

Hematite Decommissioning Project	Procedure: HDP-PR-FSS-701, Final Status Survey Plan Development		
		Revision: 10	Appendix P-4, Page 1 of 1

**APPENDIX P-4**

**FSS SAMPLE & MEASUREMENT LOCATIONS & COORDINATES**

<b>Survey Area:</b>	LSA 04	<b>Description:</b>	Plant Soils Open Land Area
<b>Survey Unit:</b>	01	<b>Description:</b>	SU in "Area 14" adjacent to west side of Bld 230
<b>Survey Type:</b>	FSS	<b>Classification:</b>	Class 3

Measurement or Sample ID	Surface or CSM	Type	Start Elevation*	End Elevation*	Northing** (Y Axis)	Easting** (X Axis)	Remarks / Notes
L04-01-01-P-S-S-00	Uniform	S	433.78	433.3	864336.0	826965.0	Surface 6-inch grab
L04-01-02-P-R-S-00	Uniform	S	433.29	428.9	864336.0	826965.0	Root 4.4-ft composite
L04-01-04-P-S-S-00	Uniform	S	434.2	433.7	864374.0	826936.0	Surface 6-inch grab
L04-01-05-P-R-S-00	Uniform	S	433.71	429.3	864374.0	826936.0	Root 4.4-ft composite
L04-01-07-P-S-S-00	Uniform	S	434.18	433.7	864429.0	826957.0	Surface 6-inch grab
L04-01-08-P-R-S-00	Uniform	S	433.69	429.3	864429.0	826957.0	Root 4.4-ft composite
L04-01-10-P-S-S-00	Uniform	S	431.74	431.3	864497.0	826825.0	Surface 6-inch grab
L04-01-11-P-R-S-00	Uniform	S	431.25	426.8	864497.0	826825.0	Root 4.4-ft composite
L04-01-13-P-S-S-00	Uniform	S	430.9	430.4	864539.0	826775.0	Surface 6-inch grab
L04-01-14-P-R-S-00	Uniform	S	430.4	426.0	864539.0	826775.0	Root 4.4-ft composite
L04-01-16-P-S-S-00	Uniform	S	431.9	431.4	864591.0	826824.0	Surface 6-inch grab
L04-01-17-P-R-S-00	Uniform	S	431.4	427.0	864591.0	826824.0	Root 4.4-ft composite
L04-01-19-P-S-S-00	Uniform	S	432.6	432.1	864578.0	826862.0	Surface 6-inch grab
L04-01-20-P-R-S-00	Uniform	S	432.1	427.7	864578.0	826862.0	Root 4.4-ft composite
L04-01-22-P-S-S-00	Uniform	S	433.3	432.8	864567.0	826897.0	Surface 6-inch grab
L04-01-23-P-R-S-00	Uniform	S	432.8	428.3	864567.0	826897.0	Root 4.4-ft composite
L04-01-07-P-S-Q-00	Uniform	Q	434.2	433.7	864429.0	826957.0	Surface 6-inch grab
L04-01-14-P-R-Q-00	Uniform	Q	430.4	426.0	864539.0	826775.0	Root 4.4-ft composite
L04-01-25-P-S-B-00	Uniform	B	430.9	430.4	864561.0	826822.0	Biased 6-inch grab
L04-01-26-P-S-B-00	Uniform	B	430.9	430.4	864526.0	826855.0	Biased 6-inch grab

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

\*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) or Uniform DCGLs used  
 Type: Systematic = S, Biased = B; QC = Q; Investigation = I

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
 Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)

