samples.

If the samples are shipped to the laboratory by commercial carrier, the original chain-of-custody from WMCO shall be sealed in a watertight container, placed in the shipping container, and the shipping container sealed prior to giving it to the carrier.

If the samples are directly transported to the laboratory, the original chain-of-custody form shall be kept in possession of the person delivering the samples.

For samples shipped by commercial carrier, the waybill shall serve as an extension of the chain-of-custody record between the final field custodian and receipt in the laboratory. (The carrier and waybill number will be written on the chain-of-custody form. If the original chain-of-custody form is sealed in the shipping container before the waybill number is received, then this number will be written on the copy of the chain-of-custody form.)

Upon receipt in the laboratory, the Quality Control Coordinator, or representative, shall open the shipping containers, compare the contents with the chain-of-custody record, and sign and date the record. The Quality Control Coordinator will also record the carrier and waybill number on the original chain-of-custody form, if it is not already present.

The original (white copy) of the original chain-of-custody record and the Request for Analysis Form will accompany the sample to the laboratory.

The yellow copies of the chain-of-custody record and the Request for Analysis Form will be retained in the project file. Once samples are received in the laboratory, chain-of-custody records will be signed by a designated representative of the laboratory and copies of the signed chain-of-custody records will be submitted to the K-65 Sampling Task Manager or other designated representative.

1.1.3 Sample Collection Log

A sample collection log is prepared for each sample to record information pertaining to the location and collection of a sample. The following information is required on the sample collection log, as appropriate:

- Project name and number
- Unique sample number
- Sample location
- Collector initials
- Date and time sample collected
- Sample location
- Analysis required

An example of a sample collection log is provided in Figure 1-2.

1.1.4 Laboratory Request for Analysis Form

The laboratory Request for Analysis Form is prepared to indicate the testing program required for the collected samples. The following information is recorded on the laboratory request for analysis form:

- Project name and number
- Date samples shipped
- Required report date and turnaround times for analysis
- Contact with telephone number for receipt of the analytical report and billing invoices
- Sample identification numbers
- Sample volume collected and appropriate preservatives

An example of the laboratory request for analysis form is provided in Section 1, Figure 3-5.

1.2 Analytical Laboratory

1.2.1 Laboratory Sample Receipt

NOTE

The same procedures will be followed at both the IT Analytical Laboratory and the WMCO Extraction Facility.

Upon sample receipt, the QA coordinator or designee shall:

- If samples have been damaged during shipment, the remaining samples shall be carefully examined to determine whether they were affected. Any samples suspected of being affected shall also be considered damaged. It will be noted on the chain-of-custody record what specific samples were damaged and that the samples were removed from the sampling program. The K-65 Sample Task Manager or designee will be notified by telephone and in writing as soon as possible of an estimate of the cause of damage, that samples were damaged and that they must be resampled, or the testing program changed.

- Compare samples received against those listed on the chain-of-custody record

- Sign and date the chain-of-custody record and attach the waybill to the chain-of-custody record

- Place the samples in adequate laboratory storage

- Enter the samples in the laboratory sample log-in book which contains the following information:

  - Project identification number
  - Sample numbers
  - Type of samples
  - Date received in laboratory

- Notify the laboratory manager or group leaders of sample arrival

- Place the completed chain-of-custody records in the project file

If samples collected arrive without chain-of-custody or with incorrect chain-of-custody records, the following actions shall be undertaken by the QC coordinator:

- If the chain-of-custody record is incorrect, a memorandum to the project director and K-65 Task Sampling Manager is prepared stating the deviation. The memorandum must be signed and dated by the person originating the chain-of-custody and by the QC coordinator. The memorandum will serve as an amendment to the chain-of-custody. If the information on the chain-of-custody record cannot be corrected by the QC coordinator or the field personnel, the samples affected shall be removed from the sampling program. The K-65 Sampling Task Manager will be contacted.

- If the chain-of-custody record is not shipped with the samples, the field personnel shall be contacted and a memorandum prepared which lists the persons involved in collecting, shipping, and receiving the samples and the times, dates, and events. Each person involved must sign and date this memorandum. The completed memorandum will be maintained in lieu of the chain-of-custody record.

1.2.2 Initiation of Testing Program

As stated in Section 1.1.4, a request for analysis form shall be submitted with the samples to the laboratory. If the analytical program is not defined with the sample shipment, the QC coordinator shall immediately notify the manager responsible for the work for definition of the analysis program.

The laboratory manager and group leaders are responsible for prioritizing samples on the basis of holding time and of the required time needed to include the samples into the laboratory sample stream.

1.2.3 Sample Disposal

The chain-of-custody for the sample is completed as part of sample disposal. There are several possibilities for sample disposition:

- The sample may be completely consumed during analysis
- Samples may be returned to WMCO for disposal
- The samples may be stored after analysis. Proper environmental control and holding time must be observed if re-analysis is anticipated. If re-analysis is not anticipated, environmental conditions for storage will not be observed.

The laboratory manager shall determine disposition of samples if not specified on the Request for Analysis Form.

