DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
9170 LATTY AVENUE
BERKELEY, MISSOURI 63134

April 29, 1998

REPLY TO
ATTENTION OF:

Formerly Utilized Sites Remedial Action Program Project Office

Mr. Scott F. Honig
Missouri Dept. of Natural Resources
P. O. Box 176
Jefferson City, MO 65102-0176

SUBJECT: ST. LOUIS DOWNTOWN SITE - RADIONUCLIDE CONCENTRATION IN CRUSHED BUILDING DEBRIS

Dear Mr. Honig:

The purpose of this letter is to respond to comments provided by the Federal Facilities Section of the Missouri Department of Natural Resources (MDNR). These comments were provided in a March 6, 1997 MDNR letter, in response to the USACE's letter of January 9, 1998 which transmitted the crushed building debris results associated with demolition activities at the St. Louis Downtown Site (SLDS).

The letter indicated that radionuclide concentrations were determined from samples collected during crushing operations at the St. Louis Downtown Site (SLDS). The crushed building debris samples were obtained subsequent to the demolition of the SLDS Buildings 116,117, 219, 700, 704 through 707, and 708. The crushing operations were conducted from October 1 through November 12, 1997. A composite sample was collected for each day that crushing operations were conducted. The samples were analyzed by gamma spectroscopy to determine the radionuclide concentration in the resulting crushed material.

Subsequent to the review of these data, MDNR has provided questions which request clarification or additional information. These questions and associated responses are provided below:

1) Building 219 was listed as being demolished and crushed, but the results do not include samples from Building 219. Building 219 was also not listed in the "1997 Remedial Action Plan for Building Demolition at the St. Louis Downtown Site, July 1997" as to be demolished at this time. Please clarify. Was Building 219 demolished, why sampling results for the building were not included, and location of Building 219 on Mallinckrodt's property?

Response: Building 219 was a shed-like structure located immediately west of the St. Louis Terminal Railroad vicinity property. This location is within the Plant 5 area of SLDS. While the demolition of this building was not initially planned in the original scope of work, it was added at Mallinckrodt's request. Since the building was constructed of steel trusses, lumber and roofing material, no masonry components were present, hence no crushate samples obtained.

2) Why was the analysis limited to uranium^{238}, radium^{226}, thorium^{232}, and thorium^{230}? Other radionuclides could have been included in the analysis, e.g., actinium^{227}, protactinium^{231} etc.

Response: The analyses performed on the samples were not limited to the radionuclides reported. However, based on the review of characterization data available, along with the site process history, the former list of radionuclides, specifically uranium^{238}, are shown to be the contaminants of concern. Actinium^{227} and protactinium^{231} concentrations have been obtained for the samples and reviewed to determine that radionuclides present in the crushate are in natural equilibrium. This has been repeatedly shown for the SLDS crushate samples. These values have now been added to the original table and are attached to this letter for your review. It should be noted that results presented in this attachment include natural occurring background concentrations for each radionuclide.

3) How could gamma spectroscopy effectively detect thorium^{230}? Explain how gamma spectroscopy could be used to detect thorium^{230} and other alpha emitting particles.

Response: While thorium^{230} is ideally quantified by alpha spectroscopy, this radionuclide emits low energy and abundance gamma radiation, that is easily detected by gamma spectroscopy. Gamma spectroscopy can also be used in similar instances for other radionuclides. For the SLDS crushate, where uranium^{238} is the primary contaminant, gamma spectroscopy is the selected method, as each potential contaminant can be detected on a single analysis, without the need of a chemical preparation.

4) What sample size was collected for analysis?

Response: A 500 cubic centimeter (cc) sample was collected for each analysis.

5) When and how were samples collected for a specific day?

Response: An aliquot of the crushed material was collected from the conveyor at the beginning and end of each daily operational shift. The two aliquots were combined to form one sample for analysis. Therefore, one sample was collected per day. It should be noted that material staged for processing in the crusher was monitored with a field measurement device to determine if segregation of material was necessary prior to introduction into the crusher. Segregation of the material was determined to be unnecessary during the crushate work activities at SLDS.

The SLDS building demolition project has been a very successful collaborative effort between FUSRAP, Mallinckrodt, and the MDNR. We look forward to continuing our successful relationship during future remediation at SLDS.

Please contact me with any questions or comments regarding these responses to your questions.

Sincerely,

for R. L. Mullins, Jr., Ph. D., P.E., AICP
FUSRAP Program Manager

cc: Dan Wall, U.S. EPA, Region VII
R. Boland, Mallinckrodt Inc.
K. Albin, BNI

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Demolition
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Gamma Sp[redacted] Results