Evaluate Final Status Survey Data: LSA-04-01

Sample ID	Sample Depth (ft)	Type (Systematic, Bias, QC)	TestAmerica Analytical Results Step 8.3.2																													
			Ra-226						Tc-99					Th-232					Inferred U-234				U-235				U-238					
			Result	Uncertainty	MDC	Qualifier	Net Result*	Corrected Result	Result	Corrected Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC	Qualifier	Net Result**	Corrected Result	Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC	Qualifier	Result
L04-01-01-P-S-S-00	0.00	S	0.934	0.143	0.073	N/A	-0.136	0.000	0.412	0.412	0.104	0.212	N/A	0.950	0.143	0.122	N/A	-0.050	0.000	5.431	NA	NA	NA	0.297	0.147	0.197	N/A	1.740	0.371	0.869	N/A	
L04-01-02-P-R-S-00	0.50	S	1.240	0.180	0.089	N/A	0.170	0.170	0.091	0.091	0.015	0.213	U	1.310	0.196	0.108	N/A	0.310	0.310	2.035	NA	NA	NA	0.108	0.157	0.259	U	1.060	0.316	0.821	N/A	
L04-01-04-P-S-S-00	0.00	S	0.894	0.126	0.052	N/A	-0.176	0.000	0.647	0.647	0.115	0.218	N/A	0.874	0.136	0.101	N/A	-0.126	0.000	4.987	NA	NA	NA	0.275	0.142	0.172	N/A	1.190	0.627	0.781	N/A	
L04-01-05-P-R-S-00	0.50	S	1.060	0.175	0.087	N/A	-0.010	0.000	0.066	0.066	0.015	0.212	U	1.050	0.186	0.111	N/A	0.050	0.050	1.833	NA	NA	NA	0.094	0.126	0.251	U	1.370	0.563	0.841	N/A	
L04-01-07-P-S-S-00	0.00	S	0.799	0.119	0.060	N/A	-0.271	0.000	0.244	0.244	0.042	0.208	N/A	0.738	0.124	0.111	N/A	-0.262	0.000	1.002	NA	NA	NA	0.051	0.100	0.203	U	0.760	0.250	0.700	N/A	
L04-01-08-P-R-S-00	0.50	S	1.090	0.160	0.081	N/A	0.020	0.020	0.152	0.152	0.047	0.205	U	1.010	0.154	0.116	N/A	0.010	0.010	4.018	NA	NA	NA	0.218	0.132	0.243	U	1.510	0.539	0.801	N/A	
L04-01-10-P-S-S-00	0.00	S	1.050	0.142	0.050	N/A	-0.020	0.000	0.027	0.027	0.034	0.216	U	1.110	0.164	0.096	N/A	0.110	0.110	2.057	NA	NA	NA	0.111	0.138	0.215	U	0.877	0.314	0.782	N/A	
L04-01-11-P-R-S-00	0.50	S	1.320	0.195	0.087	N/A	0.250	0.250	0.014	0.014	0.004	0.225	U	1.060	0.179	0.145	N/A	0.060	0.060	1.443	NA	NA	NA	0.074	0.125	0.279	U	1.050	0.398	1.020	N/A	
L04-01-13-P-S-S-00	0.00	S	0.303	0.053	0.031	N/A	-0.767	0.000	0.031	0.031	0.011	0.184	U	0.100	0.031	0.061	N/A	-0.900	0.000	0.632	NA	NA	NA	0.035	0.048	0.102	U	0.166	0.108	0.326	U	
L04-01-14-P-R-S-00	0.50	S	1.180	0.168	0.071	N/A	0.110	0.110	0.034	0.034	0.028	0.227	U	1.080	0.166	0.124	N/A	0.080	0.080	1.215	NA	NA	NA	0.061	0.157	0.245	U	0.993	0.512	0.801	N/A	
