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RESPONSES TO COMMENTS ON THE OPERABLE UNIT 5 REMEDIAL INVESTIGATION REPORT OF JUNE 1994 - OCTOBER 1994

10/31/94

DOE-FN EPAS
225
RESPONSES

RESPONSES TO COMMENTS ON THE OPERABLE UNIT 5 REMEDIAL INVESTIGATION REPORT OF JUNE 1994

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

OCTOBER 1994

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

FOREWORD

The U.S. Department of Energy's (DOE) draft responses to U.S. Environmental Protection Agency (EPA) and Ohio EPA (OEPA) comments on the June 1994 draft Remedial Investigation (RI) Report are provided herein. A total of 559 comments were submitted; 333 (1 to 333) from EPA and 226 (334 to 559) from OEPA. DOE's responses are provided in the usual template format.

EPA's comments were not coded as to major (M), clarification (C), or editorial (E) status so they are all included and answered. OEPA did provide coding and all the M and C comments are answered here; the editorial comments are addressed as appropriate in the revised report.

The sequential number DOE has assigned to each comment appears in the left margin. The original comment number assigned by each agency remains within the template, on the third line. A comment number cross reference list for each agency's comments is included.

The cross reference list repeats the information from the comment template and adds, in the first and last columns, the sequential DOE-assigned comment number and the page number in the revised document where the response appears. This DOE-assigned number appears in the left margin of the RI Report at the beginning of the paragraph containing the redlined revision. NA in the "New Page No." column indicates either a no-action response or that the comment was general and did not result in a change to a specific part of the text.

Whenever the Action portion of the template states that revised text begins on a certain page and/or line number, the reference is to the June edition of the RI Report.

The Foreword to the RI Report explains how the text reflects the placement and nature of the comment responses.

U.S. EPA

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1	U.S. EPA	Saric	1	2.4.6	2-30 to 2-31	NA	4-23
2	U.S. EPA	Saric	2	2.4.6.1	2-31	19 & 20	Figure 2-16
3	U.S. EPA	Saric	3	2.4.6.1	2-31 to 2-32	28-34	2-30
4	U.S. EPA	Saric	4	2.4.6.1	2-31 to 2-32	36-13	2-30
5	U.S. EPA	Saric	5	2.5.4.2	2-40	8	2-39
6	U.S. EPA	Saric	6	3.6.1.1	3-44	12 & 13	Table 3-15
7	U.S. EPA	Saric	1	4.0	NA	NA	NA
8	U.S. EPA	Saric	2	4.0	4-1	1	NA
9	U.S. EPA	Jablonowski	1	4.1.6	4-10	24	2-81
10	U.S. EPA	Jablonowski	2	4.1.6	4-13	18	4-13
11	U.S. EPA	Jablonowski	2	4.2	4-15	32	4-15
12	U.S. EPA	Jablonowski	3	4.2	4-15	32	4-15
13	U.S. EPA	Saric	7	4.5.2.1	4-25	5	4-23
14	U.S. EPA	Saric	8	4.5.2.2	4-25	30	4-23
15	U.S. EPA	Saric	9	4.5.2.3	4-28	9	4-23
16	U.S. EPA	Saric	10	4.5.2.5	4-29	19	4-23
17	U.S. EPA	Saric	11	4.5.4.5	4-41	1	4-23, Table 7-12
18	U.S. EPA	Jablonowski	5	4.6.1.1.1	4-49	10	4-50
19	U.S. EPA	Jablonowski	4	4.6.1.1.1	4-49	9	4-50
20	U.S. EPA	Saric	12	4.6.1.2	4-75	11	4-74, D.2-90
21	U.S. EPA	Saric	13	4.6.2	4-84	4	4-84
22	U.S. EPA	Saric	14	4.6.2	4-84	4	4-84
23	U.S. EPA	Saric	15	4.6.2	4-84	4	Figures 4-63 thru 4-76
24	U.S. EPA	Saric	16	4.7.1.1.1	4-116	4	NA
25	U.S. EPA	Saric	17	4.7.1.1.1	4-120	7	4-121
26	U.S. EPA	Saric	18	4.7.1.1.3	4-121	27	4-110
27	U.S. EPA	Saric	19	4.7.1.1.3	4-121	27	4-123
28	U.S. EPA	Saric	20	4.7.1.1.5	4-123	16	4-110
29	U.S. EPA	Saric	21	4.7.1.1.5	4-123	21	4-110
30	U.S. EPA	Jablonowski	6	6.0	NA	NA	NA
31	U.S. EPA	Saric	22	6.0	NA	NA	NA
32	U.S. EPA	Saric	23	6.0	NA	NA	6-9
33	U.S. EPA	Jablonowski	9	7	Table 7-12	NA	Table 7-11
34	U.S. EPA	Jablonowski	7	7.6.7	7-60	6	7-58
35	U.S. EPA	Saric	24	7.7	7-60	9	Table 7-12

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36	U.S. EPA	Saric	25	7.7	7-60	9	Table 7-12
37	U.S. EPA	Jablonowski	8	7.9.5	7-68	22	7-66
38	U.S. EPA	Saric	3	A	All	All	A.1-4
39	U.S. EPA	Saric	4	A	All	All	A.2-8; A.2-10
40	U.S. EPA	Saric	5	A	NA	NA	Cover Sheet Attach VI
41	U.S. EPA	Saric	26	A.1.0	A.1-1	15-19	Section A.3
42	U.S. EPA	Saric	39	A.1.0	NA	NA	Figure A.1-2
43	U.S. EPA	Saric	40	A.1.0	NA	NA	Figure A.1-3
44	U.S. EPA	Saric	41	A.1.0	NA	NA	Figure A.1.4
45	U.S. EPA	Saric	28	A.1.1	A.1-2	22	A.1-2
46	U.S. EPA	Saric	27	A.1.1	A.1-2	6-14	A.1-2
47	U.S. EPA	Saric	29	A.1.2	A.1-4	12-14	A.1-4
48	U.S. EPA	Saric	30	A.1.2.2	A.1-8	17 & 18	A.1-8
49	U.S. EPA	Saric	31	A.1.3.1	A.1-10	5	A.1-10
50	U.S. EPA	Saric	32	A.1.3.1	A.1-11	6 & 7	A.1-11
51	U.S. EPA	Saric	33	A.1.3.1	A.1-12	1	A.1-12
52	U.S. EPA	Saric	34	A.1.3.1	A.1-12	9	A.1-12
53	U.S. EPA	Saric	35	A.1.3.1	A.1-13	8	A.1-13
54	U.S. EPA	Saric	36	A.1.3.1	A.1-14	5	A.1-14
55	U.S. EPA	Saric	37	A.1.3.2	A.1-16	2-4	A.1-16
56	U.S. EPA	P. Van Leeuwen	01	A.1.5.1	A.1-18		A.1-18
57	U.S. EPA	Saric	38	A.1.5.4	A.1-20	9-11	A.1-21
58	U.S. EPA	P. Van Leeuwen	02	A.2	A.2-4	30	A.2-4
59	U.S. EPA	P. Van Leeuwen	03	A.2	A.2-6	3-4	A.2-6
60	U.S. EPA	P. Van Leeuwen	05	A.2	A.2-9	22-24	A.2-10
61	U.S. EPA	P. Van Leeuwen	04	A.2	Tbl A.2-1 to A.2-12		A.2-11; Tables A.2-1 Thru 2-12
62	U.S. EPA	P. Van Leeuwen	07	A.2	Tbl 2-11		A.2-12 Table A.2-2
63	U.S. EPA	Saric	42	A.2.0	A.2-1	11-13	A.2-1
64	U.S. EPA	Saric	44	A.2.2.2	A.2-6	26	A.2-7
65	U.S. EPA	Saric	45	A.2.2.2	A.2-6	36-38	A.2-6 A.2-7

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66	U.S. EPA	Saric	43	A.2.2.2	A.2-6	6 & 7	A.2-5
67	U.S. EPA	Jablonowski	10	A.2.3	A.2-7	14 & 15	Tables A.2-13 and A.2-14
68	U.S. EPA	Saric	46	A.2.3.1	A.2-7	27 & 28	A.2-8
69	U.S. EPA	Saric	47	A.2.3.1	A.2-8	24-34	A.2-8
70	U.S. EPA	P. Van Leeuwen	06	A.2.4	A.2-10		A.2-12, 14, 15, 16, 17, 18, 20; Tbls A.2-1 thru A.2-12
71	U.S. EPA	Saric	48	A.2.4	All	All	A.2-11
72	U.S. EPA	Saric	49	A.2.4	All	All	A.2-12 A.2-15 - PCBs and A.2-18; Tbls A.2-1 thru A.2-12
73	U.S. EPA	Saric	52	A.2.4	NA	NA	Tables A.2-1 thru A.2-12
74	U.S. EPA	Saric	50	A.2.4.1	A.2-13	2	A.2-14
75	U.S. EPA	Saric	51	A.2.4.4	A.2-17	5-8	A.2-12
76	U.S. EPA	P. Van Leeuwen	12	A.3			A.3-17
77	U.S. EPA	P. Van Leeuwen	15	A.3	A.3-19		A.3-19
78	U.S. EPA	P. Van Leeuwen	16	A.3	A.3-19/20		A.3-20
79	U.S. EPA	P. Van Leeuwen	09	A.3	A.3-28/ A.3-30		A.3-29
80	U.S. EPA	P. Van Leeuwen	17	A.3	A.3-36	5 & 6	A.3-37
81	U.S. EPA	P. Van Leeuwen	18	A.3	A.3-38	9-18	A.3-38, 40
82	U.S. EPA	P. Van Leeuwen	19	A.3	A.3-39	16	A.3-40
83	U.S. EPA	P. Van Leeuwen	20	A.3	A.3-64	18-26	A.3-67
84	U.S. EPA	P. Van Leeuwen	08	A.3	Tbl A. 3-2A		Table A.3-2D
85	U.S. EPA	P. Van Leeuwen	10	A.3	Tbl A. 3-2A /2B		Table A.3-2A/2B
86	U.S. EPA	P. Van Leeuwen	11	A.3	Tbl A. 3-3...		Table A.3-3

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87	U.S. EPA	P. Van Leeuwen	13	A.3	Tbl A.3-7		A3-36
88	U.S. EPA	P. Van Leeuwen	14	A.3	Tbl A.3-9		Table A.3-9
89	U.S. EPA	Saric	91	A.3.0	NA	NA	Table A.3-2D
90	U.S. EPA	Saric	92	A.3.0	NA	NA	Table A.3-10
91	U.S. EPA	Saric	93	A.3.0	NA	NA	Table A.3-11
92	U.S. EPA	Saric	94	A.3.0	NA	NA	A.3-16, Table A.3-10, Table A.3-20
93	U.S. EPA	Saric	95	A.3.0	NA	NA	Table A.3-21a
94	U.S. EPA	Saric	96	A.3.0	NA	NA	Table A.3-23
95	U.S. EPA	Saric	97	A.3.0	NA	NA	N/D
96	U.S. EPA	Saric	98	A.3.0	NA	NA	Figure A.3-2
97	U.S. EPA	Saric	99	A.3.0	NA	NA	Figure A.3-6
98	U.S. EPA	Saric	55	A.3.1.10	A.3-13	12-17	N/A
99	U.S. EPA	Saric	56	A.3.1.10	A.3-13	27-35	N/A
100	U.S. EPA	Saric	57	A.3.1.10	A.3-13	37-43	Figure A.3-6
101	U.S. EPA	Saric	53	A.3.1.7	A.3-10	16	A.1-7
102	U.S. EPA	Saric	54	A.3.1.8	A.3-11	5-12	A.3-11
103	U.S. EPA	Saric	58	A.3.2	A.3-16	21-23	A.3-16
104	U.S. EPA	Saric	59	A.3.2	A.3-16	32-35	A.3-16
105	U.S. EPA	Saric	60	A.3.2	A.3-17	1-16	A.3-18
106	U.S. EPA	Saric	61	A.3.2	A.3-17	31 & 32	A.3-18
107	U.S. EPA	Saric	62	A.3.2.1	A.3-18	22 & 23	A.3-18, 19
108	U.S. EPA	Saric	63	A.3.2.1	A.3-19	3	A.3-13
109	U.S. EPA	Saric	64	A.3.2.1	A.3-20	1-4	A.3-20
110	U.S. EPA	Saric	65	A.3.2.1	A.3-20	40 & 41	A.3-21
111	U.S. EPA	Saric	66	A.3.2.2.1	A.3-22	16 & 17	A.3-23
112	U.S. EPA	Saric	67	A.3.2.3.2	A.3-25	2 & 3	A.3-25
113	U.S. EPA	Saric	68	A.3.2.3.4	A.3-25	18	A.3-26
114	U.S. EPA	Jablonowski	11	A.3.2.4	NA	NA	Table A.3-1
115	U.S. EPA	Saric	70	A.3.2.4.1	A.3-28	35-37	N/A
116	U.S. EPA	Saric	69	A.3.2.4.1	A.3-28	8	A.3-28
117	U.S. EPA	Saric	71	A.3.2.4.1	A.3-29	3 & 4	A.3-16; Table A.3-16
118	U.S. EPA	Saric	72	A.3.2.4.1	A.3-29	30-33	A.3-20

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119	U.S. EPA	Saric	73	A.3.2.4.3	A.3-31	19-21	A.3-32
120	U.S. EPA	Saric	74	A.3.2.4.3	A.3-32	19-30	A.3-33
121	U.S. EPA	Saric	75	A.3.3	A.3-35	13	A.3-36
122	U.S. EPA	Saric	76	A.3.3.1	A.3-36	2	A.3-35
123	U.S. EPA	Saric	77	A.3.3.2	A.3-36	17-33	Tables A.3-9 thru A.3-12
124	U.S. EPA	Saric	78	A.3.3.3	A.3-38	1-5	Table A.3-13
125	U.S. EPA	Saric	79	A.3.3.3	A.3-38	3 & 4	A.3-39
126	U.S. EPA	Saric	80	A.3.3.3	A.3-39	15 & 16	A.3-41
127	U.S. EPA	Saric	81	A.3.3.4	A.3-40	12	A.3-16; Table A.3-16
128	U.S. EPA	Saric	82	A.3.4	A.3-42	7	A.3-43
129	U.S. EPA	Saric	83	A.3.4.1.2	A.3-44	3 & 10	A.3-46
130	U.S. EPA	Saric	84	A.3.4.1.3	A.3-44	26	A.3-46
131	U.S. EPA	Saric	85	A.3.4.2.4	A.3-47	32	A.3-49
132	U.S. EPA	Saric	86	A.3.4.4.2	A.3-55	24	A.3-57
133	U.S. EPA	Saric	87	A.3.4.4.3	A.3-56	25 & 26	A.3-58
134	U.S. EPA	Saric	88	A.3.4.4.3	A.3-57	29	A.3-60
135	U.S. EPA	Saric	89	A.3.4.6.1	A.3-58	30	A.3-60
136	U.S. EPA	Saric	90	A.3.4.6.3	A.3-63	17-19	N/A
137	U.S. EPA	Saric	6	A.4	NA	NA	Tables
138	U.S. EPA	P. Van Leeuwen	21	A.4	Tbl A.4-5		Table A.4-5
139	U.S. EPA	Saric	100	A.4.1.3	A.4-7	34	A.4-7
140	U.S. EPA	Saric	101	A.4.1.4	A-9	23	A.4-9
141	U.S. EPA	Saric	7	A.5	All	All	Tables A.5-21 and A.5-22
142	U.S. EPA	P. Van Leeuwen	22	A.5	A.5-14	16-19	A.5-15
143	U.S. EPA	P. Van Leeuwen	23	A.5	A.5-17	17-26	A.5-18
144	U.S. EPA	P. Van Leeuwen	25	A.5	A.5-21	21-28	A.5-22
145	U.S. EPA	P. Van Leeuwen	24	A.5	A.5-22	28-31	A.5-24
146	U.S. EPA	Saric	102	A.5	NA	NA	A.5-5
147	U.S. EPA	Saric	103	A.5	NA	NA	Tables in A.VI
148	U.S. EPA	Saric	104	A.5	NA	NA	NA

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149	U.S. EPA	P. Van Leeuwen	26	A.5	Tbl A.5-2 to A.5-12 & A.5-20		Tables A.5-2 Thru A.5-12
150	U.S. EPA	Saric	105	A.5.3.11	A.5-24	9-17	
151	U.S. EPA	P. Van Leeuwen	30	A.6	A.6-11	21-31	A.6-12
152	U.S. EPA	P. Van Leeuwen	27	A.6	A.6-5	32-35	A.6-5
153	U.S. EPA	P. Van Leeuwen	28	A.6	A.6-5	47	A.6-6
154	U.S. EPA	P. Van Leeuwen	29	A.6	A.6-8	21-25	A.6-9
155	U.S. EPA	Saric	106	A.6.0	NA	NA	A.6-9
156	U.S. EPA	Saric	107	A.6.0	NA	NA	Table 6-1, 6-7
157	U.S. EPA	Saric	108	A.6.1	A.6-2	18 & 19	A.6-2
158	U.S. EPA	Saric	109	A.6.1	All	All	A.6-2
159	U.S. EPA	Saric	110	A.6.2.2	A.6-4	19-24	A.6-4
160	U.S. EPA	Saric	111	A.6.2.2	A.6-4	34-37	A.6-5
161	U.S. EPA	Saric	112	A.6.2.2	A.6-5	14-16	A.6-5
162	U.S. EPA	Saric	113	A.6.2.2	A.6-5	32-36	A.6-5
163	U.S. EPA	Saric	114	A.6.2.2	A.6-5	46 & 47	A.6-6
164	U.S. EPA	Saric	115	A.6.2.3	A.6-7	1-8	A.6-7
165	U.S. EPA	Saric	117	A.6.2.6	A.6-12	4	A.6-12
166	U.S. EPA	Saric	116	A.6.2.6	All	All	A.6-13
167	U.S. EPA	P. Van Leeuwen	31	A.6.3	A.6-12		A.6-13
168	U.S. EPA	Saric	8	A.7	NA	NA	Tables in A.7
169	U.S. EPA	Saric	9	A.7	NA	NA	A.7-6
170	U.S. EPA	P. Van Leeuwen	32	A.7	A.7-6	8-10	A.7-8
171	U.S. EPA	Saric	127	A.7	NA	NA	Table A.7-13
172	U.S. EPA	Saric	128	A.7	NA	NA	Tables in A.7
173	U.S. EPA	Saric	129	A.7	NA	NA	A.7-7
174	U.S. EPA	Saric	130	A.7	NA	NA	A.7-9
175	U.S. EPA	Saric	118	A.7.0	All	All	Text in A.7
176	U.S. EPA	Saric	119	A.7.1	A.7-1	15 & 16	A.7-1
177	U.S. EPA	Saric	121	A.7.2	A.7-5	11-13	A.7-9
178	U.S. EPA	Saric	122	A.7.2	A.7-5	6-8	A.7-2

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179	U.S. EPA	Saric	124	A.7.2	A.7-6	12-18	A.7-8
180	U.S. EPA	Saric	123	A.7.2	A.7-6	8-10	A.7-7
181	U.S. EPA	Saric	120	A.7.2	All	All	A.7-7
182	U.S. EPA	Jablonowski	12	A.7.3	A.7-6	25	A.7-8, 9
183	U.S. EPA	Saric	125	A.7.3	A.7-6	All	A.7-8, 9
184	U.S. EPA	Saric	126	A.7.3	A.7-6	NA	A.7-9
185	U.S. EPA	Saric	131	A.II.1.2.1	A.II-2	14	A.II-2
186	U.S. EPA	Saric	134	A.II.1.2.1	A.II-8	28	NA
187	U.S. EPA	Saric	132	A.II.1.2.1.1	A.II-4	9	Table A-2
188	U.S. EPA	Saric	133	A.II.1.2.1.1	A.II-6	All	A.II-4
189	U.S. EPA	Saric	135	A.III.1	A-III-2	1-9	A.III-1
190	U.S. EPA	Saric	136	A.III.3.2	A-III-4	All	Pg A.III-5/Table A.III-1
191	U.S. EPA	Saric	137	A.III.3.2	A-III-5	4-7	A.III-4
192	U.S. EPA	Saric	139	A.III.3.3	A-III-6	1-7	A.III-6
193	U.S. EPA	Saric	138	A.III.3.3	All	All	A.III-2
194	U.S. EPA	Saric	141	A.V.26	A-V-17	NA	A.V-20
195	U.S. EPA	Saric	140	A.V.3.1	A-V-2	NA	A.V-2
196	U.S. EPA	Saric	142	A.V.89	A-V-61	5	A.V-65
197	U.S. EPA	Saric	143	A.V.99	A-V-76	NA	A.V-80
198	U.S. EPA	Saric	144	A.VII	All	All	Table A.2-15
199	U.S. EPA	Saric	145	A.VII	NA	NA	Tables in A.VII
200	U.S. EPA	Saric	10	A.VIII	All	All	A.VIII-2
201	U.S. EPA	Saric	146	A.VIII	A.VIII-2	29-31	A.VIII-3
202	U.S. EPA	Saric	147	A.VIII	NA	All	Table A.VIII-1
203	U.S. EPA	Saric	148	A.VIII-1	NA	NA	A.VIII-2
204	U.S. EPA	Saric	19	ARAR-2	NA	NA	Table A.X-2
205	U.S. EPA	Jablonowski	20	ARAR-2	NA	NA	Table A.X-2
206	U.S. EPA	Jablonowski	21	ARAR-2	NA	NA	Table A.X-2
207	U.S. EPA	Jablonowski	22	ARAR-2	NA	NA	Table A.X-2
208	U.S. EPA	Jablonowski	23	ARAR-2	NA	NA	Table A.X-2
209	U.S. EPA	Jablonowski	24	ARAR-2	NA	NA	Table A.X-2
210	U.S. EPA	P. Van Leeuwen	33	ATT.A.V.68			A.5-24 (Comment 145)
211	U.S. EPA	Saric	11	B	All	NA	NA
212	U.S. EPA	Saric	12	B	All	NA	B-ES-1

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DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
213	U.S. EPA	Saric	13	B	NA	NA	NA
214	U.S. EPA	Saric	149	B	B-ES-1	27 & 28	NA
215	U.S. EPA	Saric	157	B	NA	NA	B.1-1
216	U.S. EPA	Saric	169	B	NA	NA	NA
217	U.S. EPA	Saric	176	B	NA	NA	NA
218	U.S. EPA	Saric	177	B	NA	NA	Table B.4-3
219	U.S. EPA	Saric	150	B.1.0	B-2	15-17	B.1-2
220	U.S. EPA	Saric	14	B.1.1.2.3	B-7	NA	B.1-7
221	U.S. EPA	Saric	151	B.1.1.2.3	B-7	13	Figure B.1-1
222	U.S. EPA	Saric	152	B.1.1.2.3	B-7	25	Figure B.1-1
223	U.S. EPA	Saric	153	B.1.1.2.3	B-8	26-32	B.1-9, Figure B.1-1
224	U.S. EPA	Saric	15	B.1.2	All	NA	B.1-11
225	U.S. EPA	Saric	154	B.1.3	B-12	14 & 15	B.1-12
226	U.S. EPA	Saric	155	B.1.4.1	B-14	7-11	B.1-14
227	U.S. EPA	Saric	156	B.1.4.2	B-16	27	B.1-17
228	U.S. EPA	Saric	16	B.2 & B.3	NA	NA	Table B.2-1 Table B.3-10 Table B.2-3 Table B.2-7
229	U.S. EPA	Saric	158	B.2.0	B-1	6 & 7	B.2-2, B.2-4
230	U.S. EPA	Saric	159	B.2.1	B-1	12	B.1-1, B.2-1
231	U.S. EPA	Saric	160	B.2.2.1	B-6	2-4	B.2-5
232	U.S. EPA	Saric	161	B.2.2.1	B-7	21-25	B.2-7
233	U.S. EPA	Saric	162	B.2.2.1	B-7	25	B.2-7
234	U.S. EPA	Saric	163	B.2.2.1	B-9	18-20	B.2-9
235	U.S. EPA	Saric	164	B.2.2.2	B-11	19 & 25	Table B.IV-1 thru B.IV-7
236	U.S. EPA	Saric	165	B.2.2.3	B-13	21 & 22	Table B.V-1 thru B.V-9
237	U.S. EPA	Saric	166	B.2.4.1	B-28	1 & 2	B.2-30
238	U.S. EPA	Saric	167	B.2.4.3	B-33	30-32	B.2-36
239	U.S. EPA	Saric	168	B.2.4.3	B-34	18 & 19	B.2-37
240	U.S. EPA	Saric	170	B.3.0	B-1	16	B.3-1, B.3-9
241	U.S. EPA	Saric	14	B.3.2.1	B-5	10	B.3-5
242	U.S. EPA	Saric	171	B.3.2.1	B-5	10	B.3-5
243	U.S. EPA	Saric	172	B.3.2.2	B-6	11	B.3-6
244	U.S. EPA	Saric	15	B.3.2.2	B-6	8	NA

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DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
245	U.S. EPA	Saric	173	B.3.2.3	B-7	13	B.3-7
246	U.S. EPA	Saric	174	B.3.2.3	B-8	22	NA
247	U.S. EPA	Saric	17	B.4	All	NA	B.4-1
248	U.S. EPA	Saric	18	B.4.2	All	NA	B.4-10
249	U.S. EPA	Saric	175	B.4.2	B.4-12	4-5	B.4-12
250	U.S. EPA	Saric	178	B.IX	NA	NA	Table B.IX-1
251	U.S. EPA	Jablonowski	13	C.1, C.2, & C.3			NA
252	U.S. EPA	Jablonowski	16	D.1.1.3.2	D.1-24		D.1-24
253	U.S. EPA	Jablonowski	17	D.1.1.3.3	D.1-27	20	D.1-27
254	U.S. EPA	Jablonowski	18	D.1.1.3.4	D.1-29	19	D.1-29
255	U.S. EPA	Saric	191	D.2.10	D.2-59	14	D.2-59
256	U.S. EPA	Saric	192	D.2.10	D.2-59	16	D.2-59
257	U.S. EPA	Saric	193	D.2.10	D.2-60	11	D-2, D.2-60
258	U.S. EPA	Saric	194	D.2.11	D.2-63	13	D-2, D.2-63
259	U.S. EPA	Saric	195	D.2.11	D.2-64	3	Table D.2-11
260	U.S. EPA	Saric	196	D.2.13	D.2-69	26	Table D.2-13
261	U.S. EPA	Saric	197	D.2.13	D.2-69	32	D-2
262	U.S. EPA	Saric	198	D.2.13	D.2-70	25	D-2
263	U.S. EPA	Saric	199	D.2.15	D.2-76	35	D-2
264	U.S. EPA	Saric	200	D.2.15	D.2-77	7	D-2
265	U.S. EPA	Saric	201	D.2.19	D.2-90	27	D-2. D.2-90
266	U.S. EPA	Saric	179	D.2.2	D.2-21	26	D-2
267	U.S. EPA	Saric	202	D.2.21	D.2-97	8	D.2-98
268	U.S. EPA	Saric	203	D.2.24	D.2-106	8	D.2-107
269	U.S. EPA	Saric	204	D.2.27	D.2-116	26	D-2
270	U.S. EPA	Saric	205	D.2.27	D.2-117	17	D-2
271	U.S. EPA	Saric	180	D.2.3	D.2-26	10	D-2
272	U.S. EPA	Saric	206	D.2.30	D.2-126	9	Figure D.2-34
273	U.S. EPA	Saric	207	D.2.30	D.2-131	7	NA
274	U.S. EPA	Saric	208	D.2.31	D.2-134	35	NA
275	U.S. EPA	Saric	181	D.2.4	D.2-31	9	D-2
276	U.S. EPA	Saric	182	D.2.4	D.2-32	12	D-2
277	U.S. EPA	Saric	183	D.2.5	D.2-33	35	D-2
278	U.S. EPA	Saric	184	D.2.5	D.2-35	15	D-2
279	U.S. EPA	Saric	185	D.2.6	D.2-38	31	D-2, D.2-38

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DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
280	U.S. EPA	Saric	186	D.2.6	D.2-39	1	D-2, D.2-38
281	U.S. EPA	Saric	187	D.2.7	D.2-42	15	D.2-42
282	U.S. EPA	Saric	188	D.2.7	D.2-43	15	D-2, D.2-43
283	U.S. EPA	Saric	189	D.2.8	D.2-49	11	D-2, D.2-49
284	U.S. EPA	Saric	190	D.2.9	D.2-54	11	D.2-54
285	U.S. EPA	Saric	209	E.1.1.2	E.3.1-7	14-16	4-110, 4-123
286	U.S. EPA	Saric	210	E.1.1.3	E.1-12	1	4-110
287	U.S. EPA	Saric	211	E.1.2.24	E.1-38	22-27	Plates
288	U.S. EPA	Saric	212	F.1.2.1	F.1-2	10-14	F.1-2
289	U.S. EPA	Saric	213	F.1.2.2	F.1-2	22	F.1-2
290	U.S. EPA	Saric	214	F.1.2.5.6	F.1-7	NA	F.1-7
291	U.S. EPA	Saric	215	F.1.3.1	F.1-7	37	F.1-8
292	U.S. EPA	Saric	19	F.2 & F.3	NA	NA	F.3-28
293	U.S. EPA	Saric	216	F.2.5.1	F.2-35	22-24	F.2-35
294	U.S. EPA	Saric	217	F.2.5.3	F.2-37	26-30	F.2-37
295	U.S. EPA	Saric	218	F.2.5.3	NA	NA	F.2-38
296	U.S. EPA	Saric	219	F.2.5.4	F.2-39	9-12	F.2-40
297	U.S. EPA	Saric	20	F.3	NA	NA	NA
298	U.S. EPA	Saric	21	F.3	NA	NA	F.3.I.3-5
299	U.S. EPA	Saric	22	F.3	NA	NA	F.3.I.3-2, Table F.3.I.3-2
300	U.S. EPA	Saric	23	F.3	NA	NA	NA
301	U.S. EPA	Saric	220	F.3.1	F.3-2	8 & 9	F.3-21
302	U.S. EPA	Saric	221	F.3.2.1	F.3-4	13-15	F.3-4
303	U.S. EPA	Saric	222	F.3.2.3	F.3-6	1 & 2	F.3-6
304	U.S. EPA	Saric	223	F.3.2.3	F.3-6	11 & 12	F.3-6
305	U.S. EPA	Saric	224	F.3.3.1	F.3-8	35-37	NA
306	U.S. EPA	Saric	24	F.3.4.2	NA	NA	F.3-22
307	U.S. EPA	Saric	225	F.3.4.2	F.3-21	24-26	NA
308	U.S. EPA	Saric	226	F.3.4.2	F.3-21	32 & 33	Table F.3.4-2
309	U.S. EPA	Saric	228	F.3.4.3	F.3-23	13 & 14	5-79, F.3-23, F.3-59
310	U.S. EPA	Saric	227	F.3.4.3	F.3-23	6 & 7	F.3-23
311	U.S. EPA	Saric	229	F.3.4.3	F.3-26	18 & 19	F.3-23
312	U.S. EPA	Saric	230	F.3.4.4	F.3-27	18-20	F.3-28
313	U.S. EPA	Saric	231	F.3.4.4	F.3-28	1 & 2	NA

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DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
314	U.S. EPA	Saric	232	F.3.5.1	F.3-31	20	F.3-33
315	U.S. EPA	Saric	233	F.3.5.4.1	F.3-38	NA	NA
316	U.S. EPA	Saric	234	F.3.5.4.2	F.3-40	16-19	Figure F.3.3-1, Figure F.3.3-2
317	U.S. EPA	Saric	I	F.3.7.1	F.3-47	NA	5-74
318	U.S. EPA	Saric	235	F.3.7.1	F.3-47	9-11	NA
319	U.S. EPA	Saric	236	F.3.7.1	F.3-48	27 & 28	NA
320	U.S. EPA	Saric	237	F.3.I.3.2	F.3.I.3-2	9	F.3.I.3-2, Table F.3.I.3-2
321	U.S. EPA	Saric	238	F.3.I.3.2	F.3.I.3-3	5-7	F.3.I.3-2, Table F.3.I.3-2
322	U.S. EPA	Saric	239	F.3.I.3.3	F.3.I.3-6	3-7	F.3.I.3-7
323	U.S. EPA	Saric	240	F.3.I.3.3	F.3.I.3-6	NA	F.3.I.3-8, Table F.3.I.3-3
324	U.S. EPA	Saric	214	F.3.I.3.3	F.3.I.3-7	34-36	F.3.I.3-8, Table F.3.I.3-3
325	U.S. EPA	Saric	242	F.3.I.3.4	F.3.I.3-8	NA	F.3.I.3-9, Table F.3.I.3-4, Table F.3.I.3-5, Table F.3.I.3-6
326	U.S. EPA	Saric	243	F.3.I.3.5	F.3.I.3-9	17 & 18	F.3.I.3-12 F.3.I.4-1
327	U.S. EPA	Saric	244	F.3.I.4.1	F.3.I.4-1	31	F.3.I.4-2
328	U.S. EPA	Saric	245	F.3.I.4.3	F.3.I.4-4	1-10	F.3.I.4-4
329	U.S. EPA	Saric	246	F.3.I.4.5	F.3.I.4-5	29-33	F.3.I.4-6
330	U.S. EPA	Saric	247	F.3.I.4.5	F.3.I.4-7	15	F.3.I.4-4
331	U.S. EPA	Saric	248	F.3.I.5.1	F.E.I.5-2	10-20	F.3.I.5-2
332	U.S. EPA	Saric	249	F.3.I.5.2	F.3.I.5-5	1-7	F.3.I.5-3 F.3.I.REF-1
333	U.S. EPA	Saric	250	F.3.II.2.1.1	F.3.II-5	29-32	NA

U.S. EPA REVIEW COMMENTS
OPERABLE UNIT 5 DRAFT REMEDIAL INVESTIGATION REPORT

1. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.4.6 Pg.#: 2-30 to 2-31 Line#: NA Code:
Original Specific Comment #: 1
Comment: Section 2.4.6 states that the objective of the Remedial Investigation and Feasibility Study (RI/FS) surface water and sediment sampling programs was to characterize the surface water and sediment in the drainage ditches both on and off site. However, the sediment samples from the pilot plant drainage ditch were not analyzed for radiological parameters. The text also lacks organic and inorganic analytical data for sediment in the south drainage area along the west side of the inactive fly ash pile. Additional sampling should be conducted to better characterize the sediment in the pilot plant drainage ditch and the inactive flyash pile south drainage areas.
Response: Disagree. Adequate sediment samples were collected from the pilot plant drainage ditch and the drainage west of the inactive flyash piles. The following samples were collected from the pilot plant drainage ditch prior to the RI/FS: 12 CIS samples which were analyzed for U-238, U-total, Th-232, Ra-226, Ru-106, and Cs-137. One RI/FS sample was analyzed for inorganics, organics, U-total, Ra-226, and RA-228. All samples could be used for site characterization. Only the RI/FS sample could be validated and used in the baseline risk assessment. Sediment samples were collected from one location in the small drainage on the west side of the inactive flyash pile. Samples from the location were analyzed for inorganics, organics, and full radiological parameters. The samples were validated and used for characterization and risk assessment.
Action: A discussion of potential data limitations for surface water and sediment is presented in responses to comment numbers 13 through 17.

2. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.4.6.1 Pg.#: 2-31 Line#: 19 to 20 Code:
Original Specific Comment #: 2
Comment: Section 2.4.6.1 describes where surface water and sediment samples were collected. The text indicates that both surface water and sediment samples were collected at location W-7; however, Figure 2-16 indicates that only surface water was collected at location W-7. This discrepancy needs to be rectified and the text should be revised accordingly.
Response: The text does not need to be revised. Figure 2-16 was incorrect and should have shown that surface water and sediment were sampled at location W-7.
Action: Figure 2-16 will be revised to show location W-7 as a sampling point for surface water and sediment.

3. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.4.6.1 Pg.#: 2-31 to 2-32 Line#: 28 to 34 Code:
Original Specific Comment #: 3
Comment: Section 2.4.6.1 describes surface water and sediment sampling along the Great Miami River. According to the analytical tables in Appendix G, no sediment samples collected upstream of the effluent outfall line were analyzed for hazardous substance list (HSL) parameters. Thus, no background data exists against which to compare HSL analytical results for sediment samples. Additional sediment sampling should be conducted to provide background data for the Great Miami River.
Response: Agree that no background sediment data were collected from the Great Miami River. Once cleanup levels for sediment in the Great Miami River are established in the Operable Unit 5 ROD, additional sampling may be necessary to verify FS volume estimates of sediment to be

removed from the Great Miami River. This additional sampling, if necessary, would be conducted during the Remedial Design phase of the cleanup.

Action: The following paragraph will be added to the end of Section 2.4.6 to clarify surface water and sediment sampling program:
"Although there are sufficient data to present the nature and extent of contamination for the baseline risk assessment and the Operable Unit 5 FS, it is recognized that in some instances there will be a need for further sampling to support the actual remediation of these media. Because uranium is the primary contaminant in sediment and surface water, the volume of sediment defined by known uranium contamination indicates the extent of sediment contamination. As part of the remedial design additional sampling may be required to accurately determine specific volumes of sediment to be removed."

4. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.4.6.1 Pg.#: 2-31 to 2-32 Line#: 36 to 13 Code:
Original Specific Comment #: 4

Comment: Section 2.4.6.1 describes the laboratory analysis for surface water and sediment samples, but does not clearly delineate which samples were analyzed for HSL parameters. Specifically, the text (page 2-31, lines 37 to 38) states that selected surface water and sediment samples were analyzed for HSL organics; however, the analytical tables in Appendix G show that these samples were also analyzed for HSL inorganic parameters. Lines 11 to 13 on page 2-32 indicate that selected surface water samples from drainage ditches were analyzed for HSL inorganic parameters. The analytical tables in Appendix G show some surface water and sediment samples collected from the drainage ditches were also analyzed for HSL organic parameters. Finally, the tables indicate that selected sediment samples were analyzed for HSL inorganic parameters. Discrepancies between the text and the analytical tables in Appendix G need to be corrected.

Response: Agree. There are discrepancies between the text and Appendix G. Section 2.4.6.1 will be rewritten and Appendix G will also be corrected and reissued based on a more detailed review of the Operable Unit 5 database tables.

Action: Section 2.4.6.1 will be replaced with the following paragraphs:
The original RI/FS Work Plan augmented the FEMP's ongoing surface water and sediment collection program. This work plan covered Paddys Run, the Great Miami River, and numerous on-site drainages. The sampling began in 1988 and concluded in 1990.
Surface water samples were collected from locations W-7, W-10, and W-11 along Paddys Run in January and May 1989, and July 1990. Samples from all three locations were analyzed for general water quality, radiological, and HSL inorganic parameters. In January 1989, W-10 was also analyzed for HSL organic parameters. Sediment samples from locations W-5, W-7, W-10, and W-11 were collected in June and August of 1988 and April 1989 and analyzed for radiological constituents. In January 1989 sediment from these same four locations was sampled and analyzed for HSL inorganic parameters, with samples from W-5 and W-10 additionally analyzed for HSL volatiles (Figure 2-16). The lack of surface water in Paddys Run during the rounds of sediment sampling in 1988 prevented the concurrent sampling of surface water. A seep sample, collected at Location 1422 in July of 1989 along the bank of Paddys Run, was an addition to this program; its samples were analyzed for general water quality, radiological, and HSL inorganic parameters (Figure 2-17).
Seven locations were established in the Great Miami River for this original RI sampling program. The sampling locations were W-1, W-3, W-4, GMR-1, GMR-2, GMR-3, and GMR-4 as shown in Figure 2-16. In June and August 1988 and April 1989 surface water samples from these locations were analyzed for general water quality, radiological, and HSL inorganic parameters; additional sampling in June and December 1988 was sent in for radiological analysis. These same locations were sampled for sediment in July, September, and December 1988 and in July 1989, and the samples were analyzed for radiological constituents.

Figure 2-17 identifies the discrete drainage ditch locations, including the storm sewer outfall ditch, which were sampled as part of the original RI Work Plan. All samples were collected following installation and start-up of the storm water retention basin.
Twenty locations were sampled for surface water and sediment (ASIT-001 through ASIT-007, ASIT-009 through ASIT-016, and ASIT-018 through ASIT-022) as shown in Figure 2-17. The sediment samples collected from these 20 locations in June or July 1988 were analyzed for radiological parameters. Additionally, in June 1988, locations ASIT-007 and ASIT-010 were sampled for sediment and analyzed for HSL inorganic and general water quality constituents. ASIT-011 through ASIT-015 and ASIT-018 through ASIT-022 were sampled for surface water in February 1989 and analyzed for radiological parameters. Additionally, surface water samples from ASIT-020 were analyzed for HSL inorganics and general water quality, while ASIT-021 samples were analyzed for those constituents as well as HSL semivolatiles. In March 1989, locations ASIT-001, ASIT-003, ASIT-006, ASIT-007, and ASIT-010 were sampled for surface water and analyzed for radiological parameters. Also in March 1989, surface water samples were collected from locations ASIT-002, ASIT-004, ASIT-005, and ASIT-009 and were sent to the laboratory to be analyzed for radiological, HSL inorganic and general water quality parameters. In May 1989, surface water samples from both ASIT-003 and ASIT-016 were analyzed for radiological constituents while those from ASIT-003 were analyzed for HSL inorganic and general water quality parameters.
Two drainage ditch locations, ASIT-008 and ASIT-017, were sampled for sediment only in June and July 1988, respectively, and analyzed for radiological constituents. Surface water samples were collected in February 1989 at ASIT-023 and ASIT-024 and were sent to the laboratory for radiological analysis. That same month, ASIT-030 and ASIT-031 were sampled for surface water and analyzed for radiological, general water quality, and HSL inorganic and organic parameters. In March 1989 surface water samples from ASIT-025, ASIT-026, ASIT-029, ASIT-036, ASIT-037, and ASIT-038 were sent for radiological analysis. Surface water samples were collected from ASIT-027, ASIT-028, ASIT-038, and ASIT-40 in May 1989 and analyzed for radiological parameters (Figure 2-17).

5. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.5.4.2 Pg.#: 2-40 Line#: 8 Code:
Original Specific Comment #: 5
Comment: Section 2.5.4.2 describes the analysis of surface soil samples collected from the Plant 1 Pad area before and after excavation. The text states that some of the samples collected were not analyzed, but were archived. The text should clearly state which samples were actually analyzed.
Response: This discussion could have been more clearly written.
Action: The paragraph on page 2-40, lines 4 through 9, will be revised to read:
"The first 6-inch interval was analyzed for limited radiological parameters (i.e., isotopic uranium and thorium, radium-226 and -228) and HSL inorganics, pesticides, and PCBs. The 1.25 to 2.0-foot-deep interval was analyzed for HSL volatiles and semivolatiles. Soil samples collected from 0.5 to 1.0 and 1.0 to 1.5 feet were archived.

6. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 3.6.1.1 Pg.#: 3-44 Line#: 12 to 13 Code:
Original Specific Comment #: 6
Comment: Section 3.6.1.1 discusses the core permeability test performed on 41 core samples collected from the glacial overburden. The text should indicate the soil type from which the cores were collected to facilitate comparison of the slug test data and the core permeability test results.
Response: Agree.
Action: A column will being added to Table 3-15 to show the soil type for each sample.

7. Organization: U.S. EPA Commentor: Saric
Section#: 4.0 Page #: NA Line #: NA
Original General Comment #: 1
Comment: Generally the description of the nature and extent of contamination presented in Section 4 is accurate. In most cases, information on major areas of contamination is sufficient to support the baseline risk assessment and feasibility study. The general comments for Section 4.0 highlight areas where additional investigation may be necessary. Specific comments relate to specific geographical locations or to specific chemicals as described in the appendixes. The specific comments regarding the appendixes should be addressed, and corresponding changes should be made to the main text of the remedial investigation report.
Response: Agree
Action: No specific action to this comment required. Actions will be implemented as appropriate, based on responses to specific comments.

8. Organization: U.S. EPA Commentor: Saric
Section#: 4.0 Page #: 4-1 Line #: 1
Original General Comment #: 2
Comment: In several instances, the text concludes that certain media at certain depth intervals are free of contamination. However, some of these conclusions are based on insufficient data, or in some cases no data at all. Specific examples are cited in specific comments. Conclusions regarding the extent of contamination should be reevaluated, and more accurate conclusions should be drawn from the available data.
Response: Agree
Action: No specific action to this comment required. Actions will be implemented as appropriate, based on responses to the specific comments.

9. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.1.6 Page#: 4-10 Line#: 24
Original Comment #: 1
Comment: This section discusses the analyses of radionuclides using various techniques. As a matter of comparison, the minimum detectable concentrations for the various techniques used to measure total and isotopic uranium should be provided.
Response: The minimum detectable concentrations (MDCs) for radionuclide analyses are not constant for a given technique or nuclide. The MDCs are a function of such factors as the sample volume, detector background, and the counting time. These factors are adjusted to achieve the MDC required for a particular application. As a general rule, the use of radiological data includes the required MDCs in contract terms with analytical laboratories.
Action: This discussion is more suitable to Section 2.12, Data Validation. The following text and Table 2-7 of MDCs typically required for Operable Unit 5 analyses will be inserted as new Section 2.12.2.3:

2.12.2.3 Radiological Detection Limits
The concept of a minimum detectable concentration (MDC) is very useful in discussing radiological data. The MDC is defined as the minimum concentration of radioactive material that can be detected above background at a given level of statistical confidence. All measurements of radioactivity have some associated random uncertainty or imprecision. This uncertainty is a result of the physics governing radioactive decay and means that no radioactivity measurement can be seen as exact. This applies to measurements of both sample activity and background. The MDC is based on a comparison of two imprecise numbers using statistical techniques. Factors used in calculating the MDC include the uncertainty associated with method blank analysis, the detector efficiency, the sample volume or weight, chemical yields, counting time of the sample, decay corrections, and conversion constants. Because

some of the factors are readily adjustable, particularly the sample quantity and counting time, the MDCs for radionuclide analyses are not constant for a given radionuclide or technique. The adjustable factors are varied to achieve the MDCs required for a particular sample. As a general rule, the use of radiological data includes as a contract requirement that laboratories must plan their analyses to meet certain MDCs. DOE, with EPA concurrance, has established in the SCQ a set of highest allowable minimum detectable concentrations (HAMDCs) for analytical data collected for use in FEMP remedial investigations since implementation of the SCQ in 1993. The HAMDCs for total uranium and uranium isotopes as well as other selected radiological analytes are shown in Table 2-7.

10. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.1.6 Page#: 4-13 Line#: 18
Original Comment #: 2
Comment: While it is possible to calculate the total uranium from isotopic data, it is not possible to calculate isotopic uranium concentrations from total uranium data unless conversion factors are used that assume a set uranium isotope ratio; The other point that should be made clear is that while total uranium analysis is useful in the toxicity assessment for noncarcinogenic effects, it should not be used as substitute for isotopic uranium analysis when assessing carcinogenic effects.
Response: Both of the review comments are correct. However, it is not within the scope of this section to discuss how the data from specific analyses are used in the risk assessment; Appendix A.4, Baseline Risk Assessment, addresses this point.
Action: The following sentence will be inserted following the sentence ending on line 20 of page 4-13: However, total uranium data cannot be used to calculate isotopic data for uranium unless the ratios of the individual uranium isotopes are known or assumed.

11. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.2 Page#: 4-15 Line#: 32
Original Comment #: 2
Comment: The statement is made that summary statistics are provided for surface-soil sampling for transuranic/fission products; the location of these summary statistics should be indicated.
Response: Agree. The text will be modified as indicated below.
Action: "as evidenced by the summary statistics provided in Table 4-5."

12. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.2 Page#: 4-15 Line#: 32
Original Comment #: 3
Comment: It is stated that strontium-90 was detected only once in the 81 soil samples collected; indicate whether or not background subtraction was then performed for it.
Response: The statement is incorrect. Strontium-90 was detected in 4 out of 30 surface soil and 2 out of 51 subsurface soil background samples as reflected in Tables 4-5 and 4-6. Background subtraction was not performed on any sample results reported in the entire RI report. The text will be modified as indicated below.
Action: "Strontium-90 was detected in 4 out of 30 surface soil and 2 in 51 subsurface soil background samples as reflected in Tables 4-5 and 4-6."

13. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.5.2.1 Pg.#: 4-25 Line#: 5
Original Specific Comment #: 7
Comment: The text indicates that no fissionable or uranium activation radionuclides were detected above background levels in surface water samples from the pilot plant drainage ditch. However, the

detection limits for these radionuclides are above the background concentrations. In addition, fissionable and uranium activation radionuclides were detected in sediment samples at concentrations above background and could therefore be present in the surface water. The samples with lower detection limits should be reanalyzed or the text should explain how this data limitation will affect the risk assessment and feasibility study.

Response: The text in Section 4.5.2.1 did not indicate if fission products or uranium activation radionuclides were detected in surface water in the pilot plant drainage ditch. The discussion in Section 4.5 focuses on the nature and extent of uranium contamination because a review of the entire Operable Unit 5 data set indicates that total uranium is the primary contaminant at the FEMP, including in surface water and sediment. Appendix C does discuss the presence of all contaminants, including radionuclides.

Detection limits for radionuclides varied throughout the duration of field investigations. The particular case, where non-detect results are detection limits greater than background, is not a data limitation. In the Operable Unit 5 FS all results were compared to the PRGs for the most conservative scenario: 10^{-6} risk to the trespassing child. All results, including reported detection limits, were below the PRGs. The use of detection limits greater than background will not impact the FS evaluation of alternatives. Because data were limited, exposure point concentrations were derived from relatively few samples. In such circumstances, the maximum values were used. Therefore the probability of underestimating risk due to an inadequate database is low. Data limitations are discussed in detail in Section 7 and Table 7-12.

Action: See action for Comment 17.

14. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.5.2.2 Pg.#: 4-25 Line#: 30
Original Specific Comment #: 8

Comment: The investigation of the pilot plant drainage ditch did not include collecting and analyzing sediment samples for fissionable or uranium activation radionuclides such as plutonium or neptunium. These radionuclides were detected in surface water samples at levels significantly above background concentrations. In addition, the environmental monitoring data indicate that other fissionable radionuclides (ruthenium and cesium) were detected at concentrations above background. Sediment samples should be collected and analyzed for fissionable radionuclides to more accurately estimate the risk to human receptors and the environment.

Response: Comment noted. Although there was one detection each of plutonium and neptunium in surface water samples collected for 1993, the concentrations are well below the PRGs (10^{-6} risk to trespassing child) established for surface water in Paddys Run. The environmental monitoring data that the reviewer references is apparently from the Characterization Investigation Study conducted in 1986 (these data are included in Appendix C). None of these data could be validated. Moreover, due to the short half-life of ruthenium-106 (about 1 year), almost all ruthenium present at that time has since decayed. Since uranium production has ended, this radionuclide is not expected to be found and is no longer analyzed for. In fact, PRGs were not developed for ruthenium. Cesium, strontium, and neptunium were present in trace amounts in the recycled material processed at the FEMP, and are also present in the environment through radioactive fallout from weapons testing. Again, the PRGs for these radionuclides — for both surface water and sediment — are much higher than their maximum detected values or their detection limits.

Surface water in the pilot plant drainage ditch remains uncontrolled, and the data do show that it is contaminated with uranium. It is clear that the ditch — and the source(s) of contamination — will need to be remediated. In fact, Operable Unit 5 is currently addressing the contamination in the pilot plant drainage ditch as part of Best Management Practices to confirm and investigate suspected sources of contamination. This is as an interim activity. The final cleanup of contamination in the pilot plant drainage ditch will be in accordance with the Record of Decision for Operable Unit 5.

Action: See action for Comment 17.

15. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.5.2.3 Pg.#: 4-28 Line#: 9
Original Specific Comment #: 9

Comment: Surface water and sediment samples from the SSOD were collected during only one sampling event and at only the head and the mouth of the SSOD. In addition, these surface water and sediment samples were not analyzed for any fissionable radionuclides. Fissionable radionuclides are very likely present in the SSOD because it is one of the main drainage sources for the production area. The limited characterization of the SSOD precludes the accurate assessment of risk, limits accurate determination of contaminant loading to the GMA from the SSOD, and limits the ability to screen remedial alternatives. Because the SSOD is one of the main drainage ways of the production area, it is a likely deposition point of contamination and should therefore be further characterized. Additional samples should be collected over time to adequately characterize the contamination in the SSOD and to evaluate the sources of contamination to the SSOD.

Response: The RI sampling program for surface water and sediment from the storm sewer outfall ditch was limited. As noted in Section 4.5.2.3, the Environmental Monitoring Program has been collecting sediment samples in the storm sewer outfall ditch since the 1970s. These samples have been analyzed for a number of radionuclides, including plutonium, radium, technetium, thorium, and uranium. A comparison of the 1987 through 1993 data to the PRGs for sediment showed that only four data points out of the hundreds collected during that time period were near or above their PRGs (10^{-6} risk for trespassing child). The EM data also show that uranium is the most prevalent contaminant in the storm sewer outfall ditch. Furthermore, the storm sewer outfall ditch has not carried surface water runoff from the former production area since the storm water retention basin was placed in operation in 1986. The effect of this is evidenced by the significant decrease in total uranium concentrations in the sediment in the outfall ditch as well as in the surface water samples collected from Paddys Run at EM location W-7 just downstream of the outfall ditch.

Action: See action for Comment 17.

16. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.5.2.5 Pg.: 4-29 Line#: 19
Original Specific Comment #: 10

Comment: Surface water and sediment samples collected from Paddys Run were not analyzed for any fissionable radionuclides. Fissionable radionuclides are very likely present in Paddys Run because fissionable radionuclides were detected in the pilot plant samples at levels greater than five times background. The limited characterization of Paddys Run precludes the accurate assessment of risk and limits the ability to screen remedial alternatives. Paddys Run should be further characterized.

Response: Paddys Run surface water and sediment were not sampled extensively for the RI. That was due in part because the RI program was designed to build on existing Environmental Monitoring data, which were available since the mid-1970s. The sediment samples were analyzed for the same parameters as mentioned in the response to Comment 15. Again, a comparison of the sediment data to PRGs developed for the Operable Unit 5 FS show that the concentrations of very few contaminants are above their PRGs. None of the results for samples collected in 1993 had concentrations above their PRGs. EM sediment data collected during several years show not only that uranium is the primary contaminant in SSOD and Paddys Run sediment, but also that due to the dynamic nature of the streams and periods of high flow, contaminated sediment does not tend to collect in the streams.

Action: See action for Comment #17.

17. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.5.4.5 Pg.#: 4-41 Line#: 1
Original Specific Comment #: 11

Comment: Section 4.5.4.5 states that no additional characterization is necessary to complete the RI/FS. Specific comments provided above indicate where additional characterization is necessary to assess risk to human health and to completely screen remedial alternatives. Areas that need additional investigation include the northeast drainage ditch, the east drainage area, the pilot plant drainage ditch, the SSOD, and Paddys Run.

Response: The number of sediment samples is limited, especially in the pilot plant drainage ditch. As indicated in Table 7-10 (now 7-12), additional sampling may be required during the RD and/or RA phases of remedial design to verify the FS estimates of these affected media. Additional sampling is not required for the screening of alternatives for the FS.

When the 10^{-6} risk PRGs for surface water (Paddys Run) and sediment for the exploring youth — as presented in the Operable Unit 5 draft FS — are compared to the surface water and sediment data presented in the Operable Unit 5 RI Report, it is apparent that the concentrations of the fission products and uranium activation radionuclides are significantly less than their respective PRGs. Moreover, the PRGs are well above the detection limits for those radionuclides which were not present in detectable concentrations.

Because fission products and uranium activation radionuclides may be present at the FEMP, they were analyzed for as part of the Operable Unit 5 RI soil sampling program. Data from soil samples collected near sources of contamination indicate that these radionuclides are not present in concentrations that would lead one to expect to find these radionuclides in surface water or sediment some distance from the source areas. The extent of uranium contamination is likely to be the prime factor in determining and evaluating remedial options.

These data limitations for surface water and sediment could potentially impact the risk assessment because exposure point concentrations were derived from relatively few samples. In such circumstances, the maximum values were used. Therefore the probability of underestimating risk due to a limited database is low. Data limitations are discussed in detail in Section 7 and Table 7-12.

Action: Add the following paragraph in Section 4.5.1, page 4-23, and Appendix C, Section C.0.2, and Table 7-12:

Uranium analytical results exist for almost every sampling location, but the data sets for nonuranium parameters are smaller. Consequently, the extent of some less prevalent contaminants has not been as completely defined as that for uranium; however, the occurrence of nonuranium contaminants are for the most part confined to areas of uranium contamination. The existing data are deemed sufficient because the forthcoming FS will base its remediation volume estimates on well-defined uranium contamination as well as the nonuranium contamination found outside the uranium-contaminated areas. The existing data have also adequately documented the contamination for purposes of the baseline risk assessment. As shown in the baseline risk assesment (Section 6 and Appendix A),in areas where few data points are available for some constituents the maximum observed concentrations are used as representative concentrations. The use of the maximum observed concentrations as well as other conservative assumptions tend to make the risk assessment conservative; i.e., to overestimate risk. Further discussion of data adequacy for the baseline risk assessment is provided in Section 6.7, Section 7.7 and Table 7-12, and Appendix A. Table 7-12 also provides a discussion of the data adequacy for the evaluation of remedial alternatives in the FS.

18. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.6.1.1.1 Page#: 4-49 Line#: 10
Original Comment #: 5

Comment: The statement is made that "the uranium-238 isotope accounts for greater than 95 percent of the total uranium on a mass basis; therefore, the nature and extent of contamination of uranium isotopes will be depicted and explained in the discussion on total uranium." Natural uranium contains three isotopes: uranium-234, uranium-235, and uranium-238. The corresponding typical percentages in rock for these isotopes are 0.006, 0.72, and 99.27 percent by weight, respectively. Taking the specific activities of the isotopes uranium-234 and uranium-238 into account (approximately 6,133 pCi/μg and 0.343 pCi/μg, respectively), the activity ratio of uranium-234/uranium-238 is approximately one (1). While total uranium data is used to determine toxicity values for noncarcinogenic effects, isotopic uranium values are necessary to determine toxicity values for carcinogenic effects. Discuss any findings and assumptions regarding uranium isotope ratios at the Fernald site, conversion factors used to determine the activity of total uranium measured as mass and vice versa, and whether the total uranium values presented result from total uranium analysis and/or are derived from isotopic uranium data.

Response: Agree to add additional text regarding uranium isotope ratios.

Action: Replace sentence beginning on page 4-49, line 10, with the following:
Samples were analyzed for either total uranium or the individual isotopes of uranium. The analytical techniques are described briefly in Section 4.1.6. The results of total uranium analyses are reported in units of mass, while those for isotopic analyses are reported in activity units. Total uranium data include the concentrations of all isotopes of uranium, but provide no information on the isotopic content. Total uranium data cannot be used to determine isotopic concentrations unless the ratios of the specific isotopes are accurately known. At the FEMP, the sources of potential uranium contamination may have isotopic ratios representative of natural, depleted, or enriched uranium, and isotopic ratios are not well defined for all samples. Because of this, it is not possible to accurately convert total uranium data to isotopic data, and no such conversions were made for the data used in the Operable Unit 5 RI. Isotopic data can be converted to total uranium data by calculating the mass of each isotope and summing the results. For most locations where total uranium information is needed, it is available from direct analyses. Isotopic data were used to calculate total uranium at locations where total uranium analyses were not available but isotopic data were. A review of the data reveals that locations with elevated levels of individual uranium isotopes also exhibit elevated levels of total uranium. Consequently, the nature and extent of contamination by uranium isotopes is included in the following discussion on total uranium.

19. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 4.6.1.1.1 Page#: 4-49 Line#: 9
Original Comment #: 4

Comment: It is stated that "uranium-234 and uranium-238 are constituents of total uranium." Past practices have included the processing of materials with as much as 2% uranium-235 as well as uranium-236. Explain in the text why uranium-234 and uranium-238 are constituents of total uranium while uranium-235 and uranium-236 are not.

Response: The sentence referred to is not talking about total uranium. It refers to the uranium decay series. Both uranium-235 and -236 are constituents of total uranium. The text will be clarified as shown below.

Action: "Of the radionuclides in the uranium decay series, uranium-234..."

20. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.6.1.2 Pg.#: 4-75 Line#: 11
Original Specific Comment #: 12

Comment: Section 4.6.1.2 discusses lead contamination in subsurface soil. However, no subsurface soil samples were collected in the trap range area. This area is known to have extensive lead contamination in the surface soil. Addition sampling is necessary to adequately characterize the trap range subsurface soils and screen alternatives in the FS.

Response: Disagree. The lead at the trap range is very likely to be confined to the top few inches of soil for the following reasons:

- It was deposited on the surface as metallic lead particles (lead shot).
- The extremely low solubility of lead in the carbonate rich water at the FEMP (Section 3.5.1).
- The area of deposition of the lead shot is undisturbed based on historic aerial photographs.

It is recognized that the solubility of lead is higher in rainwater falling on the surface of the FEMP than in the carbonate-dominated vadose/groundwater regime. However, assuming a vertical seepage velocity of 2.15 ft per year in the brown clay (Table 3-21), the six inches annual infiltration of surface water (Section 3.2.5) would be equilibrated with carbonate minerals by the time it reached approximately 0.6 foot in depth, given the time for equilibration of carbonate minerals in porewater is 100 days, as determined in Lee 1993 at the Oak Ridge National Laboratory. Therefore, any lead above approximately 5 $\mu g/L$ leaching from the surface soil would be precipitated out as lead carbonate at a depth of 0.6 foot or less.

In light of the above discussion sufficient characterization of the trap range soil has been performed for purposes of the baseline risk assessment and for the FS selection and evaluation of alternatives. The Operable Unit 5 FS is assuming the contamination extends to a depth of 12 inches for estimating the volume of soil to be removed from this area.

DOE recognizes that additional subsurface soil sampling in the trap range area may be necessary during remedial design to refine the FS estimate of soil to be removed during the remedial action.

Action: Add the following text to page 4-74, line 9 and page D.2-90, line 15: All of the areas with elevated levels of lead in surface soil are within the uranium envelope except the trap range. Additional subsurface sampling may be required during remedial design to verify the FS's estimates of the volume of soil requiring remediation due to the presence of lead. Based on the extremely low mobility of lead under FEMP site-specific geochemical conditions (Section 3.5.1), the fact that the lead shot was deposited on the surface, and the surface has not been disturbed, it is unlikely that lead has migrated to a depth much greater than 0.6 foot below the surface.

21. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.6.2 Pg.#: 4-84 Line#: 4
Original Specific Comment #: 13

Comment: Section 4.6.2 presents several profiles of the total uranium contamination in the subsurface soil at various places at the FEMP. However, soil profiles overstate the accuracy of the subsurface characterization. No soil samples were collected in many boreholes from the lower portion of the borehole; however, the profiles contain closed contours indicating a known boundary to uranium contamination. This situation is present at boreholes 1142 and 1145 in profile KK-KK'; at boreholes 1338, 3421, and 4013 in profile FF-FF'; at borehole 1505 in profile EE-EE'; and at boreholes 1139, 1142, 1144, 1148, and 1294 in profile AA-AA'. Either additional soil samples should be collected in these areas to define the vertical extent of soil contamination or the RI should be revised to state that the vertical extent of contamination indicated by the contours is inferred.

Response: Agree. Text will be modified as shown below. Each of the cross sections will include the same modification as a footnote.

Action: Text will be modified as shown as follows: "...assessed using the cross sections (Figures 4-63 to 4-70). The vertical extent of contamination indicated by the contours is inferred in instances where data was not collected in the lower portions of the boreholes. Figure 4-62..."

22. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.6.2 Pg.#: 4-84 Line#: 4
Original Specific Comment #: 14
Comment: The profiles presented as part of Section 4.6.2 indicate that soil contamination does not exist in the deeper portions of the glacial till. However, groundwater samples from the lower portions of the glacial till indicate significant groundwater contamination. The conclusion that no soil contamination exists in the same interval where groundwater contamination exists is not supported because soil samples were not collected at this interval. This lack of data may significantly impact the estimated volume of soil requiring remediation. Data ia lacking for boring 1336 in profile EE-EE'; borings 1179, 1190, 1220, 1231, and 1234 in profile V-V'; borehole 1423 in profile AA-AA', and borehole 1142 in profile KK-KK'. Soil samples should be collected to further characterize the vertical extent of soil contamination or the RI should be revised to state that the vertical extent of contamination indicated by the profiles is not known.
Response: Agree. Each cross section will include the same modification as a footnote.
Action: Text will be modified as follows: "...assessed using the cross sections (Figures 4-63 to 4-70). The vertical extent of contamination indicated by the contours is inferred in instances where data was not collected in the lower portions of the boreholes. Figure 4-62..."

23. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.6.2 Pg.#: 4-84 Line#: 4
Original Specific Comment #: 15
Comment: The subsurface contamination in profile AA-AA' is not presented accurately. Soil samples collected from borehole 1086 indicate that total uranium levels are as high as 71 milligrams per kilogram (mg/kg); however, the profile does not indicate any isoconcentration lines in this area. The profile and the text should be revised to include this area of contamination.
Response: The "71-" is not a soil result but a groundwater result. Thus it is a 71 μg/L result. No soil samples were collected and analyzed for boring 1086. The cross sections are being modified to resolve this confusion.
Action: Groundwater data versus soil data will be clarified on the cross sections.

24. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.1 Pg.#: 4-116 Line#: 4
Original Specific Comment #: 16
Comment: Well 1728 is located in a fringe area of the FEMP and has a total uranium concentration of greater than 2 times background. This well is in close proximity to the waste pit area, a known source of groundwater contamination. Further investigation is needed in the area of well 1728 to define the source and extent of groundwater contamination.
Response: Disagree. The large size of the FEMP makes locations on maps appear closer than they really are. Lateral transport via the groundwater system is unlikely to have contaminated Well 1728, because Well 1728 is located more than 1000 feet upgradient of the north edge of the waste storage area. No known or suspected production activities or disposal activities occurred in the vicinity of Well 1728. The elevated concentrations of uranium in groundwater of fringe areas are attributed to deposition and infiltration of plant air emissions, in the absence of any other plausible sources such as groundwater transport, routine production activities, and known or suspected disposal areas. The elevated uranium results observed in Well 1728 (10.1 μg/L, Plate E-3) are consistent with elevated uranium results observed in other fringe areas of the site, such as Wells 1124 (13.9 μg/L, Plate E-3), 11130 (7.9 μg/L), and 1733 (2.3 μg/L). Such a source is consistent with the history of plant air emissions (see Appendix F.3.I) and observed patterns of surface soil contamination (see Section 4.6.1).
Action: No action required.

25. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.1 Pg.#: 4-120 Line#: 7
Original Specific Comment #: 17

Comment: The text cites a vertical retardation factor of 20 to 80 for uranium. However, this factor appears high considering the site-specific analytical data. Appendix F-3 states that the uranium retardation factor in the glacial overburden is between 9 and 12. Also, at three lysimeter locations at the FEMP, uranium has percolated through 20 to 30 feet of till in less than 40 years. This indicates a retardation factor in the range of 2 to 3 assuming a vertical seepage rate of about 1 foot per year as stated in the text. The vertical retardation factor should be revised to consider the site-specific analytical data.

Response: Agree. The subject discussion was intended to illustrate basic concepts of transport and not the detailed discussion of transport that is presented in Section 5.

The correct range of groundwater vertical seepage velocities through glacial overburden at the FEMP is 0.85 to 2.15 ft/yr as presented in Table 3-21. These seepage velocities were calculated using a total porosity of 26% in the gray clay. With a 2.15 ft/yr groundwater seepage velocity and a relative uranium velocity of 1/20th, uranium contamination can migrate more than 4.3 feet downward in a 40-year period. However, this simple estimation only considers uranium migration due to retarded advection which presents the speed of the peak of the contamination. Overall contaminant migration is also affected by dispersion. Dispersion can cause the front of the contaminant plume to migrate at a higher speed than the peak of the plume. The plume actually elongates vertically with time. Therefore, when the peak of the contamination plume reaches the 4.3 feet depth, contamination is also present in the portion of the gray clay below 4.3 feet but at lower concentrations. For example, after an one-time contaminant spill, the contaminant concentration profile in the overburden will actually look like a bell-shape curve with contaminants present both above and below the depth of the maximum concentration. In Section 4 of the RI, the general discussion about uranium retardation factor and migration rate only refers to the advection process; and does not intend to define the complete migration rate or the location of contamination front in the overburden at any given time point.

Dispersion is included in the numerical fate and transport modeling process described in Section 5 and Appendix F of the RI Report. The gray clay thickness in the overburden is about 10 feet at the lysimeter data.

Action: Line 5 will be revised to read "...0.85 to 2.15 ft/yr...".

The last sentence of the paragraph (sentence begins on line 5 of page 4-120) will be deleted and the following text will be inserted in its place: "Assuming a 2.15 ft/yr groundwater seepage velocity and a relative uranium velocity of 1/20th, uranium contamination can migrate more than 4.3 feet downward in a 40-year period. However, this simple estimation only considers uranium migration due to retarded advection which presents the speed of the peak of the contamination. Therefore, when the peak of contamination plume reaches the 4.3 feet depth, contamination is also present in the portion of the gray clay below 4.3 feet but at lower concentrations. Contaminant migration is also affected by dispersion. Dispersion can cause the front of the contaminant plume to migrate at a higher speed. Therefore, dispersion is included in the numerical fate and transport modeling process described in Section 5 and Appendix F of the RI Report to simulate contaminant migration and define the complete profile of the contamination in the overburden. The gray clay thickness in the overburden is about 10 feet at the lysimeter locations. Simulated uranium migration with both advection and dispersion process can match the time of travel indicated by the lysimeter data (see Appendix F.3, Attachment II)."

26. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.3 Pg.#: 4-121 Line#: 27
Original Specific Comment #: 18

Comment: Section 4.7.1.1.3 discusses the extent of thorium contamination plumes estimated from filtered and unfiltered groundwater samples. However, the extent of these plumes may be underestimated because groundwater from numerous wells in the production area near the estimated fringes of the plumes were not sampled or analyzed for thorium. Additional groundwater samples should be collected to further characterize the thorium plumes, or the text should be revised to acknowledge this data limitation.

Response: Agree that the extent of thorium contamination may be underestimated in map portrayals of data, because thorium was not analyzed for at every FEMP well. The text will be revised to discuss the potential data limitation.

Uranium is the prime FEMP contaminant and was a suspect contaminant in all site investigations. Consequently, uranium analytical results exist for almost every well at the FEMP. Nonuranium parameters were typically investigated only in areas where they were suspected contaminants. Consequently, the data sets for nonuranium parameters are smaller, and in some cases geographically restricted.

Isoconcentration maps of thorium and nonuranium parameters (Plates E-11 to E-76, and corresponding in-text isoconcentration maps) include the 5 and 20 μg/L contours for total uranium based on unfiltered samples in the 1993 data set. It is recognized that the lateral extent of some less prevalent contaminants has not been as completely defined as that for uranium; however, the "uranium envelope" contours on the maps illustrate that the extent of contamination for lesser contaminants is in most cases within the uranium envelope. The extent of uranium contamination is likely to be the prime factor, during the FS process, in determining and evaluating remedial options.

The existing data sets for nonuranium parameters, though potentially lacking in a few areas, do outline the most seriously contaminated areas and define the extent of the majority of the contamination. The existing data are therefore deemed adequate to characterize nature and extent, to determine fate and transport source terms, to perform risk assessments, and to allow development of accurate decisions in the FS process. Additional sampling may be done during remedial design to further define the extent of individual parameters to a level of detail necessary to perform design.

With respect to thorium, the perceived lack of analyses in fringe areas is likely to be inconsequential. Thorium has an extremely low solubility in perched groundwater (see paragraph that follows subject text), and would therefore not be expected to have spread laterally an appreciable distance.

Action: The following paragraphs will be added to Section 4.7.1, page 4-109, line 33:

Because uranium is the prime FEMP contaminant and was a suspect contaminant in all site investigations, uranium analytical results exist for almost every well at the FEMP. Nonuranium parameters were typically investigated only in areas where they were suspected contaminants. Consequently, the data sets for nonuranium parameters are smaller, and in some cases, geographically restricted.

Isoconcentration maps of nonuranium parameters (Plates E-11 to E-76, and corresponding in-text isoconcentration maps) include the 5 and 20 μg/L contours for total uranium based on unfiltered samples in the 1993 data set. It is recognized that the lateral extent of some less prevalent contaminants has not been as completely defined as that for uranium; however, the "uranium envelope" contours on the maps illustrate that the extent of contamination for lesser contaminants is in most cases within the uranium envelope. The extent of uranium contamination is likely to be the prime factor, during the FS process, in determining and evaluating remedial options.

The existing data sets for nonuranium parameters, though potentially lacking in a few areas, outline the most seriously contaminated areas and define the extent of the majority of contamination. The existing data are therefore deemed adequate to characterize nature and extent, to determine fate and transport source terms, to perform risk assessments, and to allow development of well-founded decisions in the FS process. Additional sampling may be done

during remedial design to further define the extent of individual parameters to a level of detail necessary to perform design.

27. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.3 Pg.#: 4-121 Line#: 27
Original Specific Comment #: 19

Comment: The extent to which the thorium contamination plume estimated from filtered samples extends east near the sewage treatment plant is not characterized. Additional groundwater samples should be collected to define the eastern extent of the thorium contamination plume, or the text should be revised to reflect this data limitation.

Response: Disagree. Based on the existing text, the reviewer comment is true. However, combining the total thorium data and the isotopic thorium eliminates many data limitations. The text will be revised to provide a better explanation.
If only total thorium analytical results are examined, then the reader would reach the conclusion that the extent of thorium contamination in groundwater was not adequately characterized in the sewage treatment plant area. The filtered total thorium data indicate contamination exists beneath the west half of the sewage treatment plant (maximum 18 μg/L relative to a background value of 3.1 μg/L, Plate E-18); however, the eastern extent cannot be determined from total thorium data because samples from the three wells on the east side of the plant (1443, 1444, 1448) were not analyzed for total thorium. On the other hand, samples from the three wells were sampled for isotopic thorium and the results for filtered groundwater samples (Plates E-12, E-16 and E-22) indicate that appreciable thorium contamination does not extend eastward (thorium-232 results: 1443, 0.2 UJ pCi/L; 1444, 0.3 R pCi/L; and 1448, 0.2 UJ pCi/L). See also comment number 26.

Action: The following text will be added to Section 4.7.1.1.3, page 4-121, line 31: Results for total thorium in filtered samples are not available for every well; however, many wells that lack total thorium data do have results for isotopic thorium in filtered samples. As expected, comparisons of total thorium and thorium-232 data yield similar depictions of the nature and extent of thorium contamination (see also Appendix E.1.1.2).

28. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.5 Pg.#: 4-123 Line#: 16
Original Specific Comment #: 20

Comment: The text does not list the sewage treatment plant as an area of groundwater contaminated with strontium-90. The groundwater at the sewage treatment plant was not analyzed for strontium-90 even though the surface soil contains strontium-90 contamination above background levels. Additional groundwater samples should be collected and analyzed for strontium-90 to further characterize the groundwater contamination in the sewage treatment plant area, or the text should be revised to reflect this data limitation.

Response: See response to comment 26. Strontium-90 was analyzed at most areas of the site, but less frequently than uranium and many non-uranium constituents. The available data show that Sr-90 was detected very infrequently, and detected at concentrations only marginally above the detection limit. Therefore, it can be concluded that Sr-90 is a very minor contaminant on a sitewide basis. Sr-90 entered the site as a trace component of recycled feed material. It is not expected to be present in significant volume at the sewage treatment plant. Even though Sr-90 was detected in sewage treatment plant soils, it is not expected to be present in significant quantity in groundwater of the sewage treatment plant.

Action: See action for comment 26.

29. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 4.7.1.1.5 Pg.#: 4-123 Line#: 21
Original Specific Comment #: 21

Comment: The text describes several groundwater contamination plumes resulting from technetium-99 contamination. However, these contamination plumes may be underestimated in several areas because groundwater from numerous wells was not analyzed for technetium-99. These areas include the following: (1) the K-65/clearwell line where technetium-99 was detected in surface soil samples at over 100 mg/kg and where no groundwater samples were collected in the area; (2) the southern area of the southwest portion of the production area where the existing technetium-99 contamination plume is present but the southern extent is not characterized; (3) near the drum reconditioning building where soil samples contain up to 20 mg/kg technetium-99 and where no groundwater samples were collected; and (4) south and west of the laboratory where technetium-99 was detected in soil samples but where no groundwater samples were analyzed for technetium-99. The text should be revised to address sampling activities in these areas.

Response: See response to comment 26.

Action: See action for comment 26.

30. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 6.0 Page#: N/A Line#: N/A
Original Comment #: 6

Comment: This section should include tables of the constituents of potential concern for Operable Unit 5 which indicate the chemical-specific risk and chemical-specific hazard quotient for each constituent. Examples of such tables are presented in Exhibits 8-2 and 8-3 of the Risk Assessment Guidance for Superfund Volume 1 - Human Health Evaluation Manual (Part A).

Response: Disagree. Tables found in Appendix A, Attachment VII provide chemical specific risks and hazard quotients. The inclusion of these chemical specific tables in Section 6 would increase the size of the section by at least an order of magnitude. Section 6 provides a concise **summary** of baseline risk assessment - it was not meant to be a repeat of the **detailed information** presented in Appendix A. Also, the referenced tables from RAGS do provide a good presentation of risk. However, regrettably, the size and complexity of the baseline risk assessment for Operable Unit 5 make such a presentation impractical.

Action: None

31. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 6.0 Pg.#: NA Line#: NA
Original Specific Comment #: 22

Comment: Section 6.0 refers to Tables 6-1 through 6-7, which summarize the results of the risk characterization. However, these tables are not included in Section 6.0; the tables are instead included in Section A.6.0 of Appendix A. Section 6.0 should therefore be revised to include Tables 6-1 through 6-7.

Response: Agree. The corrected table sequence was forwarded to reviewers in correspondence dated August 3, 1994.

Action: The correct tables and table sequence will be included in the final document.

32. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 6.0 Pg.#: NA Line#: NA
Original Specific Comment #: 23

Comment: Section 6.0 includes Figures 6-1 through 6-7. However, the text refers only to Figures 6-1 and 6-2. The text should be revised to include references to Figures 6-3 through 6-7.

Response: Agree.

Action: The text will be revised to reference Figures 6-3 through 6-7.

33. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 7 Pg.#: Table 7-12 Line#: N/A
Original Comment #: 9

Comment: In this table of preliminary remediation goals (PRGs) for uranium by media, provide risk-based remediation goals in units of total uranium activity (pCi/g) and include the conversion factor used as a footnote. Also provide the PRGs in units of "ppm" mass since the draft Proposed Plan for Operable Unit 5 (OU5 PP) presents proposed remediation levels for uranium in "ppm" units, and explain why the OU5 PP is providing uranium cleanup levels in "ppm" units. Explain why this RI report does not provide PRGs for soil exhibiting uranium in non-leachable and high-leachable forms as does the OU5 PP. Also explain why Table 7-12 provides PRGs based on a toxicological risk HI of 0.2 when the OU5 PP preferred alternative is only concerned with meeting a HI of 1.

Response: DOE agrees that the table as presented is confusing. As presented, the data for the carcinogenic risks were pCi/g or liter as appropriate for the U-238 isotope, but were incorrectly labeled as mg/L or mg/kg. The units for the noncarcinogenic risks were correct as stated.
The PRGs presented in Table 7-12 (now 7-11) are based on specific receptor pathways used in the baseline risk and are independent of leachability. In contrast, the soil PRGs presented in the draft Proposed Plan (for the protection of groundwater) are dependent on leachability. The fate and transport aspects of the parameter affect the PRG - the PRG is not changing due to a change in toxicity criteria (i.e., soluble/nonsoluble form). The leachable and nonleachable PRGs referenced in the Operable Unit 5 draft Proposed Plan are cross-media (indirect exposure) PRGs which are controlled by the leaching rate of uranium from the soil to water and eventually to the aquifer. DOE prefers to defer this presentation to the FS where it can be presented in context with the remedial action objectives.
The PRG as developed in the RI for uranium as a noncarcinogenic risk uses an HI of 0.2 as a point of departure. The draft Proposed Plan uses an HI of 1 after the total noncarcinogenic risk contribution of other COCs has been established. DOE is currently reevaluating the presentation of uranium noncarcinogenic risk in light of EPA's withdrawal of the uranium reference from IRIS.

Action: Revise Table 7-11 to correct the units.

34. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 7.6.7 Page#: 7-60 Line#: 6
Original Comment #: 7

Comment: The complete list of PRGs by media (Tables A.7-20 → A.7-26) should be presented at the end of this section. Also, there should be some discussion on the information presented in the table. For example, referring to Table 7-12 as presented, is the uranium PRG for a given carcinogenic risk (say 10^{-5}) just accounting for the risk from exposure to uranium isotopes, or does it consider the residual risk from other carcinogenic contaminants removed within the "uranium envelope" during remediation.

Response: DOE feels the presentation of the PRGs in an appendix (Appendix A) is appropriate for this stage of development in the overall process. The uranium risk-based PRGs were presented in this section with the knowledge that uranium is the most abundant COC on site and, based on work completed for the FS, the driving COC of the remediation. The presentation of the uranium PRGs was not, however, intended to indicate that the cleanup of uranium to a PRG at a given risk level would also remove all COCs to the same risk level.

Action: Clarify the text on the rationale for presenting only the uranium risk-based PRGs in this section of the report by adding as the second sentence in Section 7.6.7: The uranium risk-based PRGs are presented in this section because uranium is the most abundant COC on site and, based on preliminary work completed for the FS, the driving COC of the remediation.

35. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 7.7 Pg.#: 7-60 Line#: 9
Original Specific Comment #: 24
Comment: Section 7.7 presents several data limitations but should also address the additional data limitations presented in the above comments. In addition, Table 7-10 indicates that the impact of the data limitations is to overestimate risk for certain media. However, the risk is underestimated in some media because no data regarding the level of contamination is available. The table should be revised to reflect all data limitations.
Response: Agree that Table 7-10 (now 7-12) should address the additional data limitations. Data are available for all predominant contaminants for all media. Given that data are available for predominant contaminants, it is unlikely risk will be underestimated; e.g., the sparse data for the subsurface soil would force the selection of the maximum value which would overestimate risk.
Action: The potential data limitations table (7-12) will be modified to address other potential data limitations specified in the EPA comments. The table will be modified to note that it is possible, but unlikely, that risks may be underestimated due to limited data available for subsurface soil.

36. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 7.7 Pg.#: 7-60 Line#: 9
Original Specific Comment #: 25
Comment: Section 7.7 states that soils contamination data is lacking for soils below 20 feet below ground surface (bgs). While this statement is accurate, it is somewhat misleading. Data is also lacking for depths between 1.5 and 20 feet bgs. Even less data is available for depths below 20 feet bgs. The lack of data between 1.5 and 20 feet presents a significant data limitation to both the risk assessment and the screening of alternatives. This section of the RI should address this data limitation.
Response: Agree that the statement is misleading and will modify it as shown below. However, we do not believe that the lack of data presents a significant data limitation. See comment 35. The table will be modified as indicated below.
Action: The Subsurface Soil - Vertical Extent of Contamination portion of Table 7-10 (now 7-12) will be modified to address this concern.

37. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: 7.9.5 Pg.#: 7-68 Line#: 22
Original Comment #: 8
Comment: It is stated that the FEMP fence line concentration of uranium-238 in groundwater is predicted to reach its maximum in the 560th year; please state what this concentration value actually is.
Response: Agree. The concentration value will be added and the predicted time of arrival corrected.
Action: Bullet will be corrected to read "... of uranium-238 is predicted to reach its maximum (at the south fence line) in the 260th year at a concentration of 1.76 mg/L due to infiltration of contaminated runoff from the SSOD."

38. Organization: U.S. EPA Commentor: Saric
Section#: A Page #: All Line #: All
Original General Comment #: 3
Comment: In Appendix A, several similar but slightly different terms can be easily confused by the reader. One example is the term "chemical of potential concern" (CPC) and the term "chemical of concern" (COC). Another example is the term "preliminary remediation goal" (PRG) and the term "risk-based concentration" (RBC). Throughout the appendix, these similar and easily confused terms should be clearly defined and differentiated, and used consistently.
Response: We agree that these terms may be confused.

Because these terms are used throughout Appendix A, they will be clearly defined in Section A.1. The text will state that a CPC is a radiological or chemical constituent selected for quantitative or qualitative assessment in a baseline risk assessment. A COC is a radiological or chemical constituent that will be evaluated in the FS because the risk estimates developed in the baseline risk assessment exceed conservative toxicity benchmarks (e.g., $1x10^{-7}$ for carcinogens; a Hazard Quotient of 0.1 for noncarcinogens). A risk-based concentration (RBC) is a concentration or activity calculated per EPA's RAGS B method that is used as a toxicity screening benchmark for purposes of selecting CPCs for analysis in the baseline risk assessment. As defined by RAGS Part B, (PRGs) are ...." initial clean-up goals that (1) are protective of human health and the environment and (2) comply with ARARs." They are developed early in the process based on readily available information and are modified to reflect results of the baseline risk assessment. They are also used during analyses of remedial alternatives in the FS.

Action: Clearly define and provide acronyms for COC, CPC, PRG and RBC. Incorporate the narrative presented in the response into the text.

39. Organization: U.S. EPA Commentor: Saric
Section#: A Page #: All Line #: All
Original General Comment #: 4

Comment: The procedure used to select CPCs for Operable Unit 5 (OU5) is not clear. In one section, it appears that CPCs are selected OU-wide, and in another section it appears that CPCs are selected for different areas within OU5. The text should be revised to clearly present the process used to select CPCs for OU5.

Response: Agree. The confusion may result because organic COCs were selected operable unit-wide and, in most cases, on the basis of the toxicity screens. In other words, if an organic was detected in **one area of concern** at concentrations exceeding the risk based screening concentrations/activities used in the toxicity screens, it was selected as a CPC for **all areas of concern** evaluated in the baseline risk assessment. Inorganics and metals were selected on an area of concern basis and, in most cases, on the basis of the comparison to background.

Action: The text in Section A.2 will be modified to more clearly state that organics were selected "primarily on the basis of a toxicity screen" and that "metals and radiologicals were selected as CPCs primarily on the basis of a comparison with background". The reader will be further referred to the detailed CPC selection tables presented in Attachment A.IV.

40. Organization: U.S. EPA Commentor: Saric
Section#: A Page #: NA Line #: NA
Original General Comment #: 5

Comment: About 10 percent of the detailed intake tables (Tables A.VI-1a through A.VI-38g) were reviewed. Most of the calculations were found to be correct. However, a small but significant number of errors was identified. Some examples of these errors are summarized in the following paragraphs.

In Table A.VI-9d, reviewers calculated intakes of radionuclides that were about 55 percent less than the values presented. For example, the intake for cesium-137 is presented as 3.3E+03; reviewers calculated a value of 1.8E+03. Similarly, the intake for strontium-90 is presented as 1.6E+04; reviewers calculated a value of 8.8E+03.

Reviewers consistently had difficulty reproducing the intakes calculated for inorganic toxicants from dermal exposure while bathing. For example, the intakes associated with dermal exposure to groundwater presented in Table A.VI-12f could not be reproduced. The difficulty may lie in the fact that the equations presented in Section A.3.4.2.4 for calculating the absorbed dose per event (DA_{event}) are intended to be used only for organic compounds. Nonetheless, reviewers could not duplicate the results even using the recommended equation for inorganic compounds presented in U.S. Environmental Protection Agency's (U.S. EPA) most recent dermal

guidance. Section A.3.4.2.4 should be revised to present the equations or methods used to calculate DA_{event} for inorganic contaminants.

Each of the intake tables for recreational receptors under future land use conditions (for example, Table A.VI-17a) presents a single set of intake results. For carcinogenic intakes, the results represent the summation of the exposures for each of the age groups evaluated. For noncarcinogens (referred to in the report as "toxicants"), the tables present only the results for a single age group. The tables need to be footnoted to clearly indicate what the results represent. Specifically, the carcinogenic tables should indicate that the results represent summed exposures from all age groups evaluated, and noncarcinogenic tables should clearly indicate for which age group results are presented.

For some of the tables presenting toxicant intakes for recreational receptors under future land use conditions, the results could only be duplicated if carcinogenic parameters were used. For example, the intakes presented in Table A.VI-20b for toxicants in the northwest area are identical to the intakes presented in Table A.VI-19b for carcinogens in the northwest area. Appendix A should be closely reviewed, and the calculations should be revised as necessary. The text of the risk assessment and any summary tables should also be revised as necessary to incorporate any changes made to the tables.

Response: •Regarding the cesium-137 and strontium-90 values in Tables A.VI-9 - The values presented in the report are correct as demonstrated in example calculations provided earlier. The reviewer did not consider time weighting of the ingestion rate (as detailed on page A.3-64) in performing his/her calculations.

• Note the example calculation previously provided for the intakes for inorganic toxicants from dermal exposure while bathing.

• We agree with the suggestion to add footnotes to the intake tables for the recreational receptors under the future land use scenario.

• The intakes presented in Table A.VI-20b are the same as those presented in Table A.VI-19b because the recreational scenario described on pages A.3-60 and A.3-61 covers the entire lifetime of an individual. Therefore, the averaging time values for carcinogens and noncarcinogen values are exactly the same. (The exposure duration is time weighted and ED is the same for both the carcinogenic dose calculation and the noncarcinogenic dose calculation).

Action: Add footnotes to the intake tables for the recreational receptors.

41. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.0 Pg.#: A.1-1 Line#: 15 to 19
Original Specific Comment #: 26

Comment: These lines specify that groundwater, surface water, and sediment will be evaluated in the baseline risk assessment. However, the text does not specify whether the actual concentration of CPCs will be evaluated for these media or whether modeled concentrations will be used. The text should be revised to clearly state whether modeled or actual concentrations will be used to evaluate these media.

Response: This is a general introductory section for the baseline risk assessment. As presented in Section A.3, both measured and modeled exposure point concentrations are evaluated in the baseline risk assessment. The specifics of measured versus modeled data is best presented in Section A.3.

Action: Section A.3 will be reviewed to ensure that the text clearly states whether measured or modeled data is evaluated in all cases evaluated in the baseline risk assessment.

42. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.0 Pg.#: NA Line#: NA
Original Specific Comment #: 39

Comment: Figure A.1-2 presents OUs for the FEMP RI/FS. This figure requires some clarification and modification. First, the waste storage area is defined as OU1. However, elsewhere in the

report, the waste storage area is defined as including all or parts of OUs 1, 2, and 4. The definition of the waste storage area in this figure should be revised as necessary to be consistent with the remainder of the report. Second, the figure should be revised to clearly define the boundaries of the FEMP.

Response: Agree.

Action: Figure A.1-2 will be revised to clearly define the boundaries of the FEMP. The wording on the figure will be changed from "WASTE STORAGE AREA" to "OPERABLE UNIT 1." Appendix A will be reviewed for consistant usage.

43. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.0 Pg.#: NA Line#: NA
Original Specific Comment #: 40

Comment: Figure A.1-3 shows the land use adjacent to the FEMP. This figure should be revised to show the location of the nearest residence.

Response: The nearest residence is 0.75 miles from the center of the FEMP. Private homeowner wells EM-04 and EM-13 are within this circumference. Figure A.1-6 will be revised to show the locations of these wells to denote closest residences to the FEMP.

Action: Add EM-04 and EM-13 to Figure A.1-3 (see Figure A.1-4).

44. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.0 Pg.#: NA Line#: NA
Original Specific Comment #: 41

Comment: Figure A.1-4 shows the location of private wells near the FEMP. The figure includes a legend that defines bedrock areas. However, the figure does not show the FEMP and surrounding areas as being underlain by bedrock. The figure should be revised to clarify that the areas shown as "bedrock" are in fact areas of bedrock that are exposed at the surface.

Response: The areas labeled "bedrock" in Figure A.1-4 are not comprised of exposed bedrock. They are characterized primarily by the *absence* of water-bearing sand and gravel as they are comprised of a thin layer of upland soil overlaying bedrock. Seen in cross-section, this would make the sand and gravel body appear to be buried in a basin or valley. Therefore, Figure A.1-4's legend will be modified to explain bedrock as "separates and demarcates the Great Miami Buried Valley Aquifer from the upland area."

Action: Change Figure A.1-4 accordingly.

45. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.1 Pg.#: A.1-2 Line#: 22
Original Specific Comment #: 28

Comment: This line states that one specific objective of the risk assessment is to identify specific areas of contaminated environmental media for which site cleanup is appropriate. However, this is not an objective of a baseline risk assessment; it is instead an objective of a feasibility study. This line should be deleted from the text.

Response: Disagree. Two applicable risk assessment objectives are to determine whether action is necessary and to develop remedial action alternatives.

Action: The text will be reviewed.

46. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.1 Pg.#: A.1-2 Line#: 6 to 14
Original Specific Comment #: 27

Comment: These lines discuss the specific objectives of the baseline risk assessment. However, these lines do not clearly state that the assessment evaluates both current and potential future risks. The text should be revised to clearly state that potential future risks are also assessed.

Response: Agree.

Action: The first bullet will be modified to read "Estimate the magnitude of potential current or future health risks....". "....under current and future land use scenarios" will be appended to the second bullet.

47. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.2 Pg.#: A.1-4 Line#: 12 to 14
Original Specific Comment #: 29
Comment: These lines state that the site became contaminated as a result of processing and disposal activities that took place during production activities at the facility. However, the text does not state what was produced at the facility. The text should be revised to state what was produced at the facility.
Response: Disagree.
Action: The site's primary mission to produce uranium metal is discussed in Section 1.0.

48. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.2.2 Pg.#: A.1-8 Line#: 17 and 18
Original Specific Comment #: 30
Comment: These lines state that the site maintains long-term storage facilities for thorium materials. The presence of such long-term storage facilities within specific OUs or parts of the site is relevant to potential exposures and risks to receptors in these various OUs and parts of the site. Therefore, the lines should be revised to indicate where the long-term thorium storage facilities are located within the FEMP. If the thorium storage facilities are located in OU5, then the text should be revised to indicate whether and how potential exposure to thorium from the storage facilities was addressed.
Response: Currently the FEMP retains thorium in the Thorium Storage Warehouse (Building 64). As this facility is located in Operable Unit 3, Operable Unit 5 will not address it in the Baseline Risk Assessment.
Action: See Section 1.0. Also, add the following to Section 1.0 : The thorium storage facilities are located in Operable Unit 3 and will be addressed in the Operable Unit 3 baseline risk assessment.

49. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-10 Line#: 5
Original Specific Comment #: 31
Comment: This line discusses emissions that are considered "minimally leachable." This term should be defined. The line should be revised to describe the criteria that were used to define that emissions were "minimally leachable."
Response: Minimally leachable applies to airborne contaminant transport via water moving vertically through surface and subsurface soil. In leachability terms, a minimally leachable contaminant released to the air refers to a high leachate coefficient (K_l) index for the surface and subsurface soil in a given area of contaminant deposition. For instance, according to measurements and model calibration, the leachate coefficient (K_l) of the production area is 15, while the leachate coefficient (K_l) surrounding the production area is generally 325. Appendix F details this distribution of (K_l). The recent Operable Unit 5 K_l studies indicate that surface soil outside the production area has a high K_l, meaning the soil is minimally leachable.
Action: Revise line 5 on page A.1-10 to read: "In total, only 73 percent of these emissions are considered minimally leachable through surface and subsurface soil. Minimally leachable applies to contaminant transport via water moving vertically through surface and subsurface soils. In leachability terms, a minimally leachable contaminant released refers to a surface or subsurface soil contaminant in a given area of contaminant deposition which has a high leachate coefficient (K_l) index. For instance, according to measurements and model calibration, the leachate coefficient (K_l) for soil in the production area is 15, whereas the leachate coefficient

(K_1) for soil in the areas surrounding the production area is generally 325 (i.e., minimally leachable). Appendix F details this distribution of K_1. "

50. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-11 Line#: 6 and 7
Original Specific Comment #: 32
Comment: These lines present estimated airborne uranium emissions for 1992. However, it is not clear whether the presented value (0.23 kilogram) represents an annual total or daily average value. The text should be revised to clarify the meaning of the value.
Response: This information can also be found in Section 1.3.1.1 where Table 1-3 shows that 0.23 kg is an annual value for estimated airborne uranium emissions.
Action: Revise lines 6 and 7 on page A.1-11 to read: "...and estimated at 0.23 kilograms per year..."

51. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-12 Line#: 1
Original Specific Comment #: 33
Comment: This line presents a value (1.8 billion gallons) that represents a volume of water that flowed past the facility's effluent line. However, the text does not indicate whether this is a daily or annual total. The text should be revised to clarify the meaning of this value.
Response: According to the 1992 Fernald Site Environmental Report, 1.8 billion gallons of river water flow past the discharge point of the FEMP outfall line on an average *day*.
Action: Revise line 2 on page A.1-12 to read: "...past the FEMP outfall line each day."

52. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-12 Line#: 9
Original Specific Comment #: 34
Comment: This line states that runoff conveys contaminants into surface water, groundwater, and wastewater effluent. Runoff may also convey contaminants into areas of uncontaminated soil. This line should be revised to include uncontaminated soil as a potential receptor point for contaminated runoff.
Response: Agree.
Action: The text (line 9) will be modified as suggested.

53. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-13 Line#: 8
Original Specific Comment #: 35
Comment: This line refers to an 8.5-million-gallon BSL. However, the acronym "BSL" is not defined in the text. The acronym "BSL" should be defined in the text.
Response: Agree.
Action: The text will be modified to define BSL as the biodenitrification surge lagoon.

54. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.1 Pg.#: A.1-14 Line#: 5
Original Specific Comment #: 36
Comment: This line defines the waste storage area as "(Operable Unit 1)". However, elsewhere in the report (for example, on page A.1-8), the waste storage area is defined as including parts of operable units 1, 2, and 4. This line should be revised to define the waste storage area in a manner that is consistent with the remainder of the report.
Response: Agree.
Action: The text will be modified to read that "At the Operable Unit 1 waste storage areas...." to note that the narrative is referring to waste units at Operable Unit 1 only.

55. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.3.2 Pg.#: A.1-16 Line#: 2 to 4
Original Specific Comment #: 37
Comment: These lines indicate that removal actions not fully implemented by June 1994 are not incorporated into the risk assessment. Earlier this section lists the removal actions associated with OU5. Lines 2 to 4 should be revised to clearly indicate, by action number, which removal actions are not considered in the risk assessment.
Response: All of the listed associated Operable Unit 5 removal actions were considered in the baseline risk assessment. Specifically, data from these removal actions, if available, were considered in the RI report. Some of the removal actions are ongoing and additional data are accumulating under associated sampling programs. The statement that the risk assessment "does not reflect conditions expected to result from planned actions or actions that have not been fully implemented as of June 1994." is actually is a reference to the fact that baseline evaluates currently available data and does not take into consideration the effects of ongoing or new removal actions (for which data is not yet available) or the actions planned under the feasibility study.
Action: Modify text to include information presented in the response.

56. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.1.5.1 Pg.#: A.1-18 Line#: Code:
Original Comment# 01
Comment: The discussion should point out that changes in the source-term configurations and exposure concentrations for the future scenarios rely heavily on assumptions regarding radionuclide and chemical mobility and behavior, which is largely hypothetical.
Response: The text will be clarified.
Action: The following text has been added as suggested: It should be noted that contaminant source term configurations and the potential exposure point concentrations for the future scenarios rely heavily on assumptions regarding radionuclide and chemical mobility and behavior which is, to a certain extent, theoretical. However, the theory underlying contaminant fate and transport modeling is substantiated and well documented.

57. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.5.4 Pg.#: A.1-20 Line#: 9 to 11
Original Specific Comment #: 38
Comment: These lines begin by stating, "Exposure pathways are considered if they are ..." However, as written, the sentence does not appear to be logical. The text should be revised to state, "Exposure pathways are considered complete if the following elements are present ..."
Response: Agree.
Action: The text will be modified as suggested.

58. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2 Pg.#: A.2-4 Line#: 30 Code:
Original Comment# 02
Comment: ICP/GFAA refers to the Inductively.....Atomic Absorption instrument. Please change "analysis" to "absorption".
Response: Agree.
Action: Modify text as requested.

59. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2 Pg.#: A.2-6 Line#: .3-4 Code:
Original Comment# 03

Comment: I am not certain that I understand this statement. If this is a rule adopted for this Risk Assessment, state that this is the case. Twenty samples is not a magic number needed to calculate the 95th percentile; the number of data points needed depends on the range of values in the data set.

Response: Twenty samples were not used as a magic number to calculate the 95th percentile. The 95th percentile is only used for the representative concentration when the data set does not follow a normal or lognormal distribution. The procedure for determining the nonparametric 95th percentile can be found in Section A.II.2.2.3. If a data set contains less than 20 samples, the procedure detailed in Section A.II.2.2.3 will always result in a 95th percentile equal to the maximum detection.

Action: Lines #3-4 were edited to read: "For data sets containing less than 20 samples and having undefined distributions, the nonparametric 95th percentile is always the maximum detected concentration (see A.II.2.2.3)."

60. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2 Pg.#: A.2-9 Line#: 22-24 Code:
Original Comment# 05

Comment: The lead example is not a good one because there is an OSWER Directive for lead in soil which sets the screening level at 400 ppm. Therefore, lead is never chosen as a COC based on a comparison with background. I suggest revising the example based on a different contaminant, perhaps beryllium or manganese.

Response: Agree with commentor.

Action: Edit Lines 22-24 such that beryllium is used for the example instead of lead.

61. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2 Pg.#: Tbl A.2-1 to A.2-12 Line#:
Original Comment# 04

Comment: What does the "X" in the "Retained as COC" column mean? Some tables indicate that the correct response is "yes" or "no". Why are radionuclides not chosen as COCs (or perhaps the "X" means not chosen)? Why are the radionuclides/metals/VOCs included in the tables, but not discussed in the text? Some clarification and added discussion is clearly needed in this section.

Response: The text and associated tables do need to be clarified.

Action: The tables will indicate (with a "X" in the "Retained as CPC" column) that the parameter was selected as a CPC for the baseline human health risk assessment. Summarizing from the existing text, organics were selected as CPCs based on the results of toxicity and frequency screens and considering existing Federal Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs). Inorganics and radiologicals were selected as CPCs based on a comparison to background and considering SDWA MCLs (e.g., if a metal or rad were detected at concentrations less than background but still exceeding MCLs, the metal or rad would still be evaluated in the quantitative risk assessment). The text and associated tables will be reviewed for accuracy and clarity and modified as necessary (i.e., the information presented in this response will be incorporated into the narrative and tables).

62. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2 Pg.#: Tbl 2-11 Line#: Code:
Original Comment# 07

Comment: Shouldn't the header for "subsurface soil" be >1.5 feet deep?

Response: Agree.

Action: The table will be modified as suggested.

63. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.0 Pg.#: A.2-1 Line#: 11 to 13
Original Specific Comment #: 42
Comment: These lines state that CPCs detected in the GMA and potentially impacted soil, surface water, and sediment, regardless of their location, will be addressed as part of OU5. However, the text does not state whether the OU5 baseline risk assessment will consider potential future migration of contaminants from other operable units to OU5 media. The text should be revised to clearly state whether the future impact of other operable units on OU5 media will be considered in this risk assessment.
Response: Agree.
Action: The text will be modified to note that: "The groundwater, surface water, and air modeling exercises conducted for the Operable Unit 5 baseline risk assessment considered source loading contributions by other FEMP operable units. The details of the modeling are presented in Section 5 of Volume I of this document."

64. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.2.2 Pg.#: A.2-6 Line#: 26
Original Specific Comment #: 44
Comment: Equation A.2-2 presents the value (n-t). However, this value appears to be a typographical error. The value (n-t) should be replaced with (n-1).
Response: Agree with commentor.
Action: The value (n-t) was replaced with the value (n-l).

65. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.2.2 Pg.#: A.2-6 Line#: 36 to 38
Original Specific Comment #: 45
Comment: These lines state that values equal to one-half the sample quantitation limit (SQL) were used in equations A.2-1 and A.2-2 to represent chemical concentrations reported as not detected. However, the text does not state how substituting these values may affect statistical procedures used to determine the distribution of the data. The text should be revised to clearly state how these substitutions may affect statistical procedures applied to the data.
Response: The methods used for handling nondetects is in accordance with "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities," Draft, Addendum to Interim Final Guidance, EPA, 1992. The text was revised to clarify the methods for handling nondetects.
Action: Lines 6-11 were revised to read: "In order to accurately calculate the upper 95 percent confidence limit, the underlying distribution of the data set must be determined. If the data set has less than seven detects or contains greater than 50 percent nondetects, the distribution is said to be undefined. If the data set contains less than or equal to 50 samples, has greater than 7 detects and has less than 15 percent nondetects, the Shapiro-Wilk w-test is employed to determine if the data set follows a normal or lognormal distribution (EPA 1992). If the data set contains greater than 50 samples and has less than 15 percent nondetects, the Shapiro-Francia goodness-of-fit test is employed to determine if the data set follows a normal or lognormal distribution (EPA 1992). Finally, if the data set has between 15 and 50 percent nondetects and has at least 7 positive detections, probability plot correlation coefficients using Cohen's adjustment are calculated to determine if the data set follows a normal or lognormal distribution (EPA 1992)." Lines 36-38 were edited to read "This assumption is in accordance with the EPA risk assessment guidance (EPA 1989) and the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)."

66. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.2.2 Pg.#: A.2-6 Line#: 6 and 7
Original Specific Comment #: 43
Comment: These lines discuss the use of the Shapiro and Wilk and Shapiro-Francia goodness-of-fit tests. However, no reference for these tests is cited. The text should be revised to reference either the source document for all statistical tests or the section of the baseline risk assessment where these tests are discussed in greater detail.
Response: The reference document is "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities", Draft Addendum to Interim Final Guidance, EPA, 1992.
Action: The reference was added to the text.

67. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: A.2.3 Page#: A.2.7 Line#: 14 & 15
Original Comment #: 10
Comment: The text refers to a summary list of major constituents used in the manufacturing processes (Table A.2-13) and a summary list of the radionuclides (and their radiological properties) historically present in processed materials (Table A.2-14). These tables were omitted and should actually be included in the document.
Response: The referenced tables were inadvertently omitted from the original submittal of the report. The tables were forwarded to the agency under a cover letter dated August 3, 1994.
Action: The referenced tables will be included in the final document.

68. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.3.1 Pg.#: A.2-7 Line#: 27 and 28
Original Specific Comment #: 46
Comment: These lines state that an initial screening excluded contaminants that would not contribute to human health risk. This statement should be revised to state that the initial screening excluded contaminants that would not "likely" contribute to human health risk.
Response: Agree.
Action: Modify text as requested.

69. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.3.1 Pg.#: A.2-8 Line#: 24 to 34
Original Specific Comment #: 47
Comment: These lines present a concentration-toxicity screen used to eliminate CPCs based on relative risk. However, no CPCs present at concentrations greater than their estimated RBCs should be eliminated from the risk assessment. Therefore, all CPCs present at concentrations greater than their estimated RBCs should be retained in the risk assessment, and the text should be revised to clearly state that such CPCs were retained.
Response: We agree except in the case where several hundred samples are available and the parameter is detected very infrequently (e.g., one positive detection for several hundred samples analyzed) and at relatively low concentrations (e.g., less than 10 μg/L) and where there are numerous other parameters (with similar physical properties and toxicities) selected as CPCs such that there is no possibility of underestimating risk or adversely affecting feasibility study decisions.
Action: Clarify existing text as noted in response.

70. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.2.4 Pg.#: A.2-10 Line#: Code:
Original Comment# 06
Comment: Regarding the determination of COCs: I have repeatedly remarked that there is no magic number (5% is an example in RAGS) for chosing or eliminating a COC using a "frequency of detection" criterion. It depends on the <u>number</u> of samples in the data set and the <u>location</u> of the

hits (example is 25 detects located in one area for 500 samples taken, which indicates a hot spot). The discussion should indicate that these additional criteria were also considered before a contaminant was eliminated. Also, carcinogens should not be eliminated using a "frequency of detection" rule, but should be discussed in the risk assessment. An example is 1,1,2-TCA. What is meant by "minimally" on p. A.2-15, line 25? If a contaminant is a COC in one medium, it should be retained as a COC in all related media.

Response: We agree that the discussion should indicate that (the referenced) additional criteria were also considered before a contaminant was eliminated. The following text will be incorporated into the narrative : "Carcinogens are never eliminated on a "frequency of detection" rule alone. The type of carcinogen (e.g., organic contaminants which are Class A or B1 are selected as CPCs), the number of positive hits/number of samples collected, the potential presence of small "hot spots" of contamination, and the results of the toxicity screens are all taken into consideration." We agree that any carcinogen eliminated as a CPC should be discussed in the risk assessment. The narratives which identify the organics which exceed a screening value but were not selected as CPCs will be reviewed and modified, as necessary, to ensure that all cases are identified. The location of the maximum positive detection will be provided. Attachment A.III and Tables 2-1 through 2-12 already provide information on the frequency of detection.

- Minimally generally means less than 0.01.

- The CPC selection will be reviewed to the extent possible (in light of the fact that modeling has already been completed for Operable Unit 5), and a CPC selected in one medium will be retained as a CPC in all related media. CPCs not included in the modeling will be identified in the text.

Action: Incorporate information and text presented in response.

71. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4 Pg.#: All Line#: All
Original Specific Comment #: 48
Comment: Section A.2.4 presents the results of selecting CPCs for OU5. However, no radionuclide CPCs are presented. The text should be revised to present the radionuclide CPCs that were selected or should explain their omission.
Response: Section A.2.4 explained that metals and rads were selected based on a comparison to background and directed the reader to the detailed tables in Attachment A.IV for the selection of rads and metals for each area of concern. Please see lines 25 through 32 on page A.2-10.
Action: The text will revised to summarize those rads and metals identified as CPCs as detailed in the tables presented in Attachment A.IV.

72. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4 Pg.#: All Line#: All
Original Specific Comment #: 49
Comment: Tables within the text of Section A.2.4 present CPCs selected for OU5. However, a number of inconsistencies exist between these tables and corresponding tables that follow the text. For example, acetonitrile, acrolein, and acrylonitrile are presented as CPCs in the table on page A.2-13, but are not shown in Tables A.2-3 through A.2-7. Also, frequencies of detection presented in the text for groundwater and surface water CPCs could not be replicated when compared to values in Tables A.2-3 through A.2-7. Furthermore, polychlorinated biphenyls (PCBs) detected in facility soil are not listed in the text as CPCs. Therefore, all tables in this section should be reviewed for consistency and revised as needed.
Response: Agree. Please note that certain parameters (e.g. acrolein) were detected in leachate samples only and were eliminated as potential CPCs.

Action: The text and associated tables will be reviewed for accuracy and consistency and modified as necessary.

73. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4 Pg.#: NA Line#: NA
Original Specific Comment #: 52
Comment: Tables A.2-1 through A.2-12 contain many apparent errors, omissions, and inconsistencies. For example, no radionuclides are identified as CPCs in Table A.2-1. In addition, carbazole is shown as a CPC in the corresponding text, but is not identified as a CPC in Table A.2-1. Therefore, all tables in this section should be reviewed to eliminate all inconsistences and should be revised as necessary. During the revision, all headings, footnotes, and symbols should also be reviewed and revised as needed. The revised tables should have clear, consistent column headers and should contain no blank cells.
Response: See response for comment 72.
Action: See action for comment 72.

74. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4.1 Pg.#: A.2-13 Line#: 2
Original Specific Comment #: 50
Comment: This line states that pesticides detected in OU5 are probably due to past pest control activities conducted within the study area. However, the text does not state whether this assertion is used to exclude pesticides as a CPC. The text should be revised to clarify this statement and its impact on the risk assessment.
Response: The assertion was not used to eliminate pesticides as CPCs. With the exception of dieldrin, pesticides were eliminated based on the toxicity screening results and the fact that they were detected very infrequently.
Action: The information presented in the response will be emphasized in the text.

75. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4.4 Pg.#: A.2-17 Line#: 5 to 8
Original Specific Comment #: 51
Comment: These lines state that no organics other than those presented in the tables on page A.2-16 were detected at concentrations exceeding toxicity screen benchmarks. However, Table A.2-10 shows that both acenapthalene and benzo(g,h,i)perylene were detected at concentrations exceeding their toxicity screening levels, yet they are not presented as CPCs on page A.2-16. The text and tables of this section should be thoroughly reviewed for consistency and revised as appropriate.
Response: See response for comment 72.
Action: See action for comment 72.

76. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Line#: Code:
Original Comment# 12
Comment: Regrouping the ten current on-site areas into 7 land-use areas for the future land use scenarios does not seem justified and may give an erroneous evaluation. For example, the very small, highly contaminated, Area 6 is averaged into Area 7, which then yields low soil levels for some contaminants (see Ur 238 + 2d, Pb) in the Northeast Area. This does not make much sense; Area 6 is a hot spot for some contaminants, and it should not be treated the same as Area 7. The criterion for any regrouping of areas should be homogeneity - of both contaminants and concentrations.
Response: The analysis of selected current and future land-use scenarios selected for Operable Unit 5 meets the basic objectives of a baseline risk assessment: to provide information necessary to

determine whether action is necessary at a site of concern and to support remedial action alternatives. A critical receptor for the future land-use scenario is the hypothetical on-property farmer. As discussed in Section A.3, a sizeable area is needed to support all of the activities assumed for the future on-property farmer. Thus it was necessary to combine areas 5, 6, and 7 (which adjoin each other) for an effective evaluation of the northeast area of the site. Representative concentrations for the areas were area weighted to produce a representative concentration for the northeast area. This was not an attempt to dilute the contamination. In fact, the results of the evaluation of the northeast area (cancer risk estimates exceed 1×10^{-4}) force a careful evaluation of areas 5, 6, and 7 in the FS in terms of actions necessary, remedial action decisions, etc. Also, the current and future "area of concern" designations do not preclude an evaluation, in the FS, of contaminant levels against media-specific PRGs based on critical pathways and receptors. This evaluation is not "area of concern"-specific.

Action: Section A.3 text will be modified to explain that areas 5, 6 and 7 were grouped for the evaluation of the future hypothetical on-property farmer to create an area sizeable enough to support all of the activities assumed for the future on-property farmer. (These areas adjoin each other and are in the predominant downwind direction.) The text will further note that contaminant concentrations/activities in Area 6 strongly influence the exposure point concentrations/activities developed for the combined areas 5, 6, and 7. Also the text will note that Area 6 has been (and will continue to be) a target area for removal actions and remedial activities at the FEMP.

77. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-19 Line#: Code:
Original Comment# 15

Comment: The text suggests that the Great Miami River (GMR) sediments have been minimally impacted "due to dilution upon entry into the river". An earlier discussion of Paddys Run suggested that the contaminants remain bound to the sediments and do not move further down the creek (no dilution). These two explanations do not seem to be entirely compatible. Why isn't the GMR sediment impacted at the outfall to the GMR?

Response: The Great Miami River sediment is not greatly impacted at the outfall line because the volume of surface water entering the Great Miami River there is considerably less than that flowing in the Great Miami River (dilution does affect the contaminant load to surface water and sediment). The Great Miami River is also turbulent (sediment does not readily settle). Thus, a minimal impact occurs at and downstream of the outfall line. In general, the available data suggest contaminants appear to be bound to the sediment of Paddys Run, as opposed to partitioning to the surface water; thus, significant contamination is not observed in the surface water of Paddys Run. Additionally, contaminated sediment in Paddys Run is periodically scoured from the creek bed during rain events. This explains why significant contamination is not observed in either the surface water or sediment of Paddys Run, particularly off property. Many of these explanations are supported by the modeling exercises conducted for the FEMP site.

Action: The response will be incorporated into the text.

78. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-19/20 Line#: Code:
Original Comment# 16

Comment: I did not see the "uranium plume", referred to earlier, in either the list of perched water plumes or Great Miami Aquifer groundwater plumes. Where is the "uranium plume" located?

Response: The "seven broadly contaminated areas" identified in the perched water (page A.3-19) and the six identified plumes in the Great Miami Aquifer (page A.3-20) are all uranium plumes associated with specific source areas. The "big picture" uranium plume for the perched zone and the Great Miami Aquifer is roughly depicted in the cancer risk contour lines drawn in

Figures A.7-3, A.7-4, and A.7-5 as well as in several figures in Section 4 (the Section 4 figures will be identified in the text).

Action: The response will be incorporated into the text.

79. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-28/A.3-30 Line#: Code:
Original Comment# 09

Comment: The inclusion of the Off-Property Farmer and Child receptors for both the Current Land Use With Access Controls and Without Access Controls scenarios, is based on the use of bottled water; this is rather unconventional. The provision of bottled water is an intervention step, and the unacceptable risk from the off-site use of groundwater is the justification for further action, be it supplying bottled water, installing municipal water systems or restricting building in contaminated areas. Perhaps some further discussion could be included to indicate that the risk from ingestion of groundwater is being evaluated separately under an additional scenario. A simpler approach would be to look at this receptor population risk with and without the additional of the groundwater pathway. This issue seems to be independent of the facility Control issue.

Response: Please note that the evaluation of the off-property farmer and child receptors for the current land use without access controls scenario does not assume that bottled water is provided. Instead it assumes that groundwater is used as the drinking water supply source. The exclusion of the ingestion of groundwater pathway under the current land use with access controls is an acknowledgement of the fact that the DOE actively seeks to mitigate risk to off-property receptors by supplying bottled water (the current reality within the study area). The inclusion of the ingestion of groundwater pathway under the current land-use-without-access-controls scenario is an acknowledgement of the fact that the DOE cannot force off-property receptors to accept or use the bottled water and the fact that other industrial concerns may eventually own, maintain, or operate the site even if the current land use (industrial) is continued. We agree that the issue is complex and the provision of bottled water is just an intervention step (not a justification for CERCLA action or lack of action at this site); however, it is important to acknowledge the steps taken by DOE (e.g., provision of bottled water, removal actions) to mitigate risk to the public. Additionally, the issue is not independent of facility control; facility ownership and control definitely affect actual risks incurred by on-property or off-property receptors at this site. A change to the current structure of the baseline risk assessment would in no way enhance or provide additional information.

Action: The response will be incorporated into the text.

80. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-36 Line#: 5-6 Code:
Original Comment# 17

Comment: Who are the receptor populations for exposure to subsurface soil? I only see a list for surface soil.

Response: Representative concentrations developed based on contaminant concentrations in subsurface soil were compared to representative concentrations developed based on surface soil contamination. The higher value was used for the evaluation of the homebuilder receptor.

Action: The sentences presented in the response will be added to the text on page A.3-36.

81. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-38 Line#: 9-18 Code:
Original Comment# 18

Comment: The text does now indicate how the wells were combined to give exposure concentrations for each scenario or where the information on each well is located in the document. See my earlier comment on this issue.

Response: The groundwater monitoring data for the RI is presented in Appendix I. The wells were combined based on location (e.g., data from wells along the eastern boundary were used to evaluate hypothetical receptors located along the eastern boundary) and the presence of (magnitude of) uranium contamination (e.g., the South Plume [i.e., uranium plume] wells were grouped). As stated on page A.3-38, "To the extent possible, the representative concentration/activity determined for CPCs in groundwater is based on 1992/1993 data. (For calculation purposes, the maximum available concentration of a CPC was selected to represent a well.) If analytical data were not available for a CPC in the 1992/1993 time frame, the maximum concentration detected in the pre-1992/1993 time frame was used to represent the concentration for a well which was then combined with data from other wells to calculate the representative concentration for an area." Representative concentrations for groundwater are presented in Tables A.3-13 and A.3-14. Detailed tables presenting summary statistics for CPCs detected in the groundwater well groups are found in Attachment A.IV. It should be noted that summary statistics and the representative concentrations for filtered metal/radiological results were calculated separately from unfiltered metal/radiological results available for a well grouping. If there were clear differences in uranium concentrations in Great Miami Aquifer wells for a well grouping, summary statistics and representative concentrations were calculated separately for Type 2, 3, and 4 wells. The results of the statistical analysis (summary statistics, representative concentrations) were reviewed and the maximum available representative concentration (e.g., among the results available for filtered, unfiltered samples and Type 2, Type 3, Type 4 monitoring wells) was selected as the representative concentration for an analyte for a well group.

Action: The information presented in the preceding response will be incorporated into the text presented on page A.3-38. Also, the reader will be referred to Attachment A.IV detail and summary tables for information on the grouping of wells and the development of the representative concentrations for groundwater. Footnotes will be added to the Section A.3 exposure point concentration tables directing the reader to associated Attachment A.IV tables detailing the determination of the exposure point concentration for each well group identified.

82. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-39 Line#: 16 Code:
Original Comment# 19

Comment: Where is the discussion of the methodology and assumptions used in the modeling of groundwater for the future off-site residential scenarios? Was degradation considered? Were concentration levels averaged over a period of years? Some explanation is needed here, and in the uncertainty section.

Response: The methods and assumptions used in the modeling of groundwater for the future on-site and off-site conditions are summarized in Section 5 with other pathways and in Appendix F.3 for the groundwater pathway specifically. Both contaminant source depletion and chemical degradation were considered in the groundwater modeling. Maximum future groundwater concentrations at receptor locations were presented without averaging over time.

Action: A brief summary of modeling methods and reference to Section 5 and Appendix F will be added in Appendix A. Also, footnotes will be added to the Section A.3 exposure point concentration tables directing the reader to supporting tables and text in Section 5.

83. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-64 Line#: 18-26 Code:
Original Comment# 20

Comment: Please include changes made in earlier OU reports to clarify this description of the farmer exposure. A portion of the ingestion exposure (350 days/yr - 100 days/yr = 250 days/year at 100 mg/day) has not been included in this explanation. Review the comments provided for the OU#4 RI, OU#1 RI, etc.

Response: Agree, the first two paragraphs of section A.3.4.6.5 should be replaced with text taken from the approved Operable Unit 1 RI, which clarifies the assumptions used to derive the RME farmer soil ingestion rate.

Action: The first two paragraphs of section A.3.4.6.5 will be replaced with the text below:

"The literature was consulted to determine an appropriate soil incidental ingestion rate for a farmer. However, no default values were found. Therefore, this value was estimated assuming the following:

- Soil ingestion rate on days while tilling, plowing, planting or harvesting would assume a higher average daily value of 0.48 g/day from EPA default exposure assumptions (EPA 1991).
- For all other activities, an average daily soil ingestion rate of 0.1 g/day will be used.

To determine the amount of time a farmer is engaged in the described activities, a review of farming parameters (farm size and crop configuration) were conducted for Hamilton County. The 1987 Census of Agriculture (U.S. Department of Commerce 1989) indicates that 1284 of the 1364 farms in Hamilton and Butler counties (95 percent) are under 500 acres (5 percent are 500 acres or above). Therefore, 500 acres was selected as the RME farm size. The soil ingestion rate for the CT farmer was based on similar farm configuration but using an average (CT) farm size of 125 acres (U.S. Department of Agriculture 1976; 1979). To determine the times associated with farming, a farmer was assumed to follow recommended agricultural practices for the region. A farmer is assumed to rotate the crops and plant 35 percent (175 acres) in corn, 35 percent in soybeans, 20 percent (100 acres) in wheat, and 10 percent (50 acres) in hay. It must be acknowledged that this configuration is a typical configuration and may represent an average value because each crop has a different time associated with field preparation, planting, and harvesting. However, data is not available to determine a RME configuration. Therefore, an alternative configuration could result in a slightly higher or slightly lower exposure. The RME farm size of 500 acres was assumed to be adequate to compensate for this uncertainty.

The U.S. Soil Conservation Service Field Technical Guide (U.S. Department of Agriculture 1992) indicates that a farmer spends about 1.24 hours per acre farming corn, 1 hour per acre farming soybeans, 1.28 hours per acre farming wheat, and 2.73 hours per acre farming hay. Assuming the farm configuration described above, an RME farmer would spend approximately 660 hours farming (plowing, discing, planting, and/or harvesting). An additional 20 percent is added to this time to account for miscellaneous activities and the uncertainty with the farm configuration described above to give a total of 800 hours or 100 working days. Therefore, it is assumed that a farmer would incidentally ingest 0.48 g/day of soil for 100 days per year spent tilling the soil and 0.1 g/day for the remaining 250 days per year. This results in a combined average ingestion rate of 0.18 grams/day for 350 days per year, assuming an average (CT) farmer has a soil ingestion rate of 0.120 g/day."

A table will be added to Section A.3, detailing the calculations used in the derivation of the RME and CT farmer exposure parameters, and the reference section will be reviewed to ensure the above references are included.

84. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tbl A.3-2A Line#: Code:
Original Comment# 08

Comment: I did not see the residents along the western boundary (the most likely current trespassers in Paddys Run) included under the Off-Property Resident Farmer/Child receptor evaluation. Why are they excluded?

Response: An incorrect version of the Table A.3-2 was inadvertently included in the original copy of the report sent to the agency reviewers. The correct version of the table was sent to agency reviewers under a cover letter dated August 3, 1994. A hypothetical off-property resident farmer receptor located along the western boundary **was included** in the baseline risk assessment analysis.

Action: The draft final version of the document will include the corrected table.

85. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tbl A.3-2A/2B Line#: Code:
Original Comment# 10

Comment: Scenarios in this section make reference to the use of the 95% UCL contaminant concentrations in groundwater. While, I found the list of wells evaluated for each receptor population, I did not see the lists of contaminants, with their ranges of concentrations (reference problem again). How homogenous were the wells used in each calculation of the concentration term? Were any non-detects included in the calculations? Some further discussion of the methodology (i.e., how wells were chosen for clustering), or more specific references to data used for the groundwater scenarios, is needed.

Response: Please see response to comment 81. Also, for purposes of calculating exposure point concentrations, if an analyte was selected as a CPC for a well group (as presented in the tables in Attachment A.IV) and nondetect results were reported for some of the results available for the analyte, a value of 1/2 the nondetect result (i.e., 1/2 the sample quantitation limit) was used to represent the nondetect result.

Action: A footnote will be added to Table A.3-2A/2B directing the reader to summary statistics in Attachment A.IV for the well groups considered in the baseline risk assessment. As stated in the action for comment 81, information presented in that response will be incorporated into the text on Page A.3-38.

86. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tbl A.3-3... Line#: Code:
Original Comment# 11

Comment: What happened to carbon tetrachloride, dieldrin, vinyl chloride, etc.? These contaminants were indicated as COCs in section A.2 (Tables A.2-11/12). Please reevaluate these lists for completeness.

Response: The referenced tables and lists will be reviewed for completeness. Please note that vinyl chloride was not listed in Table A.3-3 because it was detected in subsurface soil only (Table A.3-3 presents exposure point concentrations for surface soil only). Dieldrin should have appeared in Table A.3-3. The carbon tetrachloride detections appear to be anomalous hits beyond the FEMP property line.

Action: The referenced tables and lists will be reviewed for completeness and corrected as necessary. The information presented in the response will be incorporated into the text, as necessary.

87. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tbl A.3-7 Line#: Code:
Original Comment# 13

Comment: In the Off-Property, Future Land Use scenarios, the list of radionuclide contaminants has been reduced from the contaminants evaluated in the Off-Property, Current Land Use scenarios. The earlier tables in this section, which describe the scenarios and the data used for each, indicate that the data bases used for the two assessments were identical. Please explain the elimination of these radionuclides.

Response: Comment acknowledged. It is correct that the databases used for both current and future land use scenarios were identical. However, the list of future radionuclides were modified to

consider radionuclide decay. For example, members of the thorium-232 decay chain were assumed to be in equilibrium with thorium-232 under future scenarios.

Action: The information presented in the response will be incorporated into the text.

88. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tbl A.3-9 Line#: Code:
Original Comment# 14
Comment: What is the source of the pesticides and additional organics included as air contaminants in this and other scenarios in this section? These additional contaminants are not listed as surface/subsurface soil COCs. I thought that the air contaminants were modeled from soil. Some further explanation is needed.
Response: As discussed in Section A.2, the majority of the pesticides were not selected as CPCs for soil for the baseline. The CPCs for air were modeled from contaminants detected in surface soil. However, the air modeling effort began before the CPC list for the FEMP was finalized and considered more contaminants than those ultimately evaluated in the direct contact type of exposure scenarios (e.g., the ingestion-of-soil scenario). Organic CPCs not ultimately selected for direct contact scenarios should have been culled for the air pathways as well. The list of CPCs selected for the air pathway should match the list used for the direct contact exposure pathways.
Action: Table A.3-9 will be reviewed and adjusted as necessary per the discussion presented in the response to this comment.

89. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 91
Comment: Table A.3-D summarizes exposure point information under future land use without federal ownership. For the on-property resident farmer and child, the table indicates that two reasonable maximum exposure (RME) locations were selected. These locations are described as the former production area and Area No. 7. However, the text on page A.3-35 indicates that the locations evaluated included the former production area and an area northeast of the production area consisting of Areas No. 5 through 7. In fact, this area is referred to in Figure A.3-7 and in the exposure calculations as the "Northeast Area." Table A.3-D should be revised to specify the second RME location as the Northeast Area, rather than as Area No. 7.
Response: Please see response to comment 84. The table in question has been updated to specify the evaluation of the northeast area - not just area 7.
Action: See action item for comment 84.

90. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 92
Comment: Table A.3-10 contains the entries "NA" under the column headings "Northeast of FEMP" and "Southeast of FEMP" for radon-222. It is not clear why concentrations of radon-222 could not be modeled for these two areas. The table should clearly explain why such modeling could not be performed in these areas.
Response: Modeling results should have been included.
Action: Modeling results will be included.

91. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 93
Comment: Table A.3-11b presents air concentrations for critical subpopulations. However, the subpopulations for which concentrations are calculated are inconsistent with the discussion in

Section A.3.1.10. Specifically, Section A.3.1.10 identifies children attending the Venice Presbyterian Pre-School as a critical subpopulation. The Venice Presbyterian Pre-School is not included in Table A.3-11b. Table A.3-11b should be revised to include air concentrations for the Venice Presbyterian Pre-School or the table should be footnoted to explain why this previously identified critical subpopulation was excluded.

Response: Comment acknowledged. The text and table are inconsistent. Quantitative evaluation of critical subpopulations is useful to demonstrate to the public potential risk to actual local receptors. Several critical receptors, in addition to school children, are mentioned in Section A.3.1.10 which also could be quantitatively assessed. However, due to the length and complexity of the baseline risk assessment, it is important to limit the number of receptors to those which will provide the most useful information for decision-making purposes. In addition, the last paragraph in Section A.3.1.10 clearly states which critical subpopulations were chosen for quantitative evaluation under current land-use conditions. Preschool children were not chosen because children ages 0-6 years of age were already choosen for evaluation as an off-property receptor. Hence critical information for decision-making purposes was not excluded.

It also is important to note that the range of potential risk presented for the school children does not exceed a cancer risk range of 10^{-9} to 10^{-11} or a HI in the range of 10^{-4}. It is expected that potential risk to preschool children would also be within these ranges. The calculated risk would need to be several orders of magnitude greater to impact decision making at the site and hence does not further warrant analysis of this additional subpopulation.

Action: Table A.3-11 will be revised for consistency with the text and the results table (i.e., risk analyses were not carried through for preschool children). The following sentence will be added at the end of section A.3.1.10: Because a child 0-6 years of age is evaluated as an off-property receptor, children at day-care facilities were not chosen for quantitative evaluation.

92. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 94

Comment: Table A.3-20 presents exposure input parameters for current land use receptors. Three problems were identified with this table. First, parameters were developed for two age groups of students to represent critical subpopulations. Elsewhere in the report, critical subpopulations are defined as including children attending daycare facilities. The table (and all related tables and text) should be revised to include parameters (and results) for children under kindergarten age who attend local daycare facilities. As an alternative, the report (and Table A.3-20 in particular) should be revised to clearly explain and justify the use of students to represent all critical subpopulations. Second, the fraction ingested (FI) parameters included with incidental ingestion of soil and sediment are presented in Table A.3-20 as 0.06 and 0.19, respectively. The footnote suggests that these values are based at least in part on the fraction of waking hours spent on the property. The approach summarized in the footnote seems logical and consistent with other site documents. Therefore, the table should be revised to use soil and sediment FIs equal to 0.25 (4 hours on site out of 16 waking hours). Finally, the age of the trespassing youth and exploring youth is presented as 7 to 18 years old. However, Section A.3.4.6.1 describes the age range of this group as 6 to 18 years old. This inconsistency should be resolved and text should be revised accordingly.

Response: Comment acknowledged. Parameters were presented only for the critical subpopulations mentioned in Section A.3.1.10 for quantitative analysis. Please see the response and action to comment 91.

The FIs, 0.06 and 0.19 in the table, are correct values because out of the four-hour exposure time that the trespassing youth/exploring child are assumed to spend on site, one hour is spent playing in Paddys Run and the remaining 3 hours are spent playing on site. Hence 0.06 =

1/16 and 0.19 = 3/16. However these parameters were incorrectly presented in the table. The FI of 0.06 should correspond with sediment and 0.19 should correspond with soil.

Action: Table A.3-20 will be revised as follows:
The FIs presented in Table A.3-10 for sediment and soil ingestion for the exploring youth and the trespassing youth will be switched so that 0.06 corresponds with sediment and 0.19 corresponds with soil.
The age range mentioned for the trespassing youth and exploring youth in Section A.3.4.6.1 will be changed to 7 to 18 years old.
Footnotes to Table A.3-20 will clearly note that it is assumed that the receptor (the trespassing youth) is exposed to soil and sediment 3 hours and 1 hour, respectively.

93. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 95

Comment: Table A.3-21a presents exposure input parameters for future land use receptors. The parameters for incidental ingestion of soil do not include values for FI; therefore, the table should be revised to include these values. Second, the exposure frequency for the on-property home builder is listed as 50 days per year. However, the footnote does not clearly explain the derivation of this value. Footnote "d" should be revised to clearly explain how the value, 50 days per year, was derived.

Response: Agree. The FIs for all receptors listed in Table A.3-21a are assumed to be 1.0. Therefore, this parameter was left out of this table. However, for consistency with the soil exposure intake equation presented in Section A.3, this parameter should be included.
The assumption listed under footnote "d" is correct. However, the exposure frequency for the home builder, listed under soil ingestion as 50 days per year, is incorrect. The actual value used in the analysis, 175 days per year, should replace this value.

Action: Table A.3-21a will be revised as follows: A FI of 1.0 for incidental ingestion of soil will be added. The exposure frequency for the home builder under soil ingestion will be changed from 50 to 175.

94. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 96

Comment: Table A.3-23 presents partitioning coefficients and biotransfer factors for CPCs. Footnote "f" in this table cites the reference "(Lyman, et al. 1982)." Because this reference is not included in the reference section, the reference section should be revised to include this reference. Also, footnote "g" indicates that the leaching coefficient $Lambda_{Li}$ was calculated from K_d; the footnote should be revised to indicate how the value was calculated.

Response: Agree.

Action: The reference "Lyman, W. et al., 1982, "Handbook of Chemical Property Estimation Methods: Environmental Behavior of Organic Compounds," New York" will be added to the reference section.
Footnote "g" in Table A.3-23 will be revised as follows: "g - calculated from K_d, Lambda $_{Li}$ = 0.00177/(2.55 x 22.5 K_d).

95. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 97

Comment: Figure A.3-1 presents the conceptual site model for the current source term. The figure does not include off-property critical subpopulations as potential receptors. The figure should be revised to summarize potential exposures to off-property critical subpopulations.

Response: Disagree. Figure A.3-1 does show an entry for off-property critical subpopulatons.
Action: None

96. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 98
Comment: Figure A.3-2 presents the conceptual site model for the future source term. The figure indicates that ingestion of perched groundwater will be evaluated for the central tendency (CT) on-property resident farmer. However, Section A.3.2.4.4 indicates that ingestion will not be evaluated. This inconsistency should be resolved. The figure also indicates that ingestion of perched groundwater will be evaluated for the RME on-property resident farmer and child. However, Section A.3.2.4.4 indicates that ingestion of perched groundwater will only be evaluated for the RME on-property resident farmer and not for the child. The figure should be footnoted to indicate this. The entire text should be reviewed (including Section A.3.2.4.4) to consistently describe CT exposures for the on-property farmer and child. Finally, the table indicates that exposure via direct radiation as a result of recreational use of surface waters will not be evaluated for recreational receptors. However, Table A.3-1 indicates that such exposure will be evaluated. This inconsistency should be resolved.
Response: Agree, perched groundwater was only evaluated for the RME on-property resident farmer. Because the RME farmer and child are presented in the same column, it appears that this pathways was also evaluated for the on-property child.
Disagree, Figure A.3-2 presents a half circle for direct radiation from surface water which indicates that potential exposure from that pathway is negligible and therefore not evaluated.
Action: The following text will be added to the "Notes" on Figure A.3-2:
"a - Exposure pathway from perched groundwater are evaluated only for the on-property farmer and not the child."

97. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: NA Line#: NA
Original Specific Comment #: 99
Comment: Figure A.3-6 presents off-property receptor locations. Several problems with this table were noted. First, some off-property receptors discussed in the text are not shown in the figure. For example, the southeast receptor, off-property air receptors, and off-property surface water and sediment receptors are not shown. The figure should be revised to include the locations of these receptors. Second, the figure shows a well labeled "Stickers Grove Well" located very close to the Great Miami River. This well may be the well referenced in the text as the well "near the Great Miami River." If so, the text should be revised to consistently refer to the "Strickers Grove Well" rather than the well "near the Great Miami River." Third, the figure should be revised to note the location of the Venice Presbyterian Pre-School. Finally, the legend to the figure indicates that the distances associated with each receptor point represent the distance from the map's edge. With this in mind, the distances presented in the figure do not appear to correspond to the distances stated in the text. For example, Section A.3.1.10 states that the Ross County Day Nursery is located about 2.5 miles northeast of the center of the site. The figure however, indicates that this same facility is located 2.0 miles northeast of the northeast corner of the map. This would appear to place the facility about 4 miles northeast of the center of the site. The distances to all receptors should be checked and revised as necessary.
Response: In order of comment: the southeast receptor location will be marked more obviously; solid squares denote the off-property air receptor locations; and exposure point locations will be marked for surface water and sediment (see A.3-40). With respect to the second point, the well marked as the Stricker's Grove well on Figure A.3-6 has been referenced in the text as the well near the Great Miami River. The notation in the figure will be modified to agree with the

text. For the third point, the Venice Presbyterian Pre-School is located 2 miles northeast of the center of the FEMP (A.3-13). Therefore the figure will be modified to include another air receptor icon with the words "Venice Presbyterian Pre-School" and the distance from the center of the FEMP as labels. Lastly, we concur with the statement that distances are incorrectly assessed. Therefore all distances will be reviewed and the correct distance from the center of the FEMP will be placed on Figure A.3-6. The legend will also be modified to indicate distance is from center of FEMP.

Action: Revise Figure A.3-6 to meet above specifications.

98. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.1.10 Pg.#: A.3-13 Line#: 12 to 17
Original Specific Comment #: 55
Comment: The third bulleted item on this page summarizes the population centers near the site and lists the number of children living within a 5-mile radius of the site. The list of population centers does not include the City of Fernald (listed as a critical subpopulation location in Table A.3-11b). This bulleted item should be revised to include the City of Fernald in the list of population centers and to adjust the number of children to include those who live in the City of Fernald.
Response: The list of population centers in the third bulleted item includes Fernald.
Action: None required.

99. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.1.10 Pg.#: A.3-13 Line#: 27 to 35
Original Specific Comment #: 56
Comment: The fifth bulleted item on this page discusses major industries that use chemicals and are located near the site. This information is relevant to the risk assessment but is inappropriate in a section on critical subpopulations. This item should be deleted from Section A.3.1.10 and should be added elsewhere within the report, possibly within Section A.3.1.8.
Response: EPA guidance suggests inclusion of individuals previously exposed to chemicals or radionuclides during occupational activities or residing in industrial areas as being at increased risk (EPA 1989a). Therefore the category of Major Industries Using Chemicals is appropriate to Section A.3.1.10.
Action: None required.

100. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.1.10 Pg.#: A.3-13 Line#: 37 to 43
Original Specific Comment #: 57
Comment: This paragraph identifies the receptors used to evaluate sensitive populations. The discussion requires several modifications. First, Morgan Elementary School is identified in the text as being located northeast of the site; Figure A.3-6 shows it to be located northwest of the site. Second, the fifth school in the list is identified as "Ross High School;" Figure A.3-6 identifies this school as "Ross Middle High School." The text and figure should be revised appropriately to eliminate these inconsistencies. Finally, the first bulleted item on this page identifies the Venice Presbyterian Pre-School as being located only 2 miles northeast of the site. However, this daycare facility is not identified as a potential sensitive population receptor in lines 37 to 43, nor is the facility location identified in Figure A.3-6. The text should be revised to include this daycare facility as a sensitive population receptor or should clearly explain why it is not evaluated as such. Also, Figure A.3-6 should be revised to note the location of the Venice Presbyterian Pre-School.
Response: Figure A.3-6 incorrectly names a school as "Ross Middle High School"; the text on page A.3-13 is correct. The location of the Venice Presbyterian Pre-School is 2 miles northeast of the center of the FEMP.

Action: Figure A.3-6 will be modified to correct Ross Middle High School to Ross High School and to add the location of the Venice Presbyterian Pre-School.

101. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.1.7 Pg.#: A.3-10 Line#: 16
Original Specific Comment #: 53
Comment: This line states that an estimated 22,927 people reside within a 5-mile radius of the site. However, page A.1-6 gives the total residents as over 24,000. The report should be revised to consistently report the number of residents within a 5-mile radius of the FEMP.
Response: According to the Cultural Resources information in Section 3.0, the figure of 22,927 residents within a five-mile radius of the FEMP is correct for 1990.
Action: Lines 29-30 on page A.1-6 will be revised to concur with the 1990 figure: "There is an estimated population of 22,927 people within five miles of the FEMP."

102. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.1.8 Pg.#: A.3-11 Line#: 5 to 12
Original Specific Comment #: 54
Comment: This paragraph discusses the land use adjacent to the FEMP. This paragraph should be revised to reference Figure A.1-3, which graphically presents land use adjacent to the site.
Response: Agree.
Action: Add to lines 5 to 12 on page A.3-11 the following: "Figure A.1-3 depicts these land use areas."

103. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2 Pg.#: A.3-16 Line#: 21 to 23
Original Specific Comment #: 58
Comment: These lines refer to potential surface water and sediment receptor locations; however, these locations are not discussed in the text. The text should be revised to briefly discuss these potential surface water and sediment receptor locations, including reference to a figure showing these locations.
Response: The reviewer is correct.
Action: The text on page A.3-16 will be modified to note that measured surface water and sediment concentrations available for sampling locations along the Great Miami River and Paddys Run will be used to evaluate receptors exposed to contaminant concentrations: 1) in the river reach between the outfall and the confluence with Paddys Run, 2) in the river at and below the confluence with Paddys Run, and 3) in the off-property surface water and sediment of Paddys Run. (Please note that because of the limited number of sampling locations in these risk evaluation areas, generally, the maximum contaminant concentration was selected as the exposure point concentration. 1992/1993 data were used whenever possible.) A figure which identifies these off-property risk evaluation areas for surface water and sediment will be added to the report.

104. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2 Pg.#: A.3-16 Line#: 32 to 35
Original Specific Comment #: 59
Comment: These lines refer to potential receptors located northeast and southeast of the site. The discussion should refer to Figure A.3-6, which shows off-property receptor locations.
Response: Agree.
Action: Add to lines 32 to 35 on page A.3-16 the following: "Figure A.3-6 depicts the off-property receptor locations."

105. Commenting Organization: U.S. EPA Commentor: Saric

Section#: A.3.2 Pg.#: A.3-17 Line#: 1 to 16
Original Specific Comment #: 60
Comment: This paragraph discusses potential on-site receptor locations under future land use scenarios. The discussion should be revised to reference Figure A.3-17, which graphically presents these receptor locations.
Response: Agree to reference Figure A.3-7.
Action: Add to lines 10 to 24 on page A.3-17 the following: "Figure A.3-7 presents the on-site receptor locations under future land-use scenarios."

106. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2 Pg.#: A.3-17 Line#: 31 to 32
Original Specific Comment #: 61
Comment: These lines introduce the fenceline and off-property receptor locations that were evaluated. The sentence should be revised to reference Figure A.3-16, which graphically presents these receptor locations.
Response: Agree to reference Figure A.3-4 and A.3-6.
Action: Add to lines 31 to 32 on page A.3-17 the following: "Figures A.3-4 and A.3-6 present the fence line and off-property receptor locations."

107. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.1 Pg.#: A.3-18 Line#: 22 and 23
Original Specific Comment #: 62
Comment: These lines identify the major drainageways at the site. However, the discussion does not refer to the SSOD. The text should be revised to include this ditch as one of the major drainageways at the site or to explain its exclusion as a major drainageway.
Response: This section should include the storm sewer outfall ditch (SSOD) because it is discussed in Section A.3-8 as a major drainageway on FEMP property. However, it should be noted with the caveat that the SSOD rarely runs except in the event of an overflow from the SWRB. The basin was built to hold runoff from a 10 year, 24 hour rainfall event.
Action: Revise line 35 on page A.3-18 to read: "The major drainages, which are discussed in the following paragraphs, are the storm sewer outfall ditch (SSOD), the pilot plant drainage ditch, Paddys Run, and the Great Miami River." Also insert this short paragraph before line 27: "The SSOD drains to Paddys Run on FEMP property. This drainage rarely runs except when the storm water retention basin (SWRB) overflow during a storm event that exceeds their capacity. The SWRB system was built to hold runoff from the production area and parking lot areas resulting from a 10-year, 24-hour rainfall event."

108. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.1 Pg.#: A.3-19 Line#: 3
Original Specific Comment #: 63
Comment: This line discusses the presence of contaminants in Great Miami River sediment "in the vicinity" of the outfall line. This phrase is rather vague. The text should be revised to clarify where the contamination is located. For example, upstream of the outfall, at the outfall, or downstream of the outfall.
Response: Contaminants were investigated along the reach of the Great Miami River between the outfall line discharge point and the confluence with Paddys Run. Therefore, this information could correspond with a number of sampling points per the table on page A.3-40.
Action: Replace the sentence "Sediment in the vicinity of the outfall line ...." with the following text: A sediment sample collected in 1993 from GMR2 (located just below the outfall line) had a total uranium concentration of 2.1 mg/kg, a radium-226 activity of 0.8 pCi/g, and concentrations of aluminum at 11,600 mg/kg and zinc at 96.9 mg/kg. Concentrations of PAHs ranged from 580 to 2700 mg/kg.

109. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.1 Pg.#: A.3-20 Line#: 1 to 4
Original Specific Comment #: 64

Comment: These lines discuss the presence of contaminants in groundwater plumes emanating from the site. In line 1, the text refers to "some inorganics." These contaminants should be identified. Lines 2 and 3 refer to "radionuclides, inorganics, and VOCs" present as "isolated occurrences above background." The text should be revised to identify the most significant contaminants of each of these three types. Furthermore, the text should be revised to clarify that the presence of any volatile organic compounds (VOC) is above background because VOCs do not naturally occur.

Response: The first sentence of this paragraph corresponds to CPCs common to most plumes. This is correct information and does not need revision. However, the following sentence on lines 2 and 3 is specious.

Action: Modify text on page A.3-20 as follows: "Other contaminants, including radionuclides, inorganics, and VOCs, are also present in the Great Miami Aquifer; the set of these contaminants may overlap with the set existing in plumes. However, the appearance of these contaminants represents only isolated occurrences above background, disassociated with any plume in the Great Miami Aquifer. In addition, VOCs are always considered above background since they do not naturally occur." Information on significant contaminants will be added to the text.

110. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.1 Pg.#: A.3-20 Line#: 40 and 41
Original Specific Comment #: 65

Comment: This line implies that surface and subsurface soil contamination at the site is solely the result of deposition of particulate emissions. As described elsewhere in the report, soil contamination is also the result of spills, leaks, and surface water runoff. Lines 40 and 41 should be revised to include these other contaminant sources.

Response: Agree.

Action: Revise lines 38 and 40 on page A.3-20 to state: "...to characterize that fraction of vertical and horizontal contamination in soil due to air deposition of particulate emissions. Other sources of surface and subsurface soil contamination are spills, leaks, and surface water runoff."

111. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.2.1 Pg.#: A.3-22 Line#: 16 and 17
Original Specific Comment #: 66

Comment: These lines indicate that the property's vegetative cover is assumed to be consistent with the cover present at surrounding properties (85 percent cover) for the purposes of evaluating the current land use scenario. However, the degree of cover under the current land use scenario should be based on the existing quantity and quality of vegetative cover at the site. The text and possibly the exposure calculations should be revised accordingly.

Response: The 85 percent vegetative cover assumed for the current land-use scenario is a reasonable reflection of existing conditions for areas outside the production area (and the areas immediately adjoining the production area) and for Operable Unit 1. Because the presence of the buildings is ignored, it is also applied to the production area assuming that, if the buildings were removed and the land use is industrial, the vegetative cover in the production area would be similar to that noted in surrounding areas within the FEMP. (Please note that a more conservative value (50 percent) is considered under the future agricultural land-use scenario.) The existing exposure calculations are correct.

Action: The text on page A.3-22 will be modified to note that "an 85 percent vegetative cover is also reflective of areas within the FEMP (outside the production area and immediately adjoining areas) and Operable Unit 1."

112. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.3.2 Pg.#: A.3-25 Line#: 2 and 3
Original Specific Comment #: 67
Comment: These lines discuss the deposition of particulates onto the soil or edible plants present at farms. The deposited particulates can also impact vegetable gardens. The text should be revised to refer to both farmland and gardens.
Response: Agree. The Baseline Risk Assessment provides data on uranium concentrations in homeowner produce as a reality check (Section A.IX).
Action: Although the text includes garden produce, lines 3 through 5 will be amended to ensure absolute clarity: "...particulates settle out over farmland and garden plots, they can be deposited onto surface soil or on the surfaces of plants.... These plants and their fruit are then used directly as food or are ingested by livestock."

113. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.3.4 Pg.#: A.3-25 Line#: 18
Original Specific Comment #: 68
Comment: This line implies that potentially contaminated edible tissue or milk can be ingested only by off-site residents. As noted in Figure A.3-2, future on-site receptors may also ingest contaminated edible tissue and milk. The text should be revised to indicate that both on-site and off-site residents may ingest contaminated edible tissue and milk.
Response: Agree and disagree. This depends on tense of land use scenario. Under current land use, the text is correct, for no one lives on the FEMP. In addition, future land use implies on-property ingestion under certain scenarios only.
Action: The text will be modified to acknowledge that under certain land-use scenarios the off-site resident may ingest edible tissue and milk.

114. Commenting Organization: U.S. EPA Commentor:Jablonowski
Section#: A.3.2.4 Page#: N/A Line#: N/A
Original Comment #: 11
Comment: This section discusses receptor exposure pathway scenarios for the four land uses, and has related information presented in Table A.3-1, *Summary of Exposure Pathways Quantitatively Evaluated in the Baseline Risk Assessment*, and in Figures A.3-1 and A.3-2, *Operable Unit 5 Conceptual Models (Current and Future Source Term and Land Use Scenarios)*. This section and the related table and figures should be reviewed and revised since there are numerous inconsistencies, namely with respect to the exposure routes of the various receptors.
Response: The confusion may be the result of the fact that the reviewers did not receive the correct version of Tables A.3-2 in the original submittal. Please see response to comment 84.
Action: Section A.3.2.4 and related tables will be reviewed for accuracy and consistency.

115. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.1 Pg.#: A.3-28 Line#: 35 to 37
Original Specific Comment #: 70
Comment: These lines state that under current land use with access controls, the off-property farmer and child are assumed to be supplied with bottled water; therefore, exposures of these receptors to groundwater are not evaluated. This assumption needs to be justified. If families near the site are currently receiving bottled water, then the assumption is appropriate. However, if bottled water is not currently being supplied, then potential exposure to groundwater should be evaluated.
Response: Based on the groundwater monitoring results, several families near the site are currently receiving bottled water. Also, the groundwater is evaluated under the current land use without access controls. Please see response to comment 79.
Action: None.

116. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.1 Pg.#: A.3-28 Line#: 8
Original Specific Comment #: 69
Comment: This line indicates that risks are characterized for the trespassing youth for all areas of the site except the production area (Areas 1 to 4). However, in the paragraph immediately preceding the first bulleted item on page A.3-28, the text states that the trespassing youth does not have access to the production area (Areas 2, 3, and 4) and the sewage treatment plant (Area 6). The text should be revised to consistently describe the areas to which the trespassing youth is assumed to have access and for which risks will be evaluated.
Response: Agree.
Action: The text in Section A.3.2.4.1 will be corrected to state that: "..it is assumed that the visitor only has access to risk evaluation area 1 and the trespasser only has access to risk evaluation areas 5, 6, 7, 8, 9, and 10."

117. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.1 Pg.#: A.3-29 Line#: 3 and 4
Original Specific Comment #: 71
Comment: These lines state that exposure to the off-property user of surface water in the Great Miami River will be evaluated at the outfall effluent line and at the confluence of the Great Miami River and Paddys Run. This appears to be consistent with Table A.3-16, but is inconsistent with the exposure point locations presented on page A.3-40, which describe a third exposure point in the Great Miami River between the outfall line and the confluence of the Great Miami River and Paddys Run. The report should be revised to consistently present and evaluate surface water and sediment exposure points.
Response: Agree.
Action: The text and associated tables will be modified to clearly state that: "The baseline risk assessment defined and evaluated two river reaches: 1) the reach between the outfall (including data collected at the outfall) and the confluence with Paddys Run, and 2) the reach which begins (and includes data collected at the confluence with Paddys Run) and includes sampling locations below the confluence with Paddys Run. " It should be noted that because relatively few sampling locations exist in these risk evaluation areas, generally the maximum detected CPC concentrations were evaluated in the baseline risk assessment.

118. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.1 Pg.#: A.3-29 Line#: 30 to 33
Original Specific Comment #: 72
Comment: These lines describe the ages of the critical subpopulations that are evaluated for potential exposure to resuspended soil. The ages of these children are described as grades kindergarten through 12. However, this age range is not consistent with Section A.3.1.10, which describes critical subpopulations including several daycare centers. Also, Figure A.3-6 presents the locations of off-property receptor locations and includes the location of one daycare facility. The text should be revised to be consistent with the discussion presented in Section A.3.1.10; specifically, critical subpopulations should be described as including children attending local daycare facilities.
Response: Disagree, Section A.3.2.4.1 lists the same receptors as mentioned at the end of section A.3.1.10 for quantitative evaluation.
Action: None.

119. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.3 Pg.#: A.3-31 Line#: 19 to 21
Original Specific Comment #: 73

Comment: These lines describe additional off-property locations considered under future land use that were not considered under current land use conditions. These additional locations include well 2071, well 2119, and a well located near the Great Miami River. The text should be revised to explain how and why these additional locations were selected. The text should also be revised to more clearly identify the well located "near the Great Miami River." If this well has a name or number, then the well should be so identified. If the well has no existing identifier, then the report should provide such an identifier.

Response: Agree.

Action: The text will be modified to state that:"....These locations provide additional receptor locations for the groundwater modeling exercise conducted for the baseline risk assessment. The groundwater modeling exercise concentrated on potential receptor points located to the east and south of the FEMP because the south and east are predominant groundwater flow directions for the Great Miami Aquifer underlying and downgradient of the FEMP." The well "near the Great Miami River" (which has no specific identifier [name or number]) will be labeled and referred to throughout tables, text, and figures as the "Great Miami River well."

120. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.2.4.3 Pg.#: A.3-32 Line#: 19 to 30
Original Specific Comment #: 74

Comment: These lines describe Scenario B, the Undeveloped Park with Limited Facilities. However, unlike Scenarios A and C, the description of Scenario B does not clearly indicate the ages of the potential receptors. The text should be revised to indicate the ages of the potential receptors.

Response: Agree. The age groups evaluated for Scenario B are identical to those evaluated for Scenario A and C. This is stated in the last paragraph on page A.3-32. However, this paragraph was incorrectly indented, which could mislead the reader into thinking it is a further discussion of Scenario C, which does not apply to Scenario B.

Action: The last paragraph on page A.3-32 will not be indented, and will clearly state that the age groups evaluated are identical for recreational Scenarios A, B, and C.

121. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3 Pg.#: A.3-35 Line#: 13
Original Specific Comment #: 75

Comment: This line refers to Table A.3-2. No Table A.3-2 was found; instead four tables, A.3-2A through A.3-2D, were located. The text should be revised to refer to all of these tables and should briefly explain the content of each.

Response: Agree.

Action: The text will be modified to note that Tables A.3-2A, A.3-2B, A.3-2C, and A.3-2D present potential receptor locations, areas, and exposure points for current land use (with access controls), current land use (without access controls), future land use (continued federal ownership), and future land use (without federal ownership), respectively.

122. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.1 Pg.#: A.3-36 Line#: 2
Original Specific Comment #: 76

Comment: This line lists the home builder as one of the receptors that will be exposed to surface soil. Specifically, it refers to contaminant concentrations in soil 1.5 bgs as presented in Table A.3-6. However, Section A.3.2.4 (page A.3-34) states that the home builder will be exposed to deeper soils "(deeper than 1.5 feet below ground surface)." The text should be revised to indicate that the home builder will be exposed to contaminants in both surface and subsurface soil. The text should also be revised to specify the contaminant concentrations used to evaluate exposure to both types of soil.

Response: Agree. The soil exposure point concentrations used for the evaluation of the homebuilder were the highest concentrations of either subsurface or surface soils.

Action: The text will be revised to state, "This receptor would be exposed to both surface and subsurface soils (i.e., deeper than 1.5 feet below ground surface)."

123. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.2 Pg.#: A.3-36 Line#: 17 to 33
Original Specific Comment #: 77

Comment: These lines indicate that radon modeling results from a series of tables (A.3-9 to A.3-12) are summarized in the in-text table. The tables referred to do not present radon modeling results for the grazing areas; yet the in-text table summarizes radon modeling results for the grazing areas. The text should be revised to refer to the appropriate table containing radon modeling results.

Response: Agree.

Action: The referenced text and tables will be reviewed and corrected.

124. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.3 Pg.#: A.3-38 Line#: 1 to 5
Original Specific Comment #: 78

Comment: These lines present wells evaluated for several exposure point locations. Table A.3-13 lists the area "Northeast of FEMP" as one of the off-property exposure point locations. These lines should be revised to include the area "Northeast of FEMP" as an exposure point location and should list specific wells used to evaluate this location.

Response: A footnote needs to be added to Table 3-13 indicating that no acceptable RI monitoring well data are available for the "Northeast of the FEMP" location. Thus, the groundwater exposure pathways are not evaluated at this location under the current land-use scenario. This location is a potential receptor location evaluated by the groundwater modeling exercise conducted for the baseline risk assessment. Thus, modeled CPC concentrations were evaluated under the future land-use scenario.

Action: As stated in response, an appropriate footnote will be added to Table 3-13. The lack of monitoring well data for the "Northeast of the FEMP" location will be noted in the text on page A.3-38.

125. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.3 Pg.#: A.3-38 Line#: 3 and 4
Original Specific Comment #: 79

Comment: These lines refer to "South Plume Wells" but do not clearly define these wells. First, the South Plume Wells are said to "(correspond to Uranium Plume)." Section A.3.2.1 discusses six different plumes, none of which is identified as the "Uranium Plume." Lines 3 and 4 should be revised to clearly explain the reference to the "Uranium Plume." Second, the lines describe in narrative fashion the wells being referred to in the South Plume Wells. The narrative should be replaced by a list of wells, similar to the lists of wells for the other groundwater exposure point locations.

Response: Agree.

Action: The South Plume wells will be identified. Because there are 6 plumes described in Section 4, the text will not identify the South Plume wells as those corresponding to "the uranium plume." The text will explain that, for risk assessment purposes, the south plume well grouping refers to those wells located between the southern boundary of the FEMP and the Paddys Run Road Site (PRRS) industrial area. These wells comprise the heart of the uranium plume which extends off-property to south of the FEMP.

126. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.3 Pg.#: A.3-39 Line#: 15 and 16
Original Specific Comment #: 80
Comment: These lines refer to "the three well locations to the east of the FEMP." Because more than three wells are located to the east of the FEMP, the lines should be revised to more clearly identify the wells to which reference is being made.
Response: Agree.
Action: The text will be modified to reference Wells 2071, 2119, and the Great Miami River well.

127. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.4 Pg.#: A.3-40 Line#: 12
Original Specific Comment #: 81
Comment: This line indicates that Table A.3-16 presents current exposure point concentrations for surface water. Table A.3-16 presents concentrations for two exposure points in the Great Miami River: at the effluent outfall and at the confluence of the Great Miami River and Paddys Run. These exposure point concentrations are consistent with the discussion on page A.3-29. However, lines 5 to 8 on page A.3-40 present sampling point locations for two exposure point locations: the confluence of the Great Miami River and Paddys Run (as discussed above) and the Great Miami River between the Outfall line and the confluence (not discussed in line 12 or in Table A.3-16. The entire report should be reviewed and revised as necessary to consistently present and discuss surface water exposure point locations.
Response: Agree
Action: Please see response to comment 117.

128. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4 Pg.#: A.3-42 Line#: 7
Original Specific Comment #: 82
Comment: This line refers to "reasonable" exposure pathways. The meaning of the term "reasonable" is subjective, and should be clearly explained. The explanation should reference Figures A.3-1 and A.3-2.
Response: Agree.
Action: The text will be modified to state that the exposure pathways are reasonable **in light of the current and anticipated future land-use scenarios** and **with regard to the contamination detected in the environmental media**. The text will reference Figures 3-1 and 3-2.

129. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.1.2 Pg.#: A.3-44 Line#: 3 and 10
Original Specific Comment #: 83
Comment: Line 10 states that "Other values used in this report are presented in Section A.4.0." However, Section A.4.0 does not include chemical-specific dermal absorption values. The line should be revised to clearly indicate where the remaining dermal absorption values are presented. Without these values, dermal exposure and risk calculations cannot be verified.
Response: Agree.
Action: Line 10 of section A.3.4.1.2 will be revised to read, "Other values used in this report are presented in Table A.3-24."
Table A.3-24, listing dermal absorption values, will be added to section A.3.0.

130. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.1.3 Pg.#: A.3-44 Line#: 26
Original Specific Comment #: 84
Comment: This line presents and defines the variable exposure duration (ED). The units for this variable are presented as "years per lifetime," which appears to be incorrect. The units should be changed to be expressed instead as "years."
Response: Agree
Action: The units presented for ED will be changed to "years."

131. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.2.4 Pg.#: A.3-47 Line#: 32
Original Specific Comment #: 85
Comment: This line presents and defines the parameter time of event (ET). The units of measure for this parameter are defined as hours, which appears to be incorrect. The line should be revised to present the units of measure for the parameter ET, as hour per event.
Response: Agree. This is a typographical error.
Action: The text will be changed from "time of event" to "time per event."

132. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.4.2 Pg.#: A.3-55 Line#: 24
Original Specific Comment #: 86
Comment: This line presents the equations used to calculate exposures to contaminants in beef and milk. Equation A.3-32 is used to calculate exposures to radionuclides in beef. The first parameter in this equation is the concentration of the radionuclide in beef (C_{ib}). In Equation A.3-28, the units of measure for this parameter are defined as picocuries per gram (Pci/g). If these units are used in Equation A.3-32, a conversion factor (CF) with units of grams per kilograms (g/kg) is required for the equation to produce an exposure in the proper units. Equations A.3-28 and A.3-32 should be reviewed and the units for the parameter "C_{ib}" should be consistently presented and used.
Response: Agree.
Action: The units for IR in equation A.3-32 will be changed to g/day for beef, and the units for C, B in equation A.3-28 will be changed from (mg/Ig) to (mg/g).

133. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.4.3 Pg.#: A.3-56 Line#: 25 and 26
Original Specific Comment #: 87
Comment: These lines present the units for the parameter "C_{if}." However, the units of measure for radionuclide and chemical constituents are reversed. The lines should be revised to correctly present the units for radionuclide and chemical constituents.
Response: Agree
Action: The units presented for C_{if} in line 25 will be reversed to read, "(pCi/g, radionuclides; mg/g, chemicals)"

134. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.4.3 Pg.#: A.3-57 Line#: 29
Original Specific Comment #: 88
Comment: This line presents units for the parameter "C_{if};" the units are presented as pCi/g and mg/kg for radionuclide and chemical constituents, respectively. The units for this parameter were defined as pCi/g and milligram per gram (mg/g) in Equation A.3-36. If the units for the parameter "C_{if}" presented in Equation A.3-36 are used, then a conversion factor needs to be added to Equation A.3-40. If the units for the parameter "C_{if}" presented in Line 29 are used, then the conversion factor in Equation A.3-41 should be removed. Equations A.3-36, A.3-40, and

A.3-41 should be reviewed and the units for the parameter should be consistently presented and used.

Response: Agree.

Action: The units for Ci in line 29 will be changed to (pCi/g) and (mg/g.).

135. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.6.1 Pg.#: A.3-58 Line#: 30
Original Specific Comment #: 89

Comment: This line describes the age of the trespassing youth as "between the ages of six and 18." Table A.3-20 presents the age of this receptor as 7 to 18. The age of the trespassing youth should be consistently presented and used.

Response: Agree

Action: Line 30 will be changed to read "between the ages of seven and 18." Section A.3 will be reviewed for consistency.

136. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.4.6.3 Pg.#: A.3-63 Line#: 17 to 19
Original Specific Comment #: 90

Comment: These lines describe how the value for the parameter, exposure time, was determined for critical subpopulation receptors. Again, the discussion refers only to school-age children. Critical subpopulation receptors have been defined elsewhere in the report as including children attending daycare. The text should be revised to clearly define the value for the parameter, exposure time, used to evaluate exposure to children attending daycare.

Response: Please see response and action to original comment 91.

Action: None.

137. Organization: U.S. EPA Commentor: Saric
Section#: A.4 Page #: NA Line #: NA
Original General Comment #: 6

Comment: All tables should be paginated, either within each table or, more desirably, within the entire section. This is especially necessary for tables such as Table A.4-3, which is 18 pages long. As presented, it is difficult to tell if pages have been omitted or incorrectly sequenced.

Response: Agree.

Action: All tables will be paginated within the section.

138. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.4 Pg.#: Tbl A.4-5 Line#: Code:
Original Comment# 21

Comment: Why is more than one significant digit indicated for the Relative Potency Factors? This does not follow the 1993 PAH Guidance and has been corrected in prior OU reports. Please review the comments for the OU #4 and OU #1 risk assessments.

Response: Agree.

Action: The values presented in Table A.4-5 will follow 1993 PAH guidance.

139. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.4.1.3 Pg.#: A.4-7 Line#: 34
Original Specific Comment #: 100

Comment: The citation "EPA 1993a" occurs here, later in this section, and on most pages of Section A-V. However, because this reference is not included in the reference section (Page A-R-25), the data could not be verified. This reference should be added to the list.

Response: Agree.

Action: Reference concentrations available from: 1) IRIS, 2) HEAST (1994) (which was not available at the time the draft Operable Unit 5 document was prepared), or ECAO documents were used in the baseline risk assessment for Operable Unit 5. The reference citations in question will be reviewed and corrected as necessary.

140. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.4.1.4 Pg.#: A-9 Line#: 23
Original Specific Comment #: 101
Comment: The reference "DOE 1992" is unclear because Page A-R-21 includes references "DOE 1992a," "DOE 1992b," and two entries called "DOE 1992d." These citations and references should be revised appropriately.
Response: Agree.
Action: The reference citations in question will be reviewed and corrected as necessary.

141. Organization: U.S. EPA Commentor: Saric
Section#: A.5 Page #: All Line #: All
Original General Comment #: 7
Comment: The objective of the risk characterization is not clear. The summary presented in Section A.5 should clearly present (1) all CPCs in OU5 contributing significant risk, (2) all pathways and exposures leading to significant risk, (3) all current and potential future receptors at significant risk, and (4) the CPCs, pathways, routes, and receptors driving the OU-wide risk. This section should be revised to clearly present this data.
Response: The requested information is actually results, not objectives. The existing narrative and associated tables (particularly those in Attachment A.VII) do identify CPCs in Operable Unit 5 contributing significant risk, the significant exposure pathways, and significant receptors. However, the Operable Unit 5 baseline risk assessment is long and complex. Summary tables will be prepared which identify significant pathways, receptors, and CPCs for the reader.
Action: Summary tables will be prepared which identify significant pathways, receptors, and CPCs for the reader.

142. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: A.5-14 Line#: 16-19 Code:
Original Comment# 22
Comment: The reference to the Region III screening concentration for di-n-octyl phthalate in tap water is not really very applicable here. The value of 730 μg/L is based on oral ingestion only; this discussion concerns dermal exposure. In addition, the screening value for this contaminant is 73 μg/L (HI = 0.1), so the detected concentration of 89 μg/L is above the EPA level for evaluation. The text seems to suggest that 89 μg/L is a safe level. This would probably be true if only a single chemical, single pathway was being evaluated. This risk assessment addresses the risk from multiple contaminant and multiple pathway exposures.
Response: Agree.
Action: The discussion will not note the Region III screening concentration for di-n-octyl phthalate. The discussion will focus on the uncertainties associated with the evaluation of the dermal pathway for this compound (e.g., the reliance on the K_{ow} to predict dose) and the fact that the CPC was detected infrequently.

143. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: A.5-17 Line#: 17-26 Code:
Original Comment# 23
Comment: The text indicates that Future Land Use scenarios show lower HIs associated with exposure to groundwater because the future modeling predicts lower concentrations in some areas. I was unable to locate the data used in the modeling, and the assumptions are not clearly described

(cross-reference problem again). The text should reference these data and models, and more fully discuss the assumptions used in the modeling.

Response: The methods and assumptions used in the modeling of groundwater for the future on-site and off-site conditions are summarized in Section 5 with other pathways and in Appendix F.3 for the groundwater pathway specifically. Tables 5-38 to 5-41 summarize the predicted future groundwater concentration at specific receptors from groundwater modeling.

Action: The text will be edited to note the associated subsections in Section 5 and Appendix F which present the requested information.

144. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: A.5-21 Line#: 21-28 Code:
Original Comment# 25

Comment: To aid in the interpretation of the RME and CT exposure risks, the text should explain that the difference in the RME and CT exposures reflects the difference in the number of people expected to exceed the calculated risk, by definition. At the calculated CT risk level, 50% of the receptors would exceed this risk, while at the RME risk level, only 5% of the receptors would be expected to have a greater risk. Therefore, the CT value gives the <u>average</u> risk for a population, and half the receptors would be expected to have a greater risk. The RME value would simply encompass a greater portion of the population.

Response: This representation of CT and RME is not quite accurate. The methods used (and discussed in RAGS) are intended to be applied to an individual within a population. The scenarios developed and applied at the FEMP do represent individual exposure, and therefore risk. The CT and RME are "ideally" intended to use input factors and parameters such that the resultant risk estimates approach the 50th and 90th percentiles. A literal interpretation then is that the RME (individual) under the hypothetical scenario would have less than a 10 percent chance of experiencing a risk greater than the calculated estimate.

This distinction is important for two reasons:

1. The risks are hypothetical based on assumed behavior, and
2. There is only a <u>probability</u> that the estimated risk would be exceeded.

This same rationale would also extend to populations. The CT (population risk) is that there is a 50 percent chance that the estimated risk to the population would be greater; and for the RME individual, a 10 percent chance the risk would be greater than estimated. It is not appropriate to consider that the risk is greater than calculated merely because the RME or CT is intended to represent a specific percentile.

Action: The text will be modified to define the RME and CT receptors and to note why analysis of RME and CT receptors is included in the risk assessment: Actions at Superfund sites are typically based on estimates of reasonable maximum exposure (RME) expected to occur under both current and future land-use conditions. The RME is defined as the highest exposure that is reasonably expected to occur at a site and is generally based upon input factors and parameters that are often the 90th percentile values. The intent of the assessment of the RME is to estimate risks associated with a conservative exposure case that is still within the range of possible exposures (an RME receptor is expected to have less than a 10 percent chance of experiencing a risk greater than that estimated using RME exposure parameters). Since there is considerable uncertainty associated with some exposure input factors, an assessment of the central tendency (CT) exposure has been included for selected receptors evaluated in this risk assessment. The CT exposure differs from the RME exposure in that it generally uses exposure input parameters that are the 50th percentile values. By definition, risks calculated for the CT exposure are also less than those calculated for the RME exposure. The evaluation of the CT exposure is particularly useful in risk assessment when there is a high level of uncertainty associated with an exposure input value or when there is a significant difference between the RME and CT values suggested for an exposure input parameter.

145. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: A.5-22 Line#: 28-31 Code:
Original Comment# 24
Comment: Please update this paragraph, as the information is no longer correct. The July 14, 1994 OSWER Directive addressing lead in soil at Superfund sites sets the screening level at 400 ppm for residential exposure and a clean-up level based on the use of the IEUBK Model for Lead, version 0.99d.
Response: Agree. Please note that the suggested reference was not available at the time the report was submitted for review.
Action: The text will note the 400 ppm screening level for lead.

146. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.5 Pg.#: NA Line#: NA
Original Specific Comment #: 102
Comment: Tables A.5-1 through A.5-20 summarize carcinogenic and noncarcinogenic risks to receptors under various land use scenarios. In these tables, a value of "0" is used to show that no risk was calculated for a particular exposure medium. Use of this value may be misleading. Although no risk was calculated, risk may indeed exist. The value "0" should be replaced by a term such as "Not Available (NA)" or "Not Calculated (NC)."
Also, it is difficult to identify the tables in Attachment A.IV that are summarized in each of the Section A.5 summaries. Therefore, an additional column should be added to each of the Section A.5 tables citing which Attachment A.IV tables are summarized.
In addition, the tables in Section A.5 summarize chemical carcinogenic risk, but do not indicate whether this risk is based on toxicity equivalency factors for polycyclic aromatic hydrocarbons (PAH) or the assumption that all PAHs are toxically equivalent to benzo(a)pyrene. The Section A.5 tables should be footnoted appropriately.
Response: Agree.
Action: Please see response to comment 149. Also, regarding the Section A.5 tables, an additional column (or a separate table will be prepared) correlating the information in the tables with the results spreadsheets presented in Attachment A.IV. Regarding the PAHs, the Section A.5 tables will be footnoted as requested.

147. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.5 Pg.#: NA Line#: NA
Original Specific Comment #: 103
Comment: Table A.5-10 summarizes risk to a user of a wildlife refuge on the site of the shooting range. However, no corresponding table could be found in Attachment A.VI. The tables and text should be revised to eliminate this inconsistency.
Response: Agree.
Action: Corresponding risk tables will be added to Attachment A.VI.

148. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.5 Pg.#: NA Line#: NA
Original Specific Comment #: 104
Comment: Tables A.5-19 and A.5-20 both summarize risks to nearby sensitive subpopulations (grade and high school students). However, no corresponding tables were identified in Attachment A.IV. Tables should be added to Attachment A.IV to show how the risks to these sensitive subpopulations were calculated.
Response: Attachment IV is a collection of summary tables which present summary statistics and the results of the CPC selection for areas of concern. The sensitive subpopulations were evaluated using modeled air data. The air modeling results are found in Table A.3-11b.
Action: None

149. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: Tbl A.5-2 to A.5-12 & A.5-20 Line#:
Code:
Original Comment# 26
Comment: I do not know of any exposure which gives a "0E+00" risk. Perhaps this means that the pathway was not evaluated. If this is the case, "Not Applicable" or some other term should be used.
Response: "0E+00" appears if the pathway was not evaluated or if no CPCs contributed to risk.
Action: The tables will be modified with "NA," appropriate footnotes, etc., so that there is no misinterpretation of results.

150. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.5.3.11 Pg.#: A.5-24 Line#: 9 to 17
Original Specific Comment #: 105
Comment: These lines summarizes risks to critical subpopulations. However, tables showing how these risks were calculated are not included in Attachment A.VII. Tables showing the calculation of these risks should be added to Attachment A.VII.
Response: Agree.
Action: Corresponding risk tables will be added to Attachment A.IV.

151. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-11 Line#: 21-31 Code:
Original Comment# 30
Comment: I do not understand the two bullets addressing the PAH evaluation. The carcinogenic PAHs are evaluated using the Relative Potency Factors for each PAH, not benzo(a)pyrene. The RPF document has undergone numerous reviews, and the values are acceptable for the compounds listed in the 1993 guidance. The text comments lead me to think that the wrong guidance was used in evaluating the PAH risks. Please review your methodology and correct the cited bullets.
Response: Per previous discussions and agreements with EPA (including response to comment documents and discussions for Operable Units 1 and 4), PAHs were evaluated two ways: 1) using the CSF for benzo(a)pyrene as the CSF for all carcinogenic PAHS, and 2) using the relative potency factors listed in the 1993 guidance.
Action: The cited bullets will be corrected to reflect the 1993 guidance.

152. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-5 Line#: 32-35 Code:
Original Comment# 27
Comment: The entire paragraph is somewhat academic, as speciation studies are not usually done on any metal contaminants. Therefore, some metal exposure risks may be overestimated, while others may be underestimated. The IRIS toxicity values are usually to the most prominent species. I was not aware that this assessment considered that the total chromium concentration was hexavalent chrome. The EPA position, given the lack of more definitive data, is to assume that 15% of the total chromium is due to hexavalent chrome. The text should also explain that there is no accurate methods for distinguishing trivalent chrome from hexavalent chrome, so the estimate of 1.5-2.0% is only an estimate.
Response: The results of the Fernald chromium speciation studies are documented in supplemental guidance entitled Speciation of Total Chromium in Surface Soil (Supplement No. 94-014; note that hexavalent chromium does not exceed 10 percent.
Action: The text will briefly note the methods for and results of the chromium speciation studies: .....it was assumed that 10 percent hexavalent chromium is present in environmental media. Site-specific data indicate that approximately only 1.5 to 2.0 percent of all chromium detected

represents hexavalent chromium. Surface soil sampling and analysis was conducted at the FEMP to determine the percentage of trivalent and hexavalent chromium in site soil. (Methods 3060 [EPA SW-846] and 7195 [EPA SW-846] were used to determine total chromium and hexavalent chromium in 20 soil samples.)

153. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-5 Line#: 47 Code:
Original Comment# 28
Comment: Due you mean surface soil here? The text indicates that the primary risk to off-site receptors is from exposure to groundwater.
Response: Agree. The primary risk is receptor specific. For most (if not all) current on-property receptors, the primary risk is due to exposure to CPCs in soil. For off-property receptors, the primary risk is due to exposure to CPCs in groundwater.
Action: The text will be modified to note that for several off-property receptors the primary risk is due to CPCs in groundwater.

154. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-8 Line#: 21-25 Code:
Original Comment# 29
Comment: While a future on-site farmer may not farm on the production area (he might live there or use the area for other purposes related to farming), I am not convinced that the land uses do not represent a plausible starting point. It is this risk evaluation which will determine if this or any other land uses are plausible. The discussion here needs to clarify the point of the risk evaluation.
Response: The text will be clarified.
Action: The text will be modified to note that the future on-site farmer is a plausible scenario for purposes of risk assessment and provides useful information to those ultimately making risk management decisions.

155. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.0 Pg.#: NA Line#: NA
Original Specific Comment #: 106
Comment: This section discusses uncertainties in the risk assessment. However, the uncertainty contributed by future behavior patterns is not discussed. Because this is potentially a significant source of uncertainty, it should be discussed in the text.
Response: Agree.
Action: A short discussion of uncertainties contributed by future behavior patterns will be added to the text.

156. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.0 Pg.#: NA Line#: NA
Original Specific Comment #: 107
Comment: Tables 6-1 through 6-7, which summarize risks to receptors under various land use scenarios, were not introduced or referred to anywhere in Section A.6.0. Instead, these tables are referred to, but not included in, Section 6.0 of the body of the report. Furthermore, these tables appear to be identical to Tables A.7-1 through A.7-7. Therefore, Tables 6-1 through 6-7 should be transferred to Section 6.0 of the body of the report. In addition, the tables do not clearly indicate whether the risks were estimated for the RME or CT receptor. These tables should be clearly labeled to indicate the receptors for which risks are estimated.
Response: Agree. This problem was addressed in correspondence submitted to the agency on August 3, 1994.

Action: Tables will be properly placed in the report. Tables 6-1 through 6-7 will clearly note if results refer to a RME or CT receptor.

157. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.1 Pg.#: A.6-2 Line#: 18 and 19
Original Specific Comment #: 108
Comment: These lines refer to a combination of events and conditions that will not occur in an actual receptor population. Because actual exposure conditions are not known at this time, these lines should be revised to address the probability of such a combination of events and conditions rather than definitively stating that such a combination cannot occur.
Response: Agree.
Action: The text will be changed to note that the probability of occurrence is low instead of stating that such a combination cannot occur.

158. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.1 Pg.#: All Line#: All
Original Specific Comment #: 109
Comment: This section portrays the risks estimated for the RME individual as risks that will not occur. However, because actual exposure patterns are not known and many other uncertainties exist within the risk assessment process, this section should be revised to address the probability of such extreme risk estimates rather than making statements that cannot be verified at this time.
Response: The section will be reviewed and modified, as necessary, to note that the probability of "extreme risk estimates" is "low" instead of "impossible."
Action: As stated in the response.

159. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.2 Pg.#: A.6-4 Line#: 19 to 24
Original Specific Comment #: 110
Comment: These lines discuss the uncertainties related to insufficient documentation of all pockets of elevated contamination. The text states that all pockets of radiological contamination have likely been identified. The text does not discuss whether all pockets of elevated chemical contamination have been identified. Even though radiological risks exceed chemical risks in most areas and for many exposure pathways, risks associated with chemical contaminants are significantly above 10^{-6} and in some instances above 10^{-4}. Therefore, the lines should be revised to address any uncertainties related to insufficient documentation regarding pockets of elevated chemical contamination.
Response: Agree.
Action: This issue will be addressed as requested by noting that while there were fewer organic samples than radiological samples collected, the major soil, groundwater, surface water, and sediment sampling event which occurred in 1993 reduced the uncertainty associated with potential organic contamination considerably. Additionally, while certain organic parameters were used at FEMP, on a volume basis, the radiologicals should, logically, be the predominant contaminants of concern.

160. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.2 Pg.#: A.6-4 Line#: 34 to 37
Original Specific Comment #: 111
Comment: These lines discuss the possibility of eliminating certain chemicals as chemicals of potential concern because of a limited database, even though the chemicals may be site-related. As stated in EPA guidance, site-relatedness should be considered in identifying chemicals as chemicals of potential concern. An extensive amount of information exists about chemicals used at the site during production processes and about chemicals present in waste streams

generated and managed at the site. Therefore, the lines should be revised to qualify as minimal, the likelihood of chemicals being excluded as chemicals of potential concern that are related to site activities.

Response: Agree.

Action: The lines will be revised to qualify as minimal the likelihood that significant (from a toxicological standpoint and/or standpoints) site-related chemicals would be excluded as a chemical of potential concern.

161. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.2 Pg.#: A.6-5 Line#: 14 to 16
Original Specific Comment #: 112

Comment: These lines refer to a risk evaluation of soil and groundwater data generated by the on-site monitoring laboratory. However, this information was not identified or referred to elsewhere in the report. The lines should be revised to eliminate reference to this risk evaluation if it was not performed, or the report should identify and refer to this information.

Response: Agree.

Action: The referenced lines will be deleted.

162. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.2 Pg.#: A.6-5 Line#: 32 to 36
Original Specific Comment #: 113

Comment: These lines discuss the ratio of chromium III to chromium VI in FEMP media. However, this section does not discuss how this data was obtained. The text should be revised to include the methods used to determine the above-mentioned ratio and discuss any uncertainties in the methods used.

Response: See response for Comment 152.

Action: See action for Comment 152.

163. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.2 Pg.#: A.6-5 Line#: 46 and 47
Original Specific Comment #: 114

Comment: These lines state that the majority of risks for most receptors are attributable to exposure to contaminated soils. However, exposure to contaminated groundwater also contributes significantly to the total risks for many receptors. The lines should be revised to discuss the impact of the identified uncertainties on risks attributable to groundwater.

Response: Agree.

Action: See response to comment 153. Also, a short discussion will be added regarding the impact of uncertainties on risks attributable to groundwater. The conclusion will be similar to that drawn for soil.

164. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.3 Pg.#: A.6-7 Line#: 1 to 8
Original Specific Comment #: 115

Comment: These lines discuss the uncertainties associated with the use of maximum concentrations for databases with less than seven detections. The first line states that "great overestimation" of exposure concentrations exists as a result. The fifth line states that this approach "may result in an overestimation." These two statements appear to be inconsistent. For large databases in which many samples were collected and minimal detections were identified, use of the maximum concentration may result in significant overestimation. However, in other instances where the entire database is small, the number of samples may be insufficient to fully characterize a particular exposure point, location, or area. In these instances, use of the

maximum concentration may or may not result in overestimation. Lines 1 to 8 should be revised to more fully discuss the impacts of the use of the maximum concentrations.

Response: Agree with commentor.

Action: Line 1 to 8 were edited to read "There is potential for overestimation in the final exposure concentrations used in that many were based on the maximum detected concentration. The conservative approach is taken in the statistical interpretation of the RI/FS and other databases used for risk assessment purposes. Maximum concentrations were used as "representative concentrations" for large data sets with only one positive detection and any data set having an undefined distribution and less than 20 samples (see A.II.2.2.3). Thus, the potential exists for significant overestimation of the concentrations to which a receptor could be exposed.

165. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.6 Pg.#: A.6-12 Line#: 4
Original Specific Comment #: 117

Comment: This line introduces a source of uncertainty associated with calculating risks from exposure to external radiation from soils. The line states that the uncertainty is related only to surface soils. However, the same uncertainty exists regarding exposure to external radiation from subsurface soils by home builders. The line should be revised to refer to both surface and subsurface soils.

Response: Agree.

Action: The text will be modified as requested.

166. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.6.2.6 Pg.#: All Line#: All
Original Specific Comment #: 116

Comment: This section discusses uncertainty in the toxicity assessment phase of the baseline risk assessment. However, uncertainty contributed by the lack of risk factors for some CPCs is not discussed. The text should be revised to discuss this uncertainty.

Response: Agree

Action: The text will be modified to note that there is uncertainty contributed by the lack of risk factors for some CPCs. However, it will also be noted that risk factors (CSFs and/or RfDs) are available for all of the predominant contaminants detected in the environmental media samples collected to date.

167. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6.3 Pg.#: A.6-12 Line#: Code:
Original Comment# 31

Comment: This paragraph seems to address the uncertainty in the risk management decision, not the uncertainty in the risk assessment. It should be pointed out that the risk assessment is conducted to identify the extent of risk to the population posed by the levels of contamination found at the site. Identification of the risks incurred by 50% of the receptor population (the CT evaluation) and by 95% of the receptor population (the RME evaluation) are required components of the risk assessment.

Response: Agree.

Action: The information suggested will be incorporated into the text.

168. Organization: U.S. EPA Commentor: Saric
Section#: A.7 Page #: NA Line #: NA
Original General Comment #: 8

Comment: The summary section of the risk assessment adequately summarizes the exposure pathways and contaminants driving the risk for the exposure areas posing the greatest risk for different receptors. However, the summary does not adequately discuss any differences in exposure

pathways and contaminants driving the risk across the various exposure areas for each receptor. For example, under the current land use scenario, the greatest carcinogenic risks for the exploring youth is associated with the former production area. The majority of the risk is due to exposure to surface soils, with radium-228 and thorium-228 being the primary contaminants. However, the discussion does not specify whether the risks for the exploring youth are driven by other media and contaminants in other exposure areas. Differences in media and contaminants driving the risks in different parts of the site will directly impact the selection of remedial technologies across the site. The summary should be revised to more thoroughly characterize differences in media and contaminants driving the risks for various receptors across the site. This revision can be accomplished through a summary table that highlights differences in media and contaminants driving the risks for various receptors.

Response: Agree.

Action: Summary risk characterizations tables are being prepared and will be incorporated into the final document.

169. Organization: U.S. EPA Commentor: Saric
Section#: A.7 Page #: NA Line #: NA
Original General Comment #: 9

Comment: The summary section mentions that central tendency risks were calculated and indicates that central tendency risks for the on-property resident farmer are summarized in Table A.7-6. However, the summary does not discuss or draw any conclusions about the central tendency results. The summary should be revised to discuss the central tendency results, including the degree and significance of any differences between the central tendency risks and the reasonable maximum exposure risks.

Response: Agree.

Action: The narrative will be modified to discuss central tendency risks.

170. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.7 Pg.#: A.7-6 Line#: 8-10 Code:
Original Comment# 32

Comment: This is a <u>very</u> biased statement that seems to indicate a <u>total</u> lack of understanding of toxicology and the risk assessment process. The fact that a finite risk can be calculated for background levels of contaminants supports the first principle of toxicology: there is nothing that is not a poison; the dose determines (the extent of) the risk. The level of risk posed by exposure to background levels of contaminants is an accepted risk, just like the risk of death from driving a car, while the risk from a Superfund site is a risk which is imposed without benefit. As such, it is not acceptable. Both risks can be calculated. The background level of contaminants may present the maximally acceptable risk to an individual or population. It is the addition of the site risk to the always present background risk which elevates the contaminant risk to an unacceptable level and give concern for adverse health effects to the exposed population. I suggest the last two sentences of this paragraph be rewritten to reflect an understanding of the basics of toxicology and the process for evaluating adverse effects of poisons.

Response: Lines 8-10 will be deleted.

Action: Lines 8-10 will be deleted.

171. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7 Pg.#: NA Line#: NA
Original Specific Comment #: 127

Comment: Table A.7-13 presents noncarcinogenic background risks from perched groundwater. However, some of the values presented in the table as representative background concentrations do not coincide with those presented in Table A.I-1. For example, the value presented in Table A.7-13 for manganese (2.1E-02) does not correspond to any value presented in Table A.I-1 for

manganese. Also, the value presented for zinc in Table A.7-13 (3.2E-01) does not correspond to the value presented in Table A.I-1 (3.5E-01). These tables should be revised to eliminate any inconsistencies.

Response: Changes should be made to remove incorrect values.

Action: Corrections will be made according to values in the table in Attachment A.I.

172. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7 Pg.#: NA Line#: NA
Original Specific Comment #: 128

Comment: Table A.7-16 presents background carcinogenic risks estimated from exposure to sediment, but does not indicate whether the sediment is located in Paddys Run or the Great Miami River. Also, the value presented as the representative background concentration for radium-226+5D (4.3E-01) does not correspond with the value presented in Table A.I-8 (5.0E-01). These tables should be revised to eliminate inconsistencies.

Response: The trespassing youth receptor would contact sediment on property in the storm sewer outfall ditch, the pilot plant drainage ditch, and Paddys Run according to the exposure route table on page A.3-40. Therefore, the sediment is not located in off-property areas such as the Great Miami River.

Action: The text should indicate that the sediment exposure would occur only on FEMP property, thus excluding sediment from the Great Miami River. Corrections will be made according to values in the table in Attachment A.I.

173. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7 Pg.#: NA Line#: NA
Original Specific Comment #: 129

Comment: Table A.7-17 presents background noncarcinogenic risks from exposure to sediment, but does not indicate whether the sediment is located in Paddys Run or the Great Miami River. Also, several of the representative background concentration values presented in Table A.7-17 do not correspond to values presented in Table A.I-8. For example, the value presented for aluminum in Table A.7-17 (3.9E+03) does not correspond to the value presented in Table A.I-8 (1.97E+03). Also, the value presented in Table A.7-17 for copper (1.5E+01) does not correspond to the value presented in Table A.I-8. These tables should be revised to eliminate these inconsistencies.

Response: The trespassing youth receptor would contact sediment on-property in the storm sewer outfall ditch, the pilot plant drainage ditch, and Paddys Run according to the exposure route table on page A.3-40. Therefore, the sediment is not located in off-property areas such as the Great Miami River.