			U 238	Ra 228	Ra 226	Pa-231	Ac-227	Th 232	Th 230	
Date	Bldg Matl	Sample Number	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	Sample qty
10/1/97	100	116RS07797	1.272		.702	-0.51	0.05			1
1	100	116RS07897	2.905		.894	0.14	0.06		3.145	2
2	100	116RS08097	2.997		.572	0.28	0			3
2	100	116RS07997	2.146		.678	0.19	-0.43			4
3	100	116RS08197	4.19		.5872	0.07	0.09			5
4		No Crushing								5
5		No Crushing								5
6	100	116RS08297	3.809		.4604	0.28	0.17			6
6	100	116RS08397	3.53		.5085	-0.01	0.13			7
7	100	116RS08497	2.985		.497	-0.01	0.17			8
7	100	116RS08597	4.14		.4516	0.06	0.17			9
8		No Crushing								9
9	100	116RS08697-B	4.539		1.16	0.24	0.01			10
10	700/708	116RS08797	2.974		.6383	-0.03	0.25		1.72	11
10	700/708	116RS08897	2.269		.6622	0.24	0.2			12
11		No Crushing								
12		No Crushing								
13		No Crushing								12
14	700/708	116RS08997	7.17		2.19	0.34	0.15			13
15	700/708	116RS09297	6.699		1.304	0.03	0.14			14
15	700/708	116RS09397	5.126		1.014	0.07	-0.01			15
16	700/116	116RS09797	3.539		.6764	0.04	0.31			16
16	700/116	116RS09697	4.504		.48	-0.07	0.05			17
17	704-707	116RS09997	7.268		.545	0.09	0.11			18
17	704-707	116RS09897	6.802		.5782	0.53	0.03			19
18	704-707	116RS10097	6.646		.5	-0.05	0.13			20
18	704-707	116RS10197	1.122		.4513	0.05	0.78			21
18	704-707	116RS10297	1.871		.5121	-0.13	0.09			22
19	704-707	116RS10397	5.63		.5426	0.3	0.1			23
19	704-707	116RS10497	4.076		.4691	0.17	0.11			24
19	704-707	116RS10597	5.617		.429	0.44	0.03			25
19	704-707	116RS10697	2.962		.5758	0.01	0.09			26
20	700's/116	116RS10997	4.708		.481	0.16	0.05			27
20	700's/116	116RS11097	.6315		.4296	-0.1	0.08			28
21	704-707	116RS11197	3.82		.484	0.19	0.1			29

1) Results are as indicated and in pCi/gm
2) If no value entered then Nuclide less than MDA
3) Results include naturally occurring background

As of: 4/28/98

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Gamma Sp Results

			U 238	Ra 228	Ra 226	Pa-231	Ac-227	Th 232	Th 230		
Date	Bldg Matl	Sample Number	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm		Sample qty
21	704-707	116RS11297	4.301		.4886	0.58	0.04				30
21	704-707	116RS11397	5.68		.544	0.14	0.13				31
22	704-707	116RS11497	4.374		.561	-0.28	0.57		2.4		32
22	704-707	116RS11597	4.259		.7141	0.12	0.1				33
23	116/117	116RS12097	3.814		.6552	0.5	0.25				34
23	116/117	116RS11997	3.569		.5286	-0.27	0.25		2.8		35
24	116/117	116RS12397	3.034		.619	0.3	0.08				36
25		No Crushing									
26		No Crushing									36
27	116/117	116RS12497	5.59		.6975	-0.17	0.04				37
27	116/117	116RS12597	5.071		.6378	0.06	0.07				38
28	116/117	116RS12697	4.238		.5064	0	0.08				39
28	116/117	116RS12797	7.05		.6838	-0.07	0.09				40
29	116/117	116RS12897	6.967		.8694	0.2	0.13				41
30	116/117	116RS12997	12.35		1.772	0.68	0.3				42
30	116/117	116RS13097	4.765		.8926	-0.09	0.02				43
31	116/117	116RS13197	4.515		.8402	0.3	0.06				44
31	116/117	116RS13297	5.594		.8872	0.2	0.2				45
11/1/97	116/117	116RS13397	5.493		.7674	0.14	0.13				46
1	116/117	116RS13497	4.316		.5634	0.06	0.31		3.038		47
2	116/117	116RS13797	6.559		1.175	0.32	0.1				48
2	116/117	116RS13897	8.344		.802	-0.05	0.18				49
3	116/117	116RS13997	6.262		.6713	0.23	0.1				50
3	116/117	116RS14097	5.619		.874	0.06	0.05				51
4	116/117	116RS14197	8.5		.5882	0.52	0.75				52
4	116/117	116RS14297	5.563		.6807	0.66	0.18				53
4	116/117	116RS14397	4.996		.7863	0.02	0.36				54
5	116/117	116RS14497	6.933		.7249	0.16	0.09				55
5	116/117	116RS14797	8.143		.8693	0.11	0.13				56
6	116/117	116RS14897	6.55		.7464	0.08	0.1				57
6	116/117	116RS14997	5.959		.7438	1.75	0.26				58
7	116/117	116RS15397	6.585		.8148	-0.24	0.08				59
7	116/117	116RS15497	.		.	0.57	0.1				60
8	116/117	116RS15597	10.41		1.014	0.72	0.16				61
8	116/117	116RS15697	10.29		828	-0.26	0.1				62

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Gamma Sp[redacted] Results

			U 238	Ra 228	Ra 226	Pa-231	Ac-227	Th 232	Th 230		
Date	Bldg Matl	Sample Number	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm		Sample qty
9	116/117	No Crushing									62
10	116/117	116RS15797	5.765		.7295	0.03	0.09				63
10	116/117	116RS15897	7.339		.7648	0.26	0.2				64
11	116/117	116RS15997	7.647		.6436	0.08	0.11				65
11	116/117	116RS16097	7.564		.6465	0.4	0.03				66
12	116/117	116RS16197	3.848		.5905	0.72	0.15				67
		Average activity	5.1314	.	.7074	.1724	.14	.	.1956		

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Gamma Spec Results

			U 238	Ra 228	Ra 226	Pa-231	Ac-227	Th 232	Th 230		
Date	Bldg Matl	Sample Number	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm	pCi/gm		Sample qty

1) Results are as indicated and in pCi/gm
2) If no value entered then Nuclide less than MDA
3) Results include naturally occurring background

As of: 4/28/98

Gamma Spec Results

1) Results are as indicated and in pCi/gm
2) If no value entered then Nuclide less than MDA
3) Results include naturally occurring background

As of: 4/28/98

Gamma Spec Results

1) Results are as indicated and in pCi/gm
2) If no value entered then Nuclide less than MDA
3) Results include naturally occurring background

As of: 4/28/98

Gamma Sp Results

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