L04-01-16-P-S-S-00	0.00	S	0.181	0.040	0.030	N/A	-0.889	0.000	0.008	0.008	0.024	0.162	U	0.055	0.029	0.058	N/A	-0.945	0.000	0.595	NA	NA	NA	0.033	0.048	0.073	U	0.070	0.097	0.303	U	
L04-01-17-P-R-S-00	0.50	S	0.237	0.051	0.027	N/A	-0.833	0.000	-0.008	0.000	0.039	0.151	U	0.084	0.053	0.093	N/A	-0.916	0.000	0.393	NA	NA	NA	0.021	0.057	0.098	U	0.237	0.142	0.323	U	
L04-01-19-P-S-S-00	0.00	S	0.926	0.147	0.070	N/A	-0.144	0.000	0.066	0.066	0.061	0.219	U	0.866	0.144	0.133	N/A	-0.134	0.000	3.191	NA	NA	NA	0.175	0.168	0.204	U	0.965	0.503	0.784	N/A	
L04-01-20-P-R-S-00	0.50	S	1.350	0.181	0.060	N/A	0.280	0.280	0.034	0.034	0.013	0.193	U	1.260	0.190	0.151	N/A	0.260	0.260	2.204	NA	NA	NA	0.117	0.140	0.229	U	1.130	0.523	0.808	N/A	
L04-01-22-P-S-S-00	0.00	S	0.541	0.083	0.037	N/A	-0.529	0.000	0.033	0.033	0.009	0.144	U	0.387	0.076	0.044	N/A	-0.613	0.000	1.042	NA	NA	NA	0.057	0.072	0.121	U	0.375	0.162	0.425	U	
L04-01-23-P-R-S-00	0.50	S	1.020	0.139	0.060	N/A	-0.050	0.000	0.027	0.027	0.015	0.201	U	1.030	0.156	0.093	N/A	0.030	0.030	3.034	NA	NA	NA	0.165	0.116	0.181	U	1.110	0.467	0.716	N/A	
L04-01-07-P-S-Q-00	0.00	Q	0.639	0.107	0.061	N/A	-0.431	0.000	0.130	0.130	0.054	0.183	U	0.417	0.100	0.089	N/A	-0.583	0.000	2.304	NA	NA	NA	0.127	0.101	0.161	U	0.565	0.234	0.607	U	
L04-01-14-P-R-Q-00	0.50	Q	1.290	0.168	0.060	N/A	0.220	0.220	0.044	0.044	0.032	0.224	U	1.080	0.185	0.095	N/A	0.080	0.080	1.586	NA	NA	NA	0.081	0.145	0.243	U	1.140	0.619	0.793	N/A	
L04-01-25-P-S-B-00	0.00	B	1.010	0.144	0.062	N/A	-0.060	0.000	0.209	0.071	0.234	U	0.907	0.155	0.099	N/A	-0.093	0.000	3.383	NA	NA	NA	0.184	0.125	0.188	U	1.230	0.497	0.747	N/A		
L04-01-26-P-S-B-00	0.00	B	0.504	0.087	0.024	N/A	-0.566	0.000	0.226	0.226	0.028	0.209	N/A	0.360	0.097	0.064	N/A	-0.640	0.000	1.218	NA	NA	NA	0.066	0.061	0.162	U	0.505	0.221	0.567	U	
Systematic Minimum					0.000					0.000						0.000				0.393					0.021					0.070		
Systematic Maximum					0.280					0.647						0.310				5.431					0.297					1.740		
Systematic Mean					0.052					0.118						0.057				2.194					0.118					0.913		
Systematic Median					0.000					0.034						0.005				1.934					0.101					1.022		
Systematic Standard Deviation					0.096					0.177						0.096				1.549					0.086					0.483		
Step 8.3.3																																
Step 8.4.2								With ingrowth, use Ra226 bkg =	1.07					Th232 bkg =	1.0																	