2.0 SAMPLE COLLECTION PROCEDURES

The following considerations form the basis for the sampling program:

- Frequency of sampling
- Location and number of locations to be sampled
- Methods of sampling to be employed
- Media to be sampled
- Number of samples to be collected
- Volume of samples to be collected
- Type and kind of analyses to be performed in the field
- Procedures and precautions to be followed during sampling; and
- Methods of preservation and shipment

Methods of sampling employed shall preserve the integrity of material parameters.

The following guidelines are applicable to the implementation of a field sampling program:

- Review the sample collection program to become familiar with the overall scope of the study and also sampling procedures and equipment, sample handling procedures, and shipping requirements

- Determine the characteristics of the material to be sampled, become familiar with the safety precautions and practices, and obtain the necessary safety equipment

- Obtain equipment and materials necessary to perform field sampling and analyses

- Review manufacturer's instructions on equipment calibration and sensitivity

- Calibrate all field equipment prior to field work according to manufacturer's instructions and calibration procedures

  NOTE: Certain equipment may require calibration in the field before each measurement

- Fill out the appropriate sample field collection reports (Sample Collection log, Figure 1-2) completely prior to leaving the field location.

- Label all sample containers with appropriate information. This includes sample number, location, sampling date and time, preservatives added and sampler's initials.

- Complete chain-of-custody records and laboratory request for analysis forms which will accompany all samples during shipment.

The following guidelines are applicable for sample packaging to avoid breakage or cross contamination:

- Sample container lids are never to be mixed. Sample lids will stay on the original container until time of sampling (only open sample container at the time of sampling). The original sample containers will arrive in the field in packages with custody tape affixed at the appropriate access points. When sample container packages are received in the field, the chain-of-custody form for shipping the empty containers to the filed will be appropriately marked to state if the custody seal was affixed when the package arrived.

- After a sample is placed in a plastic/glass container, the sample container will be secured with a custody seal and placed in a plastic bag to minimize the potential for contamination from vermiculite or other packing material.

- Upon arrival at the laboratory, the QC coordinator, or designee will examine the contents of the shipping container and document on the chain-of-custody record if any sample containers do not have the custody tape affixed.

- The secured sample containers will be placed in the container in such a way so they do not touch one another. Use additional container protection (e.g., new, unused paint cans), if necessary. (Keep container closed except when placing sample in container).

Samples will be properly packaged and labeled for shipment and dispatched to the appropriate laboratory for analysis. Separate chain-of-custody and request-for-analysis records will be prepared for each laboratory. The following requirements for shipping containers will be followed:

- United States Department of Transportation (DOT) regulations covering the transport of hazardous materials are contained in the Code of Federal Regulations (CFR) Title 49, Parts 170-179. Field personnel should acquaint themselves with the general provisions of these requirements.

- Shipping containers are to be padlocked or custody-sealed for shipment, as appropriate. The packing custody seal should consist of filament tape wrapped around the container, with a custody seal affixed at appropriate access points. In this way, access to the container can be gained only by cutting the filament tape and breaking the seal.

- Shipping containers will be secured by field personnel with a proper custody seal, marked with indelible pen or ink, and addressed to the appropriate laboratory.

- Field personnel will make arrangements for transportation of samples. When custody is relinquished to a shipper, field personnel will telephone the receiving laboratory custodian to report the expected time of arrival of the sample shipment and the existing time constraints (holding times) for sample analysis.

2.1 Field Storage and Shipment of Samples

Samples will be stored in a cool place away from direct sunlight. Field personnel should make sure that sample container lids are tight and secure before storing them in a final package.

Samples requiring extractions shall be delivered to WMCO Extraction Facility within 7 days of sampling. Upon completion of the extraction process, the samples will then be shipped to the IT Oak Ridge laboratory for analysis following the methods described in the following paragraph.

Sample collected during sampling operations that have to be transported to IT Laboratories in Tennessee for analysis. Transportation of sample must be accomplished not only in a manner designed to protect the integrity of the sample, but also to prevent any detrimental effects from the potentially hazardous nature of the samples. Regulations for packaging, marking, labeling, and shipping of hazardous materials, substances and wastes are promulgated by the U.S. Department of Transportation (DOT) and described in 49 CFR 171 through 177 (in particular, 172.402h, Packaging Containing Samples). In general, these regulations were not intended to cover the shipment of samples collected at hazardous waste sites. However, the U.S. EPA has deemed it prudent to package, mark, label, and ship samples observing these DOT procedures. The information contained in this section is for general guidance and, although factual, should not be misconstrued as identical to DOT regulations for transportation of hazardous materials. Samples collected shall be classified as hazardous substance (or waste) samples. Special precautions, procedures, and secondary containment areas within laboratories will be used.

2.2 Sample Bottle Preparation and Sample Preservation

Sample bottle containing premeasured amounts of the appropriate chemical preservatives are prepared in the laboratory and are shipped to the field. Sample bottles are either purchased precleaned in accordance with U.S. EPA specifications or are cleaned in the laboratory to U.S. EPA specifications. Volatile organic analysis (VOA) vials are purchased precleaned. Glass containers for other organic analyses are washed with a nonphosphate detergent, rinsed with tap water, rinsed with methanol, rinsed with deionized water, and then rinsed with dilute nitric acid. Plastic containers for other general chemistry and radiological procedures are washed with a nonphosphate detergent and rinsed with tap water and deionized water.