

Hematite Decommissioning Project	Procedure: HDP-PR-FSS-701, Final Status Survey Plan Development		
	Westinghouse Non-Proprietary Class 3	Revision: 4	Appendix P-4, Page 1 of 1

APPENDIX P-4

FSS SAMPLE & MEASUREMENT LOCATIONS & COORDINATES

Survey Area:	LSA 10	Description:	Burial Pits Open Land Area
Survey Unit:	02	Description:	North East Corner Survey Unit (North Burial Pit)
Survey Type:	FSS	Classification:	Class 1

Measurement or Sample ID	Surface or CSM	Type	Start Elevation	End Elevation	Northing (Y Axis) *	Easting (X Axis) *	Remarks / Notes
L10-02-01-B-S-S-00	Uniform	S	432.6	432.5	865420.7	827351.1	Surface 1-inch grab
L10-02-02-B-R-S-00	Uniform	S	432.5	428.1	865420.7	827351.1	Root 4.4-foot composite
L10-02-04-B-S-S-00	Uniform	S	436.2	435.8	865379.3	827327.1	Surface 5-inch grab
L10-02-05-B-R-S-00	Uniform	S	435.8	431.3	865379.3	827327.1	Root 4.4-foot composite
L10-02-07-B-E-S-00	Uniform	S	424.7	424.2	865379.3	827375.0	Excavation 6-inch grab
L10-02-08-B-E-S-00	Uniform	S	426.9	426.4	865338.0	827351.1	Excavation 6-inch grab
L10-02-09-B-E-S-00	Uniform	S	423.5	423.0	865338.0	827399.0	Excavation 6-inch grab
L10-02-10-B-E-S-00	Uniform	S	418.9	418.4	865338.0	827446.9	Excavation 6-inch grab
L10-02-11-B-E-S-00	Uniform	S	422.3	421.8	865338.0	827494.8	Excavation 6-inch grab
L10-02-12-B-E-S-00	Uniform	S	422.3	421.8	865296.7	827423.0	Excavation 6-inch grab
L10-02-11-B-E-Q-00	Uniform	Q	422.3	421.8	865338.0	827494.8	Excavation 6-inch grab
L10-02-13-B-E-B-00	Uniform	B	429.5	419.6	865341.1	827408.1	Excavation 6-inch grab

Elevations are in feet above mean sea level.

* Missouri - East State Plane Coordinates [North American Datum (NAD) 1983]

Surface: Floor = F; Wall = W; Ceiling = C; Roof = R

CSM: Three-Layer (Surface-Root-Excavation) with conservative use of Uniform DCGLs

Type: Systematic = S, Biased = B; QC = Q; Investigation = I

Green shaded samples are the samples at each sample location, for use in WRS test.

Quality Record

**HDP-PR-FSS-721 Final Status Survey Data Evaluation
Data Review and Calculation of the Sum-of-Fractions (SOF)**

Use corrected net results for all DE calcs.

DCLG_W Measure Tc-99, All SEAs

	Uniform
U-234	165.4
U-235	51.6
U-238	168.6
Tc-99	25.1
Th-232	2.0
Ra-226	1.9

weighted SOF _{MEAN}	0.07		
	SS	RS	ES
fractions	0.2	0.2	0.6

SOF_{MEAN} Re-use Backfill Material
0 Off-Site Backfill

SOF_{MEAN} Groundwater
0.16

SOF_{TOT} <= 1
SOF_{MEAN} BU 0.23 PASS

Infer U234			
U-238/U235	U-234/U235	U-234	%
9.6	19.1	4.4	4.3
12.0	19.2	1.9	1.3
5.7	18.3	3.4	2.7
21.5	21.0	0.9	0.7
10.5	18.9	1.1	1.5
11.9	19.2	2.3	1.3
5.3	18.2	1.8	2.9
14.5	19.6	2.3	1.1
6.5	18.3	2.5	2.4
5.2	18.2	5.9	2.9
5.3	18.2	1.8	2.9
5.5	18.2	4.1	2.8
Average Enrichment (%)			2.11