NOTES:

Gross results in units of pCi/g.

\* Background with ingrowth (1.07 pCi/g) subtracted from gross result.

\*\*Background (1.0 pCi/g) subtracted from gross result.

U Qualifier: Result is less than the sample detection limit.

All uncertainty values are reported at the 2-sigma confidence level.

Ave Conc. Ra-226, SS	Ave Conc. Tc-99, SS	Ave Conc. Th-232, SS	Ave Conc. U-234, SS	Ave Conc. U-235, SS	Ave Conc. U-238, SS
0.000	0.412	0.000	5.431	0.297	1.740
-	-	-	-	-	-
0.000	0.647	0.000	4.987	0.275	1.190
-	-	-	-	-	-
0.000	0.244	0.000	1.002	0.051	0.760
-	-	-	-	-	-
0.000	0.027	0.110	2.057	0.111	0.877
-	-	-	-	-	-
0.000	0.031	0.000	0.632	0.035	0.166
-	-	-	-	-	-
0.000	0.008	0.000	0.595	0.033	0.070
-	-	-	-	-	-
0.000	0.066	0.000	3.191	0.175	0.965
-	-	-	-	-	-
0.000	0.033	0.000	1.042	0.057	0.375

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
 Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)

Sample ID	Sample Depth (ft)	Type (Systematic, Bias, QC)	Enrichment		SOF Step 8.4.3	Root Stratum SOF Verification (unexcavated/not backfilled only) Step 8.4.4a.1			root count	excavation count	surface count	
			Enr.	SOF		Is Sample In the Root Stratum?	Is ROOT Sample SOF 0.5?					
L04-01-01-P-S-S-00	0.00	S	2.6	0.06		SURFACE	good				1	
L04-01-02-P-R-S-00	0.50	S	1.6	0.27		ROOT	good	1				
L04-01-04-P-S-S-00	0.00	S	3.5	0.06		SURFACE	good			1		
L04-01-05-P-R-S-00	0.50	S	1.1	0.05		ROOT	good	1				
L04-01-07-P-S-S-00	0.00	S	1.1	0.02		SURFACE	good			1		
L04-01-08-P-R-S-00	0.50	S	2.2	0.06		ROOT	good	1				
L04-01-10-P-S-S-00	0.00	S	2.0	0.07		SURFACE	good			1		
L04-01-11-P-R-S-00	0.50	S	1.1	0.18		ROOT	good	1				
L04-01-13-P-S-S-00	0.00	S	3.2	0.01		SURFACE	good			1		
L04-01-14-P-R-S-00	0.50	S	1.0	0.11		ROOT	good	1				
L04-01-16-P-S-S-00	0.00	S	6.8	0.00		SURFACE	good			1		
L04-01-17-P-R-S-00	0.50	S	1.4	0.00		ROOT	good	1				
L04-01-19-P-S-S-00	0.00	S	2.8	0.03		SURFACE	good			1		
L04-01-20-P-R-S-00	0.50	S	1.6	0.30		ROOT	good	1				
L04-01-22-P-S-S-00	0.00	S	2.4	0.01		SURFACE	good			1		
L04-01-23-P-R-S-00	0.50	S	2.3	0.04		ROOT	good	1				
L04-01-07-P-S-Q-00	0.00	Q	3.4	0.02			good					
L04-01-14-P-R-Q-00	0.50	Q	1.1	0.17			good					
L04-01-25-P-S-B-00	0.00	B	2.3	0.04			good					
L04-01-26-P-S-B-00	0.00	B	2.0	0.02			good					
Average Enrichment (%)						count tot			16	8	0	8

Use corrected net results for all DE calcs 721 Sec. 8.4.2

MDC SOF Step 8.1.1c

0.14
0.14
0.11
0.12
0.10
0.12
0.09
0.14
0.06
0.12
0.05
0.07
0.12
0.12
0.05
0.09
0.09
0.10
0.10
0.06

Step 8.4.1 DCL<sub>w</sub>, Measure Tc-99, All SEAs

Uniform	
U-234	195.4
U-235	51.6
U-238	168.8
Tc-99	25.1
Th-232	2.0
Ra-226	1.9

Step 8.4.5b

weighted SOF <sub>MEAN</sub> = 0.08			
	SS	RS	ES
fractions	0.5	0.5	0

Step 8.4.5c SOF<sub>MEAN</sub> Re-use Backfill Material

0

Step 8.4.5e SOF<sub>MEAN</sub> Groundwater

0.16

Step 8.4.5g (<=1)

SOF<sub>MEAN, SU</sub> U-234 PASS

Step 8.4.6 Calculate the dose contribution for the SU by multiplying SOF<sub>MEAN, SU</sub> (including contribution from Re-use backfill and Groundwater) by 25 mrem.