Action: The text should indicate that the sediment exposure would occur only on FEMP property, thus excluding sediment from the Great Miami River. Corrections will be made according to values in the table in Attachment A.I.

174. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7 Pg.#: NA Line#: NA
Original Specific Comment #: 130

Comment: Tables A.7-20 through A.7-26 present PRGs for media at the FEMP facility. However, no tables showing the calculation of the PRGs are included in the report. The report should be revised to include tables showing the calculation of the PRGs.

Response: Agree.

Action: Tables showing the calculation of the PRGs or other appropriate back-up documentation will be added to the report.

175. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.0 Pg.#: All Line#: All
Original Specific Comment #: 118
Comment: Section A.7. summarizes estimated risks and compares them to risks estimated for background (off-site) concentrations of CPCs. However, the summary is inconsistent and confusing. The summary should be revised to (1) clearly present the objective of the section; (2) address significant pathways, routes, and receptors; and (3) include ranges for both carcinogenic and noncarcinogenic risks.
Also, several general statements made in this section appear to be inaccurate. For example, lines 27 to 29 on page A.7-1 state that estimated carcinogenic risks associated with scenarios involving current concentrations and continued access control range from 1E-3 to 1E-6. However, the carcinogenic risk for the off-property RME farmer presented in Table A.5-5 is 1E-02. Also, lines 18 and 19 on page A.7-2 state that magnesium appears to contribute significantly to noncarcinogenic risk via ingestion of milk. However, Table A.VII-8a shows that thallium contributes a greater percentage of this risk. This section should be revised to provide a complete, comprehensive, and accurate summary of risks.
Response: Summary risk characterization tables are being prepared. The summary risk information presented in Section A.7 will be reviewed for accuracy and completeness and modified, as necessary.
Action: As noted in the response.

176. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.1 Pg.#: A.7-1 Line#: 15 and 16
Original Specific Comment #: 119
Comment: These lines discuss the selection of CPCs. The text indicates that CPCs were determined for each media type. Constituents should also be identified for each exposure area. Lines 15 and 16 should be revised to clarify whether CPCs were identified for different exposure areas within each medium.
Response: Agree. CPCs were selected for each exposure area.
Action: The text will be modified to note that CPCs were selected for each area of concern evaluated in the baseline risk assessment.

177. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.2 Pg.#: A.7-5 Line#: 11 to 13
Original Specific Comment #: 121
Comment: These lines introduce risk and hazard quotient results calculated based on background concentrations. The results are correctly identified as being presented in Tables A.7-8 through A.7-19. Because these tables are summary tables, the results should also be presented in detail tables similar to those for site-related concentrations. The report should be revised to include detailed exposure and risk results related to background concentrations.
Response: Agree.
Action: The suggested tables or other appropriate back-up documentation will be included in the report.

178. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.2 Pg.#: A.7-5 Line#: 6 to 8
Original Specific Comment #: 122
Comment: These lines state that in many cases, CPCs in OU5 are at or only slightly above natural background concentrations. This is confusing because one of the CPC screening procedures involved a statistical comparison to background levels. The text should be revised to clarify or delete this statement.
Response: Agree.

Action: The text will be modified to note that a CPC for one area of concern may be at background concentrations in other areas of concern. Also, the statistical procedures used to identify the inorganic and radiological CPCs are conservative (i.e., they tend to select a CPC if there is any question that it may be above background). Thus, certain CPCs in some of the areas of concern were reported at concentrations very similar to background.

179. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.2 Pg.#: A.7-6 Line#: 12 to 18
Original Specific Comment #: 124
Comment: These lines discuss background risks and risks from on-site media. Several of the statements generalize conflicting information, and the major point of these lines is not clear. These lines should be revised for clarity and accuracy.
Response: Agree that the text should be improved.
Action: The text will be reviewed for accuracy and clarity and modified as necessary.

180. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.2 Pg.#: A.7-6 Line#: 8 to 10
Original Specific Comment #: 123
Comment: These lines correctly state that the results of background calculations indicate that toxic effects can occur from background concentrations of radionuclides and chemical constituents. However, the discussion concludes that these results indicate that the procedures used to determine background risks have a conservative bias. The fact that potential risks are identified through their association with background concentrations in no way suggests that the procedures used to determine risks have a conservative bias. It is possible that exposure to naturally occurring constituents can result in some degree of risk for potential receptors. Lines 8 to 10 should be revised to amend the conclusion that the calculation of background risks shows that the procedures used to calculate those risks have a conservative bias.
Response: We agree that exposure to naturally occurring constituents can result in some degree of risk for potential receptors. However, magnitude of the risk associated with background in this project is high, suggesting that the risk analysis does have a conservative bias. In fact, this risk analysis, like all Superfund risk analyses, was constructed to err on the side of safety (i.e., to have a conservative bias).
Action: Lines 8 to 10 will be deleted.

181. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.2 Pg.#: All Line#: All
Original Specific Comment #: 120
Comment: This section presents risks calculated using "background" concentrations of CPCs. Because these risks are estimated for only RME exposures, they should be compared only to similar exposures for on-site concentrations of CPCs. This section should be reviewed to ensure that only similar exposure scenarios are compared and that the text clearly presents the exposure scenarios being compared.
Response: Agree.
Action: The text will be reviewed, as requested, and modified as necessary.

182. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: A.7.3 Page#: A.7-6 Line#: 25
Original Comment #: 12
Comment: This section discusses the calculation of media specific preliminary remediation goals (PRGs) and provides the PRGs in Tables A.7-20 through A.7-26, but fails to explain the form and intent of these PRG tables. In these tables, it is stated that a PRG value for a constituent implies that the calculated level of contaminant must be achieved in a remediation effort in the

given media in order to achieve an "acceptable risk" for the receptor evaluated; what this "acceptable risk" is should be clarified in the text. Also to be clarified is the meaning of a constituent's PRG relative to the risk column (10^{-5} for example) for which it's under. In reading the tables, does remediation to a PRG for an individual constituent ensure the risk goal for *only* that single constituent? Or are the tables stating that if remediation is to meet a given risk goal (10^{-5} for example), that remediation should be performed to meet the PRGs for *all* the constituents listing in the given media. Table explanations should be provided in the text and as footnotes in the tables.

Response: Agree that text and tables should be clarified. PRGs are presented in Section A.7 to give the reader and individuals preparing the FS a starting point for calculations and discussions regarding PRGs for the site. It should be simply stated that the PRGs were calculated for selected receptors and target risk levels. The narrative regarding "acceptable risk" will be removed from Section A.7 because the issue is a risk management issue which is more appropriately handled in the FS and ROD for the site.

Action: Text and tables will be clarified.

183. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.3 Pg.#: A.7-6 Line#: All
Original Specific Comment #: 125

Comment: Section A.7.3 discusses calculating PRGs. However, two issues regarding the estimated PRGs were identified. First, it is unclear why PRGs were estimated for all CPCs rather than simply focusing on the COCs. Second, it is unclear why PRGs were estimated only for the most conservative scenario rather than for a range of scenarios to allow comparison of the effects of various land uses. This section should be revised to address these issues.

Response: Agree. However, PRGs are included in the baseline to give the reader and those individuals preparing the FS a starting point. The detailed analysis of PRGs, including the evaluation of a range of scenarios, will be presented in the Operable Unit 5 FS.

Action: PRGs will be provided for COCs only.

184. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.7.3 Pg.#: A.7-6 Line#: NA
Original Specific Comment #: 126

Comment: Section A.7.3 introduces and presents PRGs calculated for OU5; however, the text does not refer to the procedures used to calculate these PRGs. The section should be revised to reference the procedures used to calculate the PRGs and to clearly describe how these PRGs will be used.

Response: Agree.

Action: The text will be revised to note that PRGs were calculated for several site-specific receptors using the same method used to calculate risk for the baseline risk assessment. PRGs were calculated using target risk levels of 10^{-6}, 10^{-5}, and 10^{-4} for carcinogens and a hazard quotient of 0.2 for noncarcinogens. In some cases, the PRG calculation is a simple back calculation using the baseline risk assessment exposure dose equations and the established target risk levels. In other cases, the PRG is established by rationing off risk results established in the baseline (in other words, if concentration "X" produces risk "Y," what concentration produces a target risk level?).

185. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.II.1.2.1 Pg.#: A.II-2 Line#: 14
Original Specific Comment #: 131

Comment: This line states that the underlying data distributions were determined to be normal, lognormal, or "neither." In some cases, however, insufficient data points are identified to adequately

characterize the underlying distribution. Therefore, the text should be revised to present the three possible characterizations as normal, lognormal, and undetermined.

Response: Agree with commentor.

Action: Line No. 12-14 was edited to read "Prior to statistical analysis of an environmental data set, the data set must be analyzed to determine whether the data were drawn from an underlying normal, lognormal, or undetermined distribution."

186. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.II.1.2.1 Pg.#: A.II-8 Line#: 28
Original Specific Comment #: 134
Comment: This line refers to Table B-2 as a source of the data used for an example calculation. However, the referenced table appears to include only data for sample numbers 56 through 81. The text or table should be revised to resolve this discrepancy.
Response: All Supplement B tables consisted of hypothetical data. All sample calculations were redone using lead data from surface soil in the shooting range.
Action: All Supplement B tables were removed from the report.

187. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.II.1.2.1.1 Pg.#: A.II-4 Line#: 9
Original Specific Comment #: 132
Comment: This line refers to Table A-2. However, no such table was included in the document reviewed. The text should be revised to reference another table, or Table A-2 should be added to the document.
Response: Agree with commentor. The table was omitted during the copying process
Action: Table A-2 was inserted into the report.

188. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.II.1.2.1.1 Pg.#: A.II-6 Line#: All
Original Specific Comment #: 133
Comment: This section discusses the Shapiro-Francia goodness-of-fit test. However, no reference for the source of this test is provided. The text should be revised to reference this test.
Response: The reference document is "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities", Draft Addendum to Interim Final Guidance, EPA, 1989.
Action: The text will be revised as suggested.

189. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.III.1 Pg.#: A-III-2 Line#: 1 to 9
Original Specific Comment #: 135
Comment: These lines discuss the differences between PRGs and RBCs. However, based on this discussion, it would appear that the only difference between these values is the target risk. If this is true, then the PRG and RBC values should only differ by factors of 10, which is not the case. This section should be revised to more clearly present the differences between PRGs and RBCs.
Response: Agree. RBCs were developed based on methods presented in RAGS-Part B. PRGs were developed based on project-specific exposure assumptions detailed in Section A.3.
Action: Text will be modified as suggested.

190. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.III.3.2 Pg.#: A-III-4 Line#: All
Original Specific Comment #: 136
Comment: Several deficiencies were noted in Table A.III.1. These include the following: (1) carcinogenic slope factors for oral exposure and inhalation exposure to radionuclides are not defined, (2) a

value is presented for a gamma shielding factor without referencing the source or function of the value, and (3) a volatilization factor of 0.5 liter per cubic meter (L/m^3) is presented when, in some cases, a volatilization factor of 0 L/m^3 is used. This table should be revised as appropriate to address these deficiencies.

Response: Table A.III-1 will be revised to clarify deficiency 1; deficiencies 2 and 3 are explained in the reference itself and in the case of the volatilization factor, in text as well.

Action: 1. The chemical/radionuclide specific value for the carcinogenic slope factor for oral and inhalation exposures will be defined as: cancer slope factor, chemical or radionuclide, oral; and, cancer slope factor, chemical or radionuclide, inhalation.
2. A.III.3.1 explains that the input parameters are derived from RAGS, part B. RAGS discusses in 4.1.2 the function of the gamma shielding factor. This factor accounts for attenuation of radiation fields due to shielding (e.g., by structures, terrain, or engineered barriers). The default value of 0.2 for both residential and commercial/industrial land-use scenarios reflects a 20 percent reduction in external exposure due to shielding from structures, which is a conservative assumption.
3. A volatilization factor of 0.5 L/m^3 was applied <u>only</u> to volatile compounds as described in text as "those compounds having a Henry's Law constant greater than 10^{-5}."

191. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.III.3.2 Pg.#: A-III-5 Line#: 4 to 7
Original Specific Comment #: 137

Comment: These lines present equations for estimating noncarcinogenic RBCs for groundwater and surface water. Several errors were identified in these equations. These include (1) using the parameters "TR" and "AT_c" in the numerator in place of "THQ" and "ATn," and (2) using the parameter "SF_i" in the denominator in place of the parameter "$1/RfD_i$." These equations should be revised as appropriate.

Response: Agree.

Action: 1) TR will be changed to THQ and AT_c will be corrected to AT_n since toxicants are being discussed. 2) The parameter SF; in the denominator will be revised to read $1/RfD_i$.

192. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.III.3.3 Pg.#: A-III-6 Line#: 1 to 7
Original Specific Comment #: 139

Comment: These lines present equations used to calculate RBCs for soil and sediment at the facility. However, the concentration term in the first and third equations is presented as "C_w" rather than as "C_s." These equations should be revised to include the appropriate concentration parameter.

Response: Agree.

Action: The concentration terms in the first and third equations will be revised to read C_s.

193. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.III.3.3 Pg.#: All Line#: All
Original Specific Comment #: 138

Comment: Section A.III.3.3 presents the methodology used to calculate the RBCs for soil and sediment at the facility. However, volatilization from and particulate generation of contaminated soil are exposure pathways not considered in calculating the RBCs. These pathways should be included in setting soil RBCs, or the text should be revised to justify their exclusion.

Response: RBCs were calculated per RAGS Part B. Equations suggested for the residential land-use scenario (the most conservative land-use scenario) do not consider the inhalation pathway. As discussed in the guidance, the air pathways are generally not as significant for a hypothetical residential land-use scenario as is the incidental ingestion of soil pathways.

Action: The text will be modified as suggested.

194. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.V.26 Pg.#: A-V-17 Line#: NA
Original Specific Comment #: 141
Comment: Although minimal data are available regarding the toxicity of cesium, most available information is from cesium-137 studies. The similarities between the chemistry and biochemistry of cesium and potassium should be noted in the text. Summaries are available in compendia such as Stokinger (1981), which was mislabeled as "Stokinger 1982" on Page A-R-19, and in Carson and others (1986).
Response: Agree.
Action: Stokinger (1981) will be used to note the similarities between cesium-137 and potassium with regard to biochemistry. The text will now read:

Cesium

A comparative study of the acute toxicity of cesium and potassium hydroxides by mouth, skin, and eye in rats, rabbits and guinea pigs showed that cesium hydroxide was 3-fold less acutely toxic by mouth; by skin, 5 percent CsOH was regarded as safe for human skin contact, whereas 5 percent KOH was a mild skin irritant. (ACGIH)

195. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.V.3.1 Pg.#: A-V-2 Line#: NA
Original Specific Comment #: 140
Comment: Acetonitrile, like acrylonitrile, has cyanide-like biological actions. This should be mentioned here, as it was in Section A.V.5.
Response: Agree.
Action: The cyanide-like actions of acetonitrile will be included in A-V-2. The text will read:

Acetonitrile

Willhite reported that oral and IP doses of 100-400 mg/kg caused overt maternal toxicity in hamsters. The author concluded that the toxicity was due to cyanide liberated from the acetonitrile - A TWA TLV of 40 ppm is recommended by ACGIH to protect against organic cyanide poisoning.

196. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.V.89 Pg.#: A-V-61 Line#: 5
Original Specific Comment #: 142
Comment: The statement that "EPA stated that the dinitrophenols are administrative" should be clarified.
Response: Agree.
Action: The statement that the dinitrophenols are administrative will be replaced with the isomers of dinitrophenol are similar toxicologically and chemically. Systematically, they disrupt oxidative phosphorylation causing increased metabolism, oxygen consumption, and heat production. Chronic exposure may result in kidney and liver damage and cataract formation.

197. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.V.99 Pg.#: A-V-76 Line#: NA
Original Specific Comment #: 143
Comment: As with cesium, a discussion of the biochemistry of ruthenium should be included in the text. Stokinger (1981), Carson and others (1986), or similar compendia should be researched further.
Response: Agree.
Action: A discussion of the biochemistry of ruthenium will be included in the text. The text will read:

Ruthenium

Oral retention of ruthenium is but a minute fraction of that from intraperitoneal injection. Muscle and bone retained greater amounts of Ru-106 than the liver and kidneys. Absorption

from the GI tract is believed to decrease with age. Other, as yet unknown, factors could influence distribution and excretion upon prolonged exposure by any route of administration.

198. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.VII Pg.#: All Line#: All
Original Specific Comment #: 144
Comment: The tables presented in this section use the term "Not Applicable (NA)" when either a chemical is not a chemical of interest for a particular medium or when the exposure pathway is not applicable. Although both of these circumstances result in no quantification of risk, the rationale behind each is very different. To ease review and interpretation of these tables, the abbreviation "NA" should be replaced with two separate and distinct terms that indicate the reason that no risk was quantified.
Response: Due to the size and complexity of the risk analysis, the tables presented in Attachment A.VII are computer generated and the "NA" and "ND" are placed via macros. The tables will be adjusted as requested or a CPC list (by media) will be included in Attachment A.VII as a reference for the reader.
Action: As stated in the response.

199. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.VII Pg.#: NA Line#: NA
Original Specific Comment #: 145
Comment: Apparent errors and inconsistencies were discovered during review of several tables in this section. For example, Table A.VIII-1c, which lists carcinogenic risks for the groundskeeper in Area 3 (northeast corner of the production area), does not list several carcinogenic chemicals presented as surface soil CPCs for this area in Table A.IV-3. Chemicals that were omitted include 1,1,2,2-tetrachlorethane; 2,4-dinitrotoluene; 2,6-dinitrotoluene; 3,3'-dichlorobenzidine; and beta-BHC.
Another example regards apparent errors in Table A.VII-1a. Errors in this table include the following: (1) tetrachloroethene is presented with an inhalation slope factor when no inhalation slope factor is presented for this chemical in Section A.4, and (2) risks presented for inhalation and ingestion of chrysene, and dermal contact with beryllium and Aroclor-1254 could not be replicated. Also, it appears that all risks from dermal contact with PAHs were assumed to be equal to risks from oral exposure. The tables in this section should be revised as necessary to eliminate any calculation errors, to ensure agreement with tables in Section A.VII, and to footnote any procedural derivations or assumptions.
Response: 1) The tables in the referenced attachments will be reviewed for accuracy and inconsistencies and corrected as necessary. However, note that 1,1,2,2-tetrachloroethane, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 3,3-dichlorobenzidine, and beta-BHC were not selected as CPCs for the risk evaluation of soil. 2) Regarding PCE, the toxicity criteria table in Section A.4 will be corrected, as necessary. 3) Please review the example calculations provided earlier for risk calculations for chrysene, beryllium, and Aroclor-1254. 3) The reviewers observation regarding PAHs and the dermal route is correct.
Action: Tables in the referenced attachments will be reviewed for accuracy and inconsistencies and corrected as necessary.

200. Organization: U.S. EPA Commentor: Saric
Section#: A.VIII Page #: All Line #: All
Original General Comment #: 10
Comment: Attachment A.VIII presents and discusses the model used to estimate indoor airborne radon-222 levels from known soil radium-226 levels. However, validation of the model is not discussed. Granted, the model predicts indoor concentrations for hypothetical future residences, for which validation would require building an actual house on the facility. However, the model also

predicts a soil gas concentration that could be measured and used to evaluate the accuracy of the model. The text should be revised to discuss how the model will be validated or why it cannot be validated, as well as the impact of any validation (or lack of validation) on the expected accuracy of the model.

Response: Results from the RAETRAD code have been compared to measured radon concentrations in soil gas, soil gas permeability, and indoor radon levels at the radon testing facilities in Grand Junction, Colorado during its development for EPA. This testing confirmed that the code's predictions were generally within 2 standard deviations of the mean measured value for indoor radon concentrations.

Action: This response and a suitable reference will be inserted after the sentence ending on line 8 of page A.VIII-2 in the next draft of the RI.

201. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.VIII Pg.#: A.VIII-2 Line#: 29 to 31
Original Specific Comment #: 146

Comment: These lines state that intakes were calculated using parameter values presented in Table A.3-20. However, some of the values in the table conflict with those that were actually used to calculate radon-222 intakes. Because the values actually used to calculate intake are presented in footnotes to Table A.VIII-1, the text should be revised appropriately.

Response: Agree.

Action: Reference Table A.V.III-1 in text. However, it should be noted that Table A.3-20 and A.3-21 contain the same values for indoor inhalation exposures as those used in the radon calculations.

202. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.VIII Pg.#: NA Line#: All
Original Specific Comment #: 147

Comment: Several errors were identified in Table A.VIII-1. These include the following: (1) a failure to identify the source of the radium-226 levels for the Southern Area, (2) an apparent contradiction between symbols in the table and associated equations, and (3) incomplete and inconsistent footnoting to the table. The table and text should be revised as necessary to clearly identify the sources of all soil radium-226 concentrations used in the model, to ensure that all symbols used in the tables and corresponding equations are consistent, and to provide full and comprehensive footnotes for the table.

Response: Agree.

Action: The source of the Ra-226 concentration in soil will be identified and the footnotes will be updated.

203. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.VIII-1 Pg.#: NA Line#: NA
Original Specific Comment #: 148

Comment: Exhibit A.VIII-1 presents input parameters for the RAETRAD model used to estimate the movement of radon-222 into residences. Because the nature of the model is not clearly presented, it cannot be determined whether the presented parameters represent an RME scenario. Specifically, the parameters show a pressure gradient that would force air into a residence from the surrounding atmosphere. This may increase radon-222 concentrations from radon-222 in air surrounding the house, but may dampen radon-222 movement into the residence through the foundation. The text should clearly show that the selected input parameters represent an RME exposure scenario, or alternative parameters should be used that establish such a scenario.

Response: The parameters in question describe a negative pressure in the house. This would tend to increase the flow of radon through the foundation and raise the level of radon in the home. This negative pressure is generally found only during certain parts of the year. Assuming that

this pressure differential is present for the entire year is conservative. In addition, the radium concentrations that are the source of the radon are 95 percent UCL values.

Action: Insert the following text at line 15 on page A.VII-2: "These parameters describe a situation in which the structure is under negative pressure. This pressure differential tends to increase the flow of radon through the foundation and raise the level of radon in the home. Negative pressure situations are generally seasonal, and assuming that this pressure differential is present for the entire year increases the conservatism of the model."

204. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 19
Comment: Certain citations, such as DOE Order 5400.5, are repeatedly listed as a "TBC" with the rationale that the citations are not ARARs because they are not promulgated. Anticipating its promulgation in the near future, the proposed 10 CFR §834 *Radiation Protection of the Public and the Environment* should be incorporated as a TBC where appropriate. The requirements in this part govern activities conducted by, or for, DOE that might result in the release of radioactive material, the exposure of members of the public to radiation, or contamination of the environment with radionuclides from DOE activities. Incorporation of 10 CFR §834 as a TBC, in parallel with the current DOE order and other relevant and appropriate requirements, will later simplify the transition of the rule as an applicable requirement.
Response: Agreed.
Action: The proposed regulation, 10 CFR §834, will be incorporated in parallel with DOE Order 5400.5 as a TBC until the time when this requirement becomes promulgated, and changes to applicable.

205. Commenting Organization: U.S. EPA Commentor: Jablonowski
Table #: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 20
Comment: Regarding the EPA National Primary Drinking Water Regulations, it is stated in several instances that the requirement is not applicable to OU5 activities because there are no public drinking water systems involved with this remediation. The EPA National Primary Drinking Water Regulations are in fact applicable since DOE is partially funding a public water supply that will be used during the period of aquifer restoration, which is an element of the remediation of groundwater for the site.
Response: Acknowledged, but disagree. The partial funding provided by DOE is earmarked for the installation of and connection to the public water supply. However, DOE is not funding the operation or maintenance of this facility. DOE has no control or responsibility for the management of the Bolton facility's operation or compliance with the National Primary Drinking Water Regulations.
Action: No change is considered necessary.

206. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 21
Comment: Regarding the ARAR section on radiation dose limits, 40 CFR §61.41, *National Emission Standard for Beryllium Rocket Motor Firing*, is listed as an applicable requirement; review this citation and requirement and revise the text accordingly.
Response: Agreed.
Action: This requirement is not pertinent to the Fernald Site and will be removed from the ARARs tables.

207. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 22
Comment: Regarding the ARAR section on radiation dose limits, radionuclide NESHAP 40 CFR §61.92 Subpart H should be listed as an applicable requirement. This requirement states that emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.
Response: Acknowledged. However, the requirement 40 CFR §61.92, Subpart H is considered as applicable in Table ARAR-2.
Action: None required.

208. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 23
Comment: Regarding the ARAR section on the control of radon emissions, radionuclide NESHAP 40 CFR §61.190 Subpart Q should be listed as an applicable requirement since this rule explicitly includes Fernald in its designation of facilities, and since Fernald is presently and/or will continue to be a storage and disposal facility for radium-bearing material. This requirement states that no source at a Department of Energy facility shall emit more than 20 pCi/m^2s of radon-222 as an average for the entire source, into the air.
Response: Agreed.
Action: This requirement will be added as an additional line item to the more general reference for 40 CFR 61, Subpart Q.

209. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: ARAR-2 Page#: N/A Line#: N/A
Original Comment #: 24
Comment: Regarding the ARAR section on radiation dose limits, radionuclide NESHAP 40 CFR §61.92 Subpart H should be listed as an applicable requirement. This requirement states that emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.
Response: This comment appears to be a duplicate of original comment 22.
Action: See comment 207 (original comment 22).

210. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: Att. A.V.68 Pg.#: Line#: Code:
Original Comment# 33
Comment: The lead profile has not been updated as recommended in comments on prior OU reports. The 1994 OSWER Directive sets a screening level of 400 ppm for residential exposures. I do not see any reference to the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children, version 0.99d in this profile. This is the Superfund tool for evaluating lead exposures.
Response: Agree.
Action: The profile will be updated as suggested to recognize the 1994 OSWER Directive for lead and its suggested screening level of 400 ppm.

211. Organization: U.S. EPA Commentor: Saric
Section#: B Page #: All Line #: NA
Original General Comment #: 11

Comment: The page numbering format is inconsistent between the sections of Appendix B. The page numbers of the executive summary (ES), the reference list, and Section B.4 incorporate section numbers (for example, B-ES-1, B-R-1, and B.4-1); however, Sections B.1, B.2, and B.3 do not incorporate section numbers (for example, page B-1). As a result, several pages within Appendix B have the same page numbers, which could cause confusion. The appendix should be revised to consistently incorporate section numbers into the page numbering format.

Response: Agree with commentor.

Action: Page numbering in Appendix B will be revised so that section numbers are consistently incorporated into the page numbering format.

212. Organization: U.S. EPA Commentor: Saric
Section#: B Page #: All Line #: NA
Original General Comment #: 12

Comment: The Appendix B ES discusses contamination associated with different study areas at OU5. However, these study areas are not introduced in the ES. The ES should be revised to include a brief introduction to the study areas designated for the site-wide ecological risk assessment at OU5.

Response: Agree with commentor.

Action: Add the following text to page B-ES-1 at the end of line 13: In order to evaluate potential exposure of ecological receptors to FEMP contaminants, habitat (e.g., grassland) and the size of the home range of receptor species selected for the models developed to quantify total radiation doses were used to subdivide the FEMP into seven study areas (A through G). This approach provides for a more meaningful evaluation of potential risks to ecological receptors than does examining risks associated with the entire 1050-acre site.

213. Organization: U.S. EPA Commentor: Saric
Section#: B Page #: NA Line #: NA
Original General Comment #: 13

Comment: Figures and tables presented in Appendix B do not include page numbers. These figures and tables should have page numbers, and these page numbers should be included in the Table of Contents.

Response: Throughout the RI Report, tables and figures are placed at the end of each section of text in sequential order by table/figure number. This is an adequate substitute for continuous pagination within each section. The Table of Contents lists the table/figure number and title and the reader can easily find a specific graphic.

Action: None.

214. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B Pg.#: B-ES-1 Line#: 27 to 28
Original Specific Comment #: 149

Comment: This sentence states that representative concentrations of nonradiological contaminants were compared to benchmark values that are protective of ecological receptors. However, it does not explain how these benchmark values were established. The ES should briefly explain how these benchmark values were established.

Response: Comment noted. Because the Executive Summary is a succinct summary of the information discussed in the Site-wide Ecological Risk Assessment, many details used to assess potential risks of site contaminants to ecological receptors were not provided. If the reader feels that additional discussion is required, they can refer to the broader discussion contained in the text.

Action: No action necessary.

215. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B Pg.#: NA Line#: NA

Original Specific Comment #: 157

Comment: Figure B.1-1 designates the study areas for the Site-Wide Ecological Risk Assessment. According to the figure, Study Areas A and E apparently overlap. Also, it is unclear what the dotted and vertical hatch marks designate. For clarity, the legend should explain all hatch marks used in the figure.

Response: Agree with commentor.

Action: The legend in Figure B.1.1 will be modified to indicate that the dotted and vertical hatch marks refer to areas within the production area and/or portions of Operable Units 1-4.

216. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B Pg.#: NA Line#: NA
Original Specific Comment #: 169

Comment: Table B.2-2 is intended to summarize the steps followed to identify media-specific final CPCs. Although this table identifies the criteria used in evaluating potential CPCs, it does not specify how these criteria were applied. This table should be revised to reflect not only the criteria used, but also the process or steps followed when evaluating these criteria to determine final CPCs. A flow chart would be the most appropriate means of presenting this information.

Response: Disagree with commentor. Table B.2-2 provides a summary of the steps used to evaluate potential CPCs; the text that follows provides, in great detail, the rational and process used to select appropriate benchmarks for the CPC selection process. Summarizing this discussion in a table format would inappropriately simplify the process.

Action: No action necessary.

217. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B Pg.#: NA Line#: NA
Original Specific Comment #: 176

Comment: Table B.4.2 summarizes the fish species collected from Paddys Run. Although the table adequately presents information on fish species found within each study area, as it is currently formatted, the table makes it difficult to observe trends in the fish population over the years of FEMP operation. This table should be reformatted or divided into separate tables for each study area, similar to Table B.4.3, to more clearly show the population trends of fish species over time.

Response: Disagree with commentor. The table provides an indication of the date and location that a given species was collected and therefore provides an indication of trends over the period of FEMP operations.

Action: No action necessary.

218. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B Pg.#: NA Line#: NA
Original Specific Comment #: 177

Comment: Table B.4.3 does not include a heading explaining the information presented in the second column from the left. The table should be modified to include a heading for this column.

Response: Agree with commentor.

Action: Table B.4-3 will be modified so that a header describing the information contained in the second column of the table is appropriately identified.

219. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.0 Pg.#: B-2 Line#: 15 to 17
Original Specific Comment #: 150

Comment: This sentence states that ecological risks associated with CPCs present in groundwater were indirectly evaluated when the CPCs detected in surface water were examined. This statement implies that such an evaluation is possible because groundwater in the Great Miami Aquifer is

directly discharging to all surface water bodies examined in OU5. However, even if the surface water bodies are hydraulically connected to groundwater, the risk associated with contaminants in surface water does not necessarily characterize the risk posed by groundwater because the contaminant concentrations in groundwater may not be evenly distributed. Therefore, periodic increases or decreases in the discharge of contaminants to the surface water may occur. The text should be revised to clearly state and justify any such assumptions.

Response: Comment noted. No particular assumptions were made about the direct or indirect connection of the Great Miami Aquifer with surface water bodies on the FEMP. What was assumed, for the purposes of the Site-Wide Ecological Risk Assessment, was that surface water samples would reflect contaminant concentrations to which ecological receptors were exposed, regardless of the source of the contamination, be it groundwater, nonpoint source or point source discharges. Statements regarding the use of contaminant concentrations present in surface water samples to indirectly evaluate potential impacts of groundwater on ecological receptors are therefore appropriate.

Action: This portion of the document will be revised as follows: ...groundwater was not considered to be a specific medium of concern. For the purposes of the Site-wide Ecological Risk Assessment, it was assumed that surface water samples would reflect contaminant concentrations to which ecological receptors were exposed, regardless of the source of the contamination, be it groundwater, nonpoint, or point source discharge.