Infer U-234 MDC using U- 235 MDC * ratio of U-234/U-235 @ that sample's enrichment	2.8785
	5.4964
	5.6604
	5.6169
	6.0629
	5.0159
	4.6631
	4.8216
	2.9909
	2.1676
	3.5520
	5.8355

**HDP-PR-FSS-721 Final Status Survey Data Evaluation
Retrospective Sample Size Verification**

Uniform DCGL Criteria Evaluation	
N/2 Value Verification	
Isotope(s)	SOF (Ra/Tc/Th/Iso U)
St. Dev.	0.03
DCGL _{SOF}	1
LBGR (Mean)	0.07
Shift	0.93
Relative Shift ($\Delta\sigma$)	28.87
MARSSIM Table 5.1 (P_r)	1.000000
N	12
N + 20%	14.4
N/2	8
FSS N/2	8
Verification Check	SUFFICIENT MEASUREMENTS
"N/2" Corresponds to the number of survey unit measurement locations required for the WRS Test	

MARSSIM Table 5.1

$\Delta\sigma$	P_r
0.1	0.528182
0.2	0.556223
0.3	0.583985
0.4	0.611335
0.5	0.638143
0.6	0.664290
0.7	0.689665
0.8	0.714167
0.9	0.737710
1.0	0.760217
1.1	0.781627
1.2	0.801892
1.3	0.820978
1.4	0.838864
1.5	0.855541
1.6	0.871014
1.7	0.885299
1.8	0.898420
1.9	0.910413
2.0	0.921319
2.25	0.944167
2.5	0.961428
2.75	0.974067
3.0	0.983039
3.5	0.993329
4.0	0.997658
4.01	1.000000

MARSSIM Table 5.2, $\alpha = 0.05$, $\beta = 0.10$

α (or β)	$Z_{1-\alpha}$ (or $Z_{1-\beta}$)
0.005	2.576
0.01	2.326
0.015	2.241
0.025	1.960
0.05	1.645
0.10	1.282
0.15	1.036
0.2	0.842
0.25	0.674
0.30	0.524

α
 β

**FORM HDP-PR-FSS-703-1
FIELD DUPLICATE SAMPLE ASSESSMENT**

Survey Unit No.:	LSA 10-02				Survey Unit Description:	North East Corner Survey Unit (North Burial Pits)						
Sample ID	Field Duplicate Sample ID	Radionuclide	Sample (pCi/g)		Field Duplicate Sample (pCi/g)		Average Activity (\bar{x}) (pCi/g)	Nuclide DCGL (pCi/g)	Statistic ²	Warning Limit	Control Limit	Statistic Exceeds Limit? (Y/N)
			Activity (x_i)	MDC	Activity (x_i)	MDC						
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	Ra-226	0.956	0.0738	0.812	0.0586	0.884	1.9	0.144	0.269	0.403	N
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	Tc-99	0.274	0.249	0.453	0.243	0.3635	25.1	0.179	3.552	5.321	N
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	Th-232	0.843	0.0839	0.577	0.0649	0.710	2.0	0.266	0.283	0.424	N
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	U-234 ¹	2.477	NA	1.840	NA	2.158	195.4	0.637	27.649	41.425	N
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	U-235	0.135	0.163	0.101	0.195	0.118	51.6	NA	7.301	10.939	NA
L10-02-11-B-E-S-00	L10-02-11-B-E-Q-00	U-238	0.875	0.785	0.536	0.712	0.706	168.8	NA	23.885	35.786	NA

Comments:

1. U-234 is inferred, no MDC available.
2. U-235 results are less than the related MDC, therefore duplicate assessment is not necessary.

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Reviewed by: Brian A. Miller

Date: 02/26/2015

Date: 03/16/2015

Quality Record