6.0 mrem

**HDP-PR-FSS-721 Final Status Survey Data Evaluation**  
**Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)**

Infer U234 Step 8.3.4			
U-238/U235	U-234/U235	U-234	%
5.9	18.3	5.4	2.6
9.8	18.8	2.0	1.6
4.3	18.1	5.0	3.5
14.7	19.6	1.8	1.1
14.9	19.6	1.0	1.1
6.9	18.4	4.0	2.2
7.9	18.5	2.1	2.0
14.3	19.6	1.4	1.1
4.8	18.2	0.6	3.2
16.2	19.9	1.2	1.0
2.1	18.2	0.6	6.8
11.5	19.1	0.4	1.4
5.5	18.2	3.2	2.8
9.7	18.8	2.2	1.6
6.6	18.3	1.0	2.4
6.7	18.4	3.0	2.3
4.4	18.1	2.3	3.4
14.1	19.6	1.6	1.1
6.7	18.4	3.4	2.3
7.7	18.5	1.2	2.0
Average Enrichment (%)			2.28

Infer U-234 MDC using U-235 MDC \* ratio of U-234:U-235 @ that sample's enrichment

3.602299
4.879304
3.119226
4.919625
3.97882
4.478383
3.984477
5.468428
1.853035
4.864007
1.339137
1.867097
3.720152
4.314134
2.403726
3.328024
2.921207
4.762824
3.456732
3.002257

**HDP-PR-FSS-721 Final Status Survey Data Evaluation**  
**Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)**

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
<b>0.000</b>	<b>0.183</b>	<b>0.014</b>	<b>2.367</b>	<b>0.129</b>	<b>0.768</b>
Ave Conc. Ra-226, RS	Ave Conc. Tc-99, RS	Ave Conc. Th-232, RS	Ave Conc. U-234, RS	Ave Conc. U-235, RS	Ave Conc. U-238, RS
0.170	0.091	0.310	2.035	0.108	1.060
-	-	-	-	-	-
0.000	0.066	0.050	1.833	0.094	1.370
-	-	-	-	-	-
0.020	0.152	0.010	4.018	0.218	1.510
-	-	-	-	-	-
0.250	0.014	0.060	1.443	0.074	1.050
-	-	-	-	-	-
0.110	0.034	0.080	1.215	0.061	0.993
-	-	-	-	-	-
0.000	0.000	0.000	0.393	0.021	0.237
-	-	-	-	-	-
0.280	0.034	0.260	2.204	0.117	1.130
-	-	-	-	-	-
0.000	0.027	0.030	3.034	0.165	1.110
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
<b>0.104</b>	<b>0.052</b>	<b>0.100</b>	<b>2.022</b>	<b>0.107</b>	<b>1.058</b>
Ave Conc. Ra-226, ES	Ave Conc. Tc-99, ES	Ave Conc. Th-232, ES	Ave Conc. U-234, ES	Ave Conc. U-235, ES	Ave Conc. U-238, ES
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
 Step 8.5 Performance of Statistical Tests

WRS TEST						
SAMPLE ID	AREA (Reference, Survey Unit)	Gross SOF ( $X_{i,ref}$ , $Y_{i,SU}$ ) Step 8.5.3a	ADJUSTED SOF ( $Z_i$ ) Step 8.5.3b	RANKS Step 8.5.3d	REFERENCE AREA RANKS	
9574-SS-140910-01-01	Reference	1.31	2.310	46	46	
9574-SS-140910-01-02	Reference	1.18	2.179	37	37	
9574-SS-140910-01-03	Reference	1.06	2.064	32	32	
9574-SS-140910-01-04	Reference	1.10	2.101	33	33	
9574-SS-140910-01-05	Reference	1.29	2.293	45	45	
9574-SS-140910-01-07	Reference	1.34	2.339	47	47	
9574-SS-140910-01-08	Reference	1.15	2.154	36	36	
9574-SS-140910-01-09	Reference	1.18	2.182	38	38	
9574-SS-140910-01-10	Reference	1.23	2.227	43	43	
9574-SS-140910-01-11	Reference	1.38	2.380	48	48	
9574-SS-140910-01-12	Reference	1.05	2.055	31	31	
9574-SS-140910-01-13	Reference	0.94	1.941	21	21	
9574-SS-140910-01-14	Reference	1.12	2.119	34	34	
9574-SS-140910-01-15	Reference	1.15	2.152	35	35	
9574-SS-140910-01-16	Reference	1.03	2.028	28	28	
9574-SS-140910-01-17	Reference	0.44	1.443	17	17	
9574-SS-140910-01-18	Reference	1.19	2.188	40	40	
9574-SS-140910-01-20	Reference	0.76	1.757	18	18	
9574-SS-140910-01-21	Reference	1.02	2.023	27	27	
9574-SS-140910-01-22	Reference	1.02	2.018	26	26	
9574-SS-140910-01-23	Reference	1.00	2.002	23	23	
9574-SS-140910-01-24	Reference	0.87	1.873	20	20	
9574-SS-140910-01-25	Reference	1.04	2.040	30	30	
9574-SS-140910-01-26	Reference	0.96	1.959	22	22	
9574-SS-140910-01-27	Reference	1.20	2.204	41	41	
9574-SS-140910-01-28	Reference	1.01	2.007	25	25	
9574-SS-140910-01-29	Reference	1.22	2.223	42	42	
9574-SS-140910-01-30	Reference	1.03	2.035	29	29	
9574-SS-140910-01-31	Reference	1.00	2.005	24	24	
9574-SS-140910-01-32	Reference	0.86	1.865	19	19	
9574-SS-140910-01-33	Reference	1.24	2.238	44	44	
9574-SS-140910-01-34	Reference	1.19	2.185	39	39	
L04-01-01-P-S-S-00	Survey Unit	1.03	1.027	8	0	
L04-01-02-P-R-S-00	Survey Unit	1.33	1.330	15	0	
L04-01-04-P-S-S-00	Survey Unit	0.97	0.971	7	0	
L04-01-05-P-R-S-00	Survey Unit	1.10	1.105	10	0	
L04-01-07-P-S-S-00	Survey Unit	0.81	0.810	5	0	
L04-01-08-P-R-S-00	Survey Unit	1.12	1.118	11	0	
L04-01-10-P-S-S-00	Survey Unit	1.13	1.127	12	0	
L04-01-11-P-R-S-00	Survey Unit	1.24	1.240	14	0	
L04-01-13-P-S-S-00	Survey Unit	0.22	0.216	3	0	
L04-01-14-P-R-S-00	Survey Unit	1.18	1.176	13	0	
L04-01-16-P-S-S-00	Survey Unit	0.13	0.127	1	0	
L04-01-17-P-R-S-00	Survey Unit	0.17	0.170	2	0	
L04-01-19-P-S-S-00	Survey Unit	0.95	0.948	6	0	
L04-01-20-P-R-S-00	Survey Unit	1.36	1.362	16	0	
L04-01-22-P-S-S-00	Survey Unit	0.49	0.488	4	0	
L04-01-23-P-R-S-00	Survey Unit	1.08	1.078	9	0	
<b>Rank Sums</b>				<b>1176</b>	<b>1040</b>	<b>W<sub>r</sub> Step 8.5.3e</b>
<b># Reference Area Measurements</b>				<b>m</b>	<b>32</b>	
<b># Survey Unit Measurements</b>				<b>n</b>	<b>16</b>	
<b>Total Number of Measurements Step 8.5.3c</b>				<b>N</b>	<b>48</b>	
<b>(1-<math>\alpha</math>) percentile of a standard normal distribution (MARSSIM Pg. I-10)</b>				<b>z</b>	<b>1.645</b>	<b><math>\alpha = 0.05</math></b>
<b>WRS Critical Value (MARSSIM Pg. I-10, Eq. I.1)</b>				<b>CV</b>	<b>860</b>	

Step 8.5.1  
 Min adjusted bkg SOF  
 1.44

No WRS test necessary  
 No WRS test necessary  
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 No WRS test necessary  
 No WRS test necessary  
 No WRS test necessary

TEST: **PASS** Step 8.5.3f

HDP-PR-FSS-701 Final Status Survey Plan Development

Appendix B.1 Step 8 Calculate the Number of Samples in the Statistical Population

Uniform DCGL Criteria Evaluation	
N/2 Value Verification	
Isotope(s)	SOF (Ra/Tc/Th/Iso U)
St. Dev.	0.09
DCGL <sub>SOF</sub>	1
LBGR (Mean)	0.08
Shift	0.92
Relative Shift ( $\Delta/\sigma$ )	10.07
MARSSIM Table 5.1 ( $P_r$ )	1.000000
N	12
N + 20%	14.4
N/2	8
FSS N/2	8
Verification Check	<b>SUFFICIENT MEASUREMENTS</b>
"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,  $\alpha = 0.05$ ,  $\beta = 0.10$

$\alpha$ (or $\beta$ )	$Z_{1-\alpha}$ (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

$\alpha$   
 $\beta$

Hematite Decommissioning Project	Procedure: HDP-PR-FSS-703, Final Status Survey Quality Control		
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**FORM HDP-PR-FSS-703-1  
FIELD DUPLICATE SAMPLE ASSESSMENT**

Survey Unit No.:	LSA 04-01				Survey Unit Description:	SU in "Area 14" adjacent to west side of Bld 230						
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 <sup>2</sup>	Warning Limit	Control Limit	Statistic Exceeds Limit? (Y/N)
			Activity ( $x_i$ )	MDC	Activity ( $x_i$ )	MDC						
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	Ra-226	0.799	0.0595	0.639	0.0608	0.719	1.9	0.16	0.269	0.403	N
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	Tc-99	0.244	0.208	0.13	0.183	0.187	25.1	NA	3.552	5.321	NA
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	Th-232	0.738	0.111	0.417	0.0893	0.578	2.0	0.321	0.283	0.424	Y
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	U-234 <sup>1</sup>	1.002	N/A	2.304	N/A	1.653	195.4	1.303	27.649	41.425	N
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	U-235	0.0511	0.203	0.127	0.161	0.089	51.6	NA	7.301	10.939	NA
L04-01-07-P-S-S-00	L04-01-07-P-S-Q-00	U-238	0.76	0.7	0.565	0.607	0.663	168.8	NA	23.885	35.786	NA

Comments:

- U-234 is inferred, no MDC available.
- Duplicate assessment is not necessary if the result of either sample is < MDC.

Performed by: Thomas Yardy \_\_\_\_\_

Reviewed by: Clark Evers \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Quality Record



Hematite Decommissioning Project	Procedure: HDP-PR-FSS-703, Final Status Survey Quality Control										
								Revision: 2	Page 1 of 1		

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

Survey Unit No.:	LSA 04-01				Survey Unit Description:	SU in "Area 14" adjacent to west side of Bld 230						
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 <sup>2</sup>	Warning Limit	Control Limit	Statistic Exceeds Limit? (Y/N)
			Activity ( $x_i$ )	MDC	Activity ( $x_i$ )	MDC						
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	Ra-226	1.18	0.0707	1.29	0.0595	1.235	1.9	0.11	0.269	0.403	N
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	Tc-99	0.0336	0.227	0.0444	0.224	0.039	25.1	NA	3.552	5.321	NA
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	Th-232	1.08	0.124	1.08	0.0945	1.080	2.0	0.000	0.283	0.424	N
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	U-234 <sup>1</sup>	1.215	N/A	1.586	N/A	1.400	195.4	0.371	27.649	41.425	N
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	U-235	0.0612	0.243	0.0809	0.243	0.071	51.6	NA	7.301	10.939	NA
L04-01-14-P-R-S-00	L04-01-14-P-R-Q-00	U-238	0.993	0.793	1.14	0.793	1.067	168.8	0.147	23.885	35.786	N

Comments:

- U-234 is inferred, no MDC available.
- Duplicate assessment is not necessary if the result of either sample is < MDC.

Performed by: Thomas Yardy \_\_\_\_\_

Reviewed by: Clark Evers \_\_\_\_\_

Date: \_\_\_\_\_

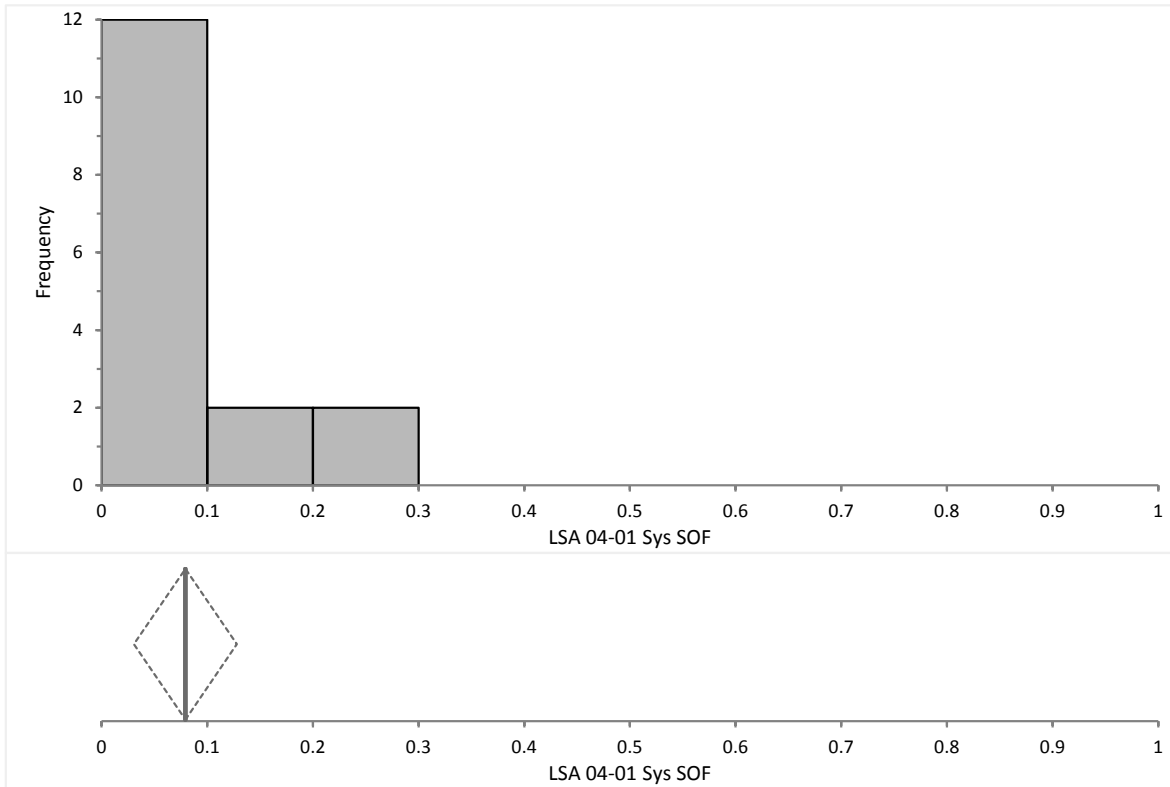
Date: \_\_\_\_\_

Quality Record

LSA 04-01 Sys SOF

0.1  
0.3  
0.1  
0.0  
0.0  
0.1  
0.1  
0.2  
0.0  
0.1  
0.0  
0.0  
0.0  
0.0  
0.3  
0.0  
0.0

Descriptives



N | 16

	Mean	95% CI	Mean SE	SD	Variance	Skewness	Kurtosis
LSA 04-01 Sys SOF	0.08	0.03 to 0.13	0.023	0.09	0.01	1.6	1.70
	Minimum	1st quartile	Median	97.87% CI	3rd quartile	Maximum	IQR
LSA 04-01 Sys SOF	0.004	0.01	0.05	0.01 to 0.11	0.10	0.3	0.08