220. Organization: U.S. EPA Commentor: Saric
Section#: B.1.1.2.3 Page #: B-7 Line #: NA
Original General Comment #: 14

Comment: Section B.1.1.2.3 introduces OU5 Study Areas C, D, and E, which consist of grassland communities. However, the text does not explain why the grasslands were divided into these three study areas. The text should be revised to include criteria that distinguishes these three areas.

Response: Comment noted.

Action: Add the following text to page B-7, line 3 .....and the pine plantations. The grassland habitat was subdivided into three smaller areas based primarily on two factors: first, the habitat size of the ecological receptors typically found in the grasslands, and second, the relationship of the entire grassland habitat to the production area, specifically in terms of deposition of airborne contaminants. Because the prevailing wind is from the southwest, Study Area C was expected to have the highest concentrations of uranium (the primary contaminant at the FEMP).

221. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.1.2.3 Pg.#: B-7 Line#: 13
Original Specific Comment #: 151

Comment: This sentence refers to the SSOD included in Study Area E. However, the SSOD is not shown in Figure B.1-1, which shows the study areas included in OU5. Figure B.1-1 should be revised to show the location of the SSOD.

Response: Agree with commentor.

Action: Figure B.1-1 will be modified so that the location of the SSOD is indicated.

222. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.1.2.3 Pg.#: B-7 Line#: 25
Original Specific Comment #: 152

Comment: This sentence refers to the active flyash pile from which drainageways in Study Area E receive runoff. However, Figure B.1-1, shows only the inactive flyash pile. Figure B.1-1 should be revised to show the location of the active flyash pile.

Response: Agree with commentor.

Action: Figure B.1-1 will be modified so that the location of the active flyash pile is indicated.

223. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.1.2.3 Pg.#: B-8 Line#: 26 to 32
Original Specific Comment #: 153
Comment: This paragraph discusses sampling reaches along Paddys Run; however, this section does not provide a figure that shows these reaches. The sampling reaches along Paddys Run should be shown in a figure similar to Figure B.1-4 for the Great Miami River.
Response: Comment noted. Paddys Run was subdivided into two sections for the purposes of the Site-Wide Ecological Risk Assessment; on-property and off-property reaches.
Action: Figure B.1-1 will be modified to indicate where Paddys Run was subdivided into on- and off-property reaches.

224. Organization: U.S. EPA Commentor: Saric
Section#: B.1.2 Page #: All Line #: NA
Original General Comment #: 15
Comment: Section B.1.2 provides a media-specific discussion of the nature and extent of contamination at the Fernald Environmental Management Project (FEMP). However, the text does not relate this contamination to the specific OU5 study areas previously designated in Appendix B. The text should be revised to discuss the nature and extent of contamination at the FEMP in relation to the environmental media at each of the OU5 study areas.
Response: Agree that a more detailed presentation in this section could help the reader gain a better understanding of the nature and extent of contamination in study area. However, Section B.4 and related attachments provide very detailed discussions as well as maps and figures illustrating the nature and extent of contamination. The discussion in Section B.1.2 refers to these detailed presentations in order to help control the length of the document. Furthermore, the reader can refer to Tables B.2-4 through B.2-6 which list the contaminants of potential concern by study area. The text does state that uranium contamination is widespread.
Action: Add the following text to the end of the section. "Tables B.2-4 through B.2-6 list the contaminants of potential concern by study area." Modify line 18 to read, "Uranium contamination of FEMP surface soil is widespread and occurs in all study areas. The occurrence of other radionuclides tend to be localized."

225. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.3 Pg.#: B-12 Line#: 14 to 15
Original Specific Comment #: 154
Comment: Section B.1.3 is introduced as a summary of removal actions most likely to directly impact ecological receptors. The text of Section B.1.3 should be revised to clarify how these actions impact ecological receptors and should specify the receptors being impacted.
Response: Agree with commentor.
Action: Add the following text to Page B-12, line 15.....impact ecological receptors. The greatest impact removal actions have on ecological receptors is by significantly reducing the amount of contamination in an area. For example, by controlling contaminated stormwater, lower concentrations of contaminants will be present in on-property ditches, the SSOD, and in Paddys Run. Thus, the potential risk to both terrestrial receptors using the ditches and creeks as sources of drinking water, as well as the aquatic ecological receptors — especially those in Paddys Run — will be reduced if not eliminated.

226. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.4.1 Pg.#: B-14 Line#: 7 to 11
Original Specific Comment #: 155
Comment: This sentence designates contaminated surface soil and contaminated surface water and sediment in Paddys Run and the Great Miami River as the OU5 contaminant sources of "greatest importance." The text should explain the rationale for this designation.

Response: Agree with commentor.
Action: Edit/add the following text beginning on page B-14 line 9: ....contaminant sources of greatest importance include surface water and sediment in Paddys Run and the Great Miami River and surface soil because contaminants are likely to have concentrated in these media and locations (Paddys Run via contaminated uncontrolled runoff, the Great Miami River via the permitted discharge through the outfall line, and soil through the deposition of airborne contaminants).

227. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.4.2 Pg.#: B-16 Line#: 27
Original Specific Comment #: 156
Comment: This sentence refers to Figure B.1-6; however, no such figure is provided in the report. Either Figure B.1-6 should be provided or its reference should be deleted from the text.
Response: Agree with commentor.
Action: All references to Figure B.1-6 will be removed from the text.

228. Organization: U.S. EPA Commentor: Saric
Section#: B.2 and B.3 Page #: NA Line #: NA
Original General Comment #: 16
Comment: Section B.2 includes tables that summarize factors contributing to uncertainty regarding the different risk assessment elements for nonradiological contaminants (for example, exposure assessment, toxicity screening, and risk characterization). Information regarding the uncertainty should also be provided in Section B.3 for radiological contaminants. Additionally, these tables should interpret whether each uncertainty factor contributes to the overestimation or underestimation of risk, as well as explain the relative magnitude of this contribution.
Response: Agree with commentor.
Action: Tables providing a summary of uncertainties for the various steps used in the risk assessment process will be modified to indicate whether these factors contribute to the under or overestimation of risk. A qualitative indication of degree to which these factors contribute to the under or overestimation of risk will also be provided (low, moderate, high). A table summarizing factors contributing to uncertainty associated with radiological contaminants will also be prepared and included in the text.

229. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.0 Pg.#: B-1 Line#: 6 to 7
Original Specific Comment #: 158
Comment: This sentence refers to media-specific benchmark values that are protective of ecological receptors, but does not refer to the specific source of these values. The text should briefly discuss the specific source of or type of values used (for example, ambient water quality criteria) or should refer to a discussion of this elsewhere in the report.
Response: Comment noted. However, this paragraph serves simply as an overview of the information discussed in detail in this section of the text.
Action: A sentence will be added to Sections B.2.1.1, B.2.1.2, and B.2.1.3 to clearly indicate that the source of each benchmark value used to screen these data is identified in the appropriate, media-specific Appendix table.

230. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.1 Pg.#: B-1 Line#: 12
Original Specific Comment #: 159
Comment: This sentence refers to U.S. EPA Region 5 guidelines used in the exposure assessment. These guidelines should be specifically identified or referenced in the text.
Response: Agree with commentor.
Action: The EPA Region V guidance will be appropriately referenced.

231. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.1 Pg.#: B-6 Line#: 2 to 4
Original Specific Comment #: 160
Comment: This sentence states that only those drainages that are known to contain water for a "large portion" of the year were considered. The description "large portion" is vague and should be defined.
Response: Agree with commentor.
Action: This section of the text will be modified to indicate that "large portion" infers that water will be present for the majority of the year (e.g., > 25 weeks), thereby increasing the probability of contact by ecological receptors.

232. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.1 Pg.#: B-7 Line#: 21 to 25
Original Specific Comment #: 161
Comment: This paragraph states that although mercury levels in the Great Miami River were significantly lower than reported background values, this metal was retained for further consideration in this risk assessment. Justification for retaining mercury as a CPC should be provided.
Response: Agree with commentor.
Action: This section will be modified to indicate that mercury was retained because of its well-documented propensity to bioaccumulate and biomagnify.

233. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.1 Pg.#: B-7 Line#: 25
Original Specific Comment #: 162
Comment: This sentence refers to Attachment B.I for a summary of the CPC screening process. However, no such summary is apparent in Attachment B.I. This discrepancy should be resolved, and the text should be revised appropriately.
Response: Agree with commentor.
Action: This sentence will be modified so that it only refers the reader to Attachment B.I, and does not indicate that Attachment B.I is a summary of the screening process.

234. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.1 Pg.#: B-9 Line#: 18 to 20
Original Specific Comment #: 163
Comment: This sentence refers to contaminants identified as "final surface water CPCs terrestrial receptors exclusively relying on drainage ditches..." This sentence appears to be incomplete and should be clarified.
Response: Agree with commentor.
Action: This sentence will be rewritten as follows: This screening process identified the following contaminants as final surface water CPCs for terrestrial receptors that exclusively rely on the drainage ditches on the FEMP as sources of drinking water.

235. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.2 Pg.#: B-11 Line#: 19 and 25
Original Specific Comment #: 164
Comment: This section identifies uranium as a final inorganic sediment CPC for Paddys Run and the Great Miami River. However, Attachment B.IV, which is referred to in this section, does not identify uranium as a CPC. This discrepancy should be resolved, and the text or attachment revised accordingly.
Response: Agree with commentor.

Action: Attachment B.IV will be modified so that it indicates that uranium was retained for further consideration as a final CPC, even though a medium-specific benchmark value was not identified for this contaminant.

236. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.2.3 Pg.#: B-13 Line#: 21 to 22
Original Specific Comment #: 165
Comment: This sentence identifies thorium as a final inorganic soil CPC. However, Attachment B.V, which is referred to in this section, does not identify thorium as a CPC. This discrepancy should be resolved, and the text or attachment revised accordingly.
Response: Agree with commentor.
Action: Attachment B.V will be modified so that it indicates that thorium was retained for further consideration as a final CPC, even though a medium-specific benchmark value was not identified for this contaminant.

237. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.4.1 Pg.#: B-28 Line#: 1 to 2
Original Specific Comment #: 166
Comment: This sentence states that quotient values for aluminum exceeding 1.0 were detected in samples collected from Reaches 1 and 2 on the Great Miami River. However, Table B.2-4 indicates that quotient values for aluminum exceeding 1.0 were detected in samples collected from Reaches 2 and 3. This discrepancy between the text and table should be resolved.
Response: Agree with commentor.
Action: This portion of the text will be modified to indicate that quotient values for aluminum exceeding 1.0 were detected in samples collected from Reaches 2 and 3 in the Great Miami River.

238. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.4.3 Pg.#: B-33 Line#: 30 to 32
Original Specific Comment #: 167
Comment: This paragraph identifies study areas in which quotient values for CPCs in surface soil are greater than or equal to 1.0. In Study Areas B and F, chrysene and seven PAHs, respectively, are identified as having a quotient value greater than 1.0. However, Table B.2-6 identifies quotient values greater than 1.0 for chrysene and the seven PAHs in Study Areas A and E, respectively, but does not identify quotient values greater than 1.0 for these contaminants in Study Areas B and F. This discrepancy should be resolved, and the text revised accordingly.
Response: Agree with commentor.
Action: This section of text will be revised so that it is consistent with the information contained in Table B.2-6.

239. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.2.4.3 Pg.#: B-34 Line#: 18 to 19
Original Specific Comment #: 168
Comment: This sentence states that representative concentrations of manganese in the outer contour exceeded the benchmark criterion. However, Table B.2-6 indicates that representative manganese concentrations exceeded benchmark criterion only in the inner contour. This discrepancy should be resolved, and the text revised accordingly.
Response: Agree with commentor.
Action: This section of the text will be revised so that it is consistent with information contained in Table B.2-6.

240. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.0 Pg.#: B-1 Line#: 16
Original Specific Comment #: 170
Comment: This sentence states that no threat of "severe" radiation effects exists to populations of terrestrial or aquatic biota. The term "severe" is unclear and should be quantified or further defined in the text.
Response: Agree with commentor.
Action: The term "severe" will be deleted from this sentence.

241. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: B.3.2.1 Page#: B-5 Line#: 10
Original Comment #: 14
Comment: It is stated that the ground beneath the animals (white-footed deer mouse/meadow vole) was represented as a cylinder with a radius of 100 meters, and that the animal was assumed to be placed along the central axis of the cylinder; indicate the length of this cylinder. Since the animal is inside the cylinder (being on the central axis), it is then unclear what the intended location of the animal really is, whether it is above the ground or burrowing into contaminated soil. Assuming the animal is on the surface, this cylinder geometry approaches a flat plane for a small animal, but it would seem more sensible to use the infinite plane/slab geometry provided by MicroShield. If the animal is being modeled as burrowing, a 200 meter diameter cylinder seems inappropriately large for a mouse. This paragraph should be reviewed and revised so that the source-to-receptor geometry can be understood by the reader.
Response: Animals were assumed to be at the central axis of the cylinder on the surface of the soil. The cylinder has a radius of 100 m and a thickness of 1.524 m. The radius value of 100 m was chosen to represent an infinite plane of soil with the concentrations of radionuclides assumed to be constant throughout the cylinder. Since 100 meters is much greater than the mean free path of gamma rays from the radionuclides present in the soil, this distance would represent an infinite length. The results from this analysis would be virtually identical to those calculated using the infinite plane/slab geometry provided by MicroShield.
Action: Text (line 13) will be revised to state: ...central axis of the cylinder, on the surface of the soil.

242. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.2.1 Pg.#: B-5 Line#: 10
Original Specific Comment #: 171
Comment: This sentence assumes a radius of 100 meters and a thickness of 5 feet for the cylinder that represents the volume of soil for the MicroShield® computer program used to calculate the absorbed dose to mammals. Justification for the 5-foot thickness is provided; however, no such justification is provided for the 100-meter cylinder radius. The text should be revised to include the rationale for the radius.
Response: The 100 m radius was chosen to represent an infinite plane of soil with the concentrations of radionuclides assumed to be constant throughout the cylinder.
Action: Text (line 12) will be revised to state: ...semi-infinite soil thickness, while the 100 meter cylinder radius represents an infinite plane.

243. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.2.2 Pg.#: B-6 Line#: 11
Original Specific Comment #: 172
Comment: As discussed in Specific Comment #171, the 100-meter cylinder radius assumed to calculate the absorbed dose to pine trees should be explained in the text.
Response: See response to Comments 241 and 242.
Action: A new sentence (line 11) will be inserted: These values were chosen for the same reason as for the terrestrial mammals (see Section B.3.2.1).

244. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: B.3.2.2 Page#: B-6 Line#: 8
Original Comment #: 15
Comment: This section addresses the calculation of absorbed dose to pine trees due to external exposure; it is assumed that the source of exposure is the contaminated soil beneath the trees, but that is not made clear. If this is the case, then the fact that a pine's root system would not only be in direct contact with, but surrounded by contaminated soil, seems to have been neglected and needs to be considered. In line #20 it is stated that the reported doses are calculated at a height of 3 cm above the ground, though in reality the tree would be in direct contact with contaminated soil; the tree should be modeled at contact with the contaminated soil to address exposure to the roots.
Response: The height of 3 cm was selected as the dose calculation point to represent a mean value for the living mass of the entire tree. While the pine's roots are surrounded by contaminated soil, this is outweighed by the fact that most of the tree's living mass is aboveground, and most of the aboveground mass is at a distance of much greater than 3 cm above the ground. The dose to the tree roots would increase by approximately a factor of 2 (from 180_ to 360_ exposure) if it were modeled as being surrounded by soil. However, the exposure to the aboveground tree mass is being overstated by more than a factor of 2 when calculating the exposure at 3 cm. Thus, for dose to the entire tree, use of 3 cm to calculate dose results in a conservative calculated value.
Action: None.

245. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.2.3 Pg.#: B-7 Line#: 13
Original Specific Comment #: 173
Comment: This sentence assumes a radius of 10 meters and a thickness of 30.5 centimeters for the cylinder that represents the volume of sediment for the MicroShield® computer program used to calculate the absorbed dose to shiners. Justification for the 10-meter radius is provided; however, no such justification is provided for the 30.5-centimeter cylinder thickness. The text should include the rationale for the thickness.
Response: The 30.5 cm cylinder thickness was chosen to represent an infinite plane of sediment with the concentrations of radionuclides assumed to be constant throughout the cylinder. Since 30.5 meters is much greater than the mean free path of gamma rays from the radionuclides present in the sediment, this distance would represent an infinite thickness.
Action: A new sentence (line 13) will be inserted: The 30.5 cm cylinder thickness value was chosen to represent an infinite thickness of sediment with respect to gamma ray transport through solid media such as the sediment.

246. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.2.3 Pg.#: B-8 Line#: 22
Original Specific Comment #: 174
Comment: This sentence states that a "slight overestimation" results from assuming unity for the absorbed fraction for photon radiation. The term "slight overestimation" should be further defined.
Response: As noted in the text (line 22), the "slight overestimate" is so small that it would not be noticeable when compared to the much larger dose from particulate radiation. In addition, the method used leads to a conservative estimate of the dose to the pine tree. Thus, further elaboration of this value is not warranted.
Action: None.

247. Organization: U.S. EPA Commentor: Saric
Section#: B.4 Page #: All Line #: NA
Original General Comment #: 17

Comment: Section B.4 refers to several figures that are not included in Appendix B. These figures should be included in Appendix B, or the text should specifically state where these figures are located.
Response: Section B.4 refers to figures that were included in Chapter 2.0 of the RI Report; inclusion of these figures again in this section of the report would be redundant and unnecessarily add to the size of the document.
Action: No action necessary.

248. Organization: U.S. EPA Commentor: Saric
Section#: B.4.2 Page #: All Line #: NA
Original General Comment #: 18
Comment: Section B.4.2 summarizes the ecological risk assessment results, including the CPCs present in various environmental media and respective study areas. This section should include a table presenting the CPC information in a more clear and concise manner. The table should summarize CPCs and their corresponding benchmarks according to study area and environmental media. Additionally, a table such as this should be included in Volume 1 of 5, Section 7.6.4, of the Draft Remedial Investigation Report for OU5.
Response: Comment noted. Incorporation of such a table would simply dulpicate information already summarized in sections B.2 and B.3. In order to bring this summary information to the reader's attention, these sections will be refered to in the text, where appropriate.
Action: The text will be modified to incorporate references to summary tables included in other sections of Appendix B.

249. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.4.2 Pg.#: B.4-12 Line#: 4 to 5
Original Specific Comment #: 175
Comment: The summary of ecological risk assessment results presented in Section B.4.2 states that biological studies conducted over the years suggest that biological communities have apparently remained stable over the period of operations at the FEMP. This sentence is too general in its description of these studies. The text should be revised to present additional information that identifies and briefly summarizes the specific studies conducted and that specifies which "communities" have apparently remained stable.
Response: Disagree with commentor. All studies performed to date are summarized in the RI report; reference to the location of these summary discussions is provided in Appendix B. This section of the text will, however, incorporate a reference to section B.4.1 for clarification.
Action: For the purposes of clarification, this section of text will be modified to incorporate a reference to the discussion contained in Section B.4.1.

250. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.IX Pg.#: NA Line#: NA
Original Specific Comment #: 178
Comment: Table B.IX-1 presents a summary of absorbed dose by areas and pathway. Within this table, the terms "awaiting" and "n/a" are included along with the maximum and mean absorbed doses, but are not defined. These terms should be defined as they apply to the information presented in the table.
Response: Term "awaiting" was inadvertently left in table. Term "n/a" is defined as "not applicable."
Action: Table will be revised to define "n/a" and delete the term "awaiting."

251. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: C.1, C.2, & C.3
Original Comment #: 13

Comment: These sections present tables of contaminant parameter data for various drainage areas and media, generally entitled Summary of Positive/Nonpositive Detections. These tables should be marked with table and page numbers, and should be indicated in the table of contents.
Response: Comment noted. However, these tables are not being revised in order to control the cost of reproduction for the final version. The text does note that these summary tables are included at the end of their respective sections.
Action: None required.

252. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: D.1.1.3.2 Page#: D.1-24 Line#:
Original Comment #: 16
Comment: It is stated that thorium contamination from FEMP activities is mostly from thorium-232. This statement contradicts the results presented in Table A.2-1 which indicates occurrences of thorium-228, thorium-230, and thorium-234 in surface soils at sample frequencies greater than 85% and activities higher than thorium-232. Review the data and revise the text accordingly.
Response: Agree.
Action: The sentence stating, "Thorium contamination from FEMP activities is mostly from thorium-232.", will be deleted. The next sentence will state, "The characterization and behavior of total thorium and thorium-232 should be analogous..."

253. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: D.1.1.3.3 Page#: D.1-27 Line#: 20
Original Comment #: 17
Comment: It is stated here that radium-228 is not a significant contaminant of the FEMP. Explain then why, under the current land use scenario, the greatest carcinogenic risks for the exploring youth are due to exposure to surface soil at the former production area, with radium-228 and thorium-228 being the primary contaminants (see section A.7).
Response: Agree.
Action: The sentence stating "Based on the data in the following discussion, it was determined that radium-228 is not a significant contaminant of the FEMP." will be deleted. The next sentence will state "All activities of radium-228 ..."

254. Commenting Organization: U.S. EPA Commentor: Jablonowski
Section#: D.1.1.3.4 Page#: D.1-29 Line#: 19
Original Comment #: 18
Comment: It is stated here that thorium-228 is not a significant contaminant of the FEMP. Explain then why, under the current land use scenario, the greatest carcinogenic risks for the exploring youth are due to exposure to surface soil at the former production are, with radium-228 and thorium-228 being the primary contaminants (see section A.7). Also, thorium-228 was detected at greater than 5 times background almost as often as thorium-230 and thorium-232.
Response: Agree.
Action: The sentence stating "Based on the data in the following discussion, it was determined that thorium-228 is not a significant contaminant of the FEMP." will be deleted. The next sentence will state "All activities of thorium-228 ..."

255. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.10 Pg.#: D.2-59 Line#: 14
Original Specific Comment #: 191
Comment: The text states that most of the inorganic parameters were detected in samples from the 0- to 0.5-foot and from the 1.0- to 1.5-foot-depth intervals, implying that no parameters were detected in the 0.5- to 1.0-foot interval. However, according to Table D.2-10, no samples

were collected from the 0.5- to 1.0-foot-depth interval. The text should be revised to clearly state that no samples were collected from this interval.

Response: Agree.

Action: The text will be modified as follows, "...1.0 to 1.5 feet. No samples were collected in the 0.5 to 1.0-foot depth interval."

256. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.10 Pg.#: D.2-59 Line#: 16
Original Specific Comment #: 192

Comment: The text states that beryllium was detected at concentrations greater than two times background in samples collected form the 1.0- to 1.5-foot-depth interval at Boring 11109. Table D.2-10 shows that lead was also detected at concentrations greater than two times background in samples collected from the 1.0- to 1.5-foot-depth interval. According to tables in H-10, this detection was also from Boring 11109. The text should be revised to clearly state that lead was also detected at this interval and boring.

Response: Agree. The text will be modified as shown below.

Action: The text will be modified as follows. "In addition, beryllium and lead were detected at concentrations greater than..."

257. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.10 Pg.#: D.2-60 Line#: 11
Original Specific Comment #: 193

Comment: The text states that several inorganic contaminants were detected in samples from the 1.5- to 3.0-foot and 5- to 10-foot-depth intervals, implying that no contaminants were detected in the 3- to 5-foot-depth interval. However, according to Table D.2-10, no samples were collected from the 3- to 5-foot-depth interval or below the 10-foot-depth interval. The text should be revised to clearly state that no samples were collected from these intervals. Also, additional soil samples should be collected and analyzed to determine the vertical extent of inorganic contamination.

Response: Agree to the need for clarification regarding the sampling intervals and to the need for justifying that the nature and extent of contamination has been characterized sufficient for purposes of the RI/FS.

Action: The text will be modified as follows, "...5.0 to 10.0 feet. No samples were collected from the 3- to 5-foot depth interval or below the 10-foot-depth interval." The following paragraph will be added to the beginning of Section 4.6 and Appendix D to clarify the subsurface soil sampling: Although there is sufficient data to present the nature and extent of contamination for the feasibility study and risk assessment, it is recognized that in some instances there will be a need for further sampling to support the actual remediation. With the exception of a few specific contaminants discussed in Section 4.6.9, the volume of soil defined by known uranium contamination (uranium envelope) indicates the extent of soil contamination. As part of the remedial design and remedial action, verification and confirmatory sampling, respectively, may be required to accurately determine specific volumes of soil to be removed. Such sampling will provide sufficient characterization to ensure that contaminant concentrations above the final remediation levels, as defined in the Operable Unit 5 Record of Decision are remediated.

258. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.11 Pg.#: D.2-63 Line#: 13
Original Specific Comment #: 194

Comment: The text states that radiological and chemical contamination was detected only in samples from the 0- to 0.5-foot-depth interval and that no validated contamination was reported in the other intervals of the surface soil. According to Table D.2-11, no samples were collected below the 0.5-foot-depth interval. The text should be revised to clearly state that no samples were

collected below this interval. Also, the text should state that additional surface and subsurface soil samples should be collected and analyzed to determine the vertical and lateral extent of radiological and chemical contamination.

Response: Agree that text should be revised to note that samples were not collected below 0.5 feet.

Action: The text will be modified as follows, "...as indicated in Table D.2-11. No samples were collected for any parameters below 0.5 foot with the exception of total uranium and total thorium." The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-24 Line 20) to clarify the subsurface soil sampling.

259. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.11 Pg.#: D.2-64 Line#: 3
Original Specific Comment #: 195

Comment: The text states that subsurface soil samples were collected from two borings at depth intervals of 2, 5, 10, and 15 feet. Because this information does not appear in Table D.2-11, it should be added to the table.

Response: Agree. The table will be corrected.

Action: The table will be corrected to reflect the data from the 1.5-3.0, 5-10, 10-15, and 15-20.

260. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.13 Pg.#: D.2-69 Line#: 26
Original Specific Comment #: 196

Comment: The text states that five surface soil samples were collected and analyzed for total uranium. According to Table D.2-13, two samples were collected from the 0- to 0.5-foot-depth interval and one sample was collected from the 1.0- to 1.5-foot-depth interval and analyzed for total uranium. This discrepancy should be reconciled, and the text revised accordingly.

Response: Table D.2-13 only indicates the typical sampling size for each of the parameter groupings. There is not enough space to indicate the specific number of analyses for each parameter. The summary soil statistics for this area indicates that 5 samples were analyzed for total uranium.

Action: The table will be modified to reflect that the number of samples are an average sampling size for the parameter grouping.

261. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.13 Pg.#: D.2-69 Line#: 32
Original Specific Comment #: 197

Comment: The text states that, except for total thorium, all other radionuclides were detected below background levels. However, according to Table D.2-13, no samples were collected below the 0.5-foot depth. As a result, the extent of contamination has not been fully defined. Additional samples should be collected and analyzed to define the nature and extent of contamination.

Response: Agree that the extent of contamination of other radionuclides might not be fully characterized.

Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-2 Line 20) to clarify the subsurface soil sampling.

262. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.13 Pg.#: D.2-70 Line#: 25
Original Specific Comment #: 198

Comment: The text states that levels of cadmium and magnesium at least five times background occurred to depths of 5 feet, which is the maximum depth interval sampled at location 1572. The text should state why sampling was not conducted to a maximum depth of 20 feet to determine the vertical extent of contamination.

Response: Agree that inorganic contamination might not be fully defined vertically.

Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-2 Line 20) to clarify the subsurface soil sampling.

263. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.15 Pg.#: D.2-76 Line#: 35
Original Specific Comment #: 199
Comment: The text states that samples from nearly all locations were tested for total uranium and total thorium, while samples from no more than three locations were tested for other radionuclides. As a result, the existing data does not provide enough information to determine the extent of soil contamination. The text should be revised to state that additional surface and subsurface soil samples should be collected and analyzed for other radionuclides to determine the volume of soil requiring remediation.
Response: Agree that other radionuclide might not be fully characterized.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-2 Line 20) to clarify the subsurface soil sampling.

264. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.15 Pg.#: D.2-77 Line#: 7
Original Specific Comment #: 200
Comment: The text states that one sample from each of the 1.5-to 3.0- and 3.0- to 5.0-foot-intervals were analyzed for inorganics and that no contaminant was detected at greater than twice background levels. However, one soil sample collected from two intervals is not sufficient to characterize the lateral extent of contamination. The text should be revised to state that additional surface and subsurface soil samples should be collected to determine the volume of soil requiring remediation.
Response: Agree that inorganics might not be fully characterized.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-2 Line 20) to clarify the subsurface soil sampling.

265. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.19 Pg.#: D.2-90 Line#: 27
Original Specific Comment #: 201
Comment: The text states that the primary inorganic contaminant present at the trap range is lead. However, only surface soil samples were collected and analyzed for lead. The text should be revised to state that additional surface and subsurface soil samples should be collected to determine the volume of soil requiring remediation.
Response: Disagree. The lead at the trap range is very likely to be confined to the top few inches of soil for the following reasons:

- It was deposited on the surface as metallic lead particles (lead shot).
- The extremely low solubility of lead in the carbonate rich water at the FEMP (Section 3.5.1).
- The area of deposition of the lead shot is undisturbed based on historic aerial photographs.

It is recognized that the solubility of lead is higher in rainwater falling on the surface of the FEMP than in the carbonate-dominated vadose/groundwater regime. However, assuming a vertical seepage velocity of 2.15 ft per year in the brown clay (Table 3-21), the six inches annual infiltration of surface water (Section 3.2.5) would be equilibrated with carbonate minerals by the time it reached approximately 0.6 foot in depth, given the time for equilibration of carbonate minerals in porewater is 100 days, as determined in Lee 1993 at the Oak Ridge

National Laboratory. Therefore, any lead above approximately 5 μg/L leaching from the surface soil would be precipitated out as lead carbonate at a depth of 0.6 foot or less.
In light of the above discussion sufficient characterization of the trap range soil has been performed for purposes of the baseline risk assessment and for the FS selection and evaluation of alternatives. The Operable Unit 5 FS is assuming the contamination extends to a depth of 12 inches for estimating the volume of soil to be removed from this area.
DOE recognizes that additional subsurface soil sampling in the trap range area may be necessary during remedial design to refine the FS estimate of soil to be removed during the remedial action.

Action: Add the following text to page 4-74, line 9 and page D.2-90, line 15: All of the areas with elevated levels of lead in surface soil are within the uranium envelope except the trap range. Additional subsurface sampling may be required during remedial design to verify the FS's estimates of the volume of soil requiring remediation due to the presence of lead. Based on the extremely low mobility of lead under FEMP site-specific geochemical conditions (Section 3.5.1), the fact that the lead shot was deposited on the surface, and the surface has not been disturbed, it is unlikely that lead has migrated to a depth much greater than 0.6 foot below the surface.

266. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.2 Pg.#: D.2-21 Line#: 26
Original Specific Comment #: 179

Comment: The text states that total uranium was present in the 15- to 20-foot-depth interval with concentrations of 2.65 to 735 mg/kg. However, a review of the data indicates that contamination in the area may not be fully characterized. F-3 states that Plant 2/3 was a major source of highly contaminated spills and episodic discharges. Because of the limited data available on subsurface contamination associated with the Plant 2/3 Area, further investigation may be required to determine the extent of radionuclide contamination and the potential for further contaminant migration.

Response: Agree that vertical contamination in soils at the Plant 2/3 area may not be fully defined.

Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-2 Line 20) to clarify the subsurface soil sampling.

267. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.21 Pg.#: D.2-97 Line#: 8
Original Specific Comment #: 202

Comment: Section D.2.21 concludes that contaminants were detected only sporadically at depths greater than 5 feet bgs in the K-65/Clearwell line area. This conclusion is misleading because samples were collected from subsurface materials at only one location (1031). Furthermore, the K-65/Clearwell line is a significant source of contamination and requires extensive characterization. The subsurface contamination associated with the K-65/Clearwell line is not well characterized and requires further investigation to determine the extent of contamination and the potential for further contaminant migration. The text should be revised accordingly.

Response: Agree that there is not sufficient data to fully characterize the soil conditions under the length of the K-65/Clearwell Line. For the FS the conservative assumption has been made that for the length of any pipe outside the production area a zone below the pipe 1 foot deep and 3 feet wide will have to be excavated for remediation. The estimate is conservative because not every pipe will have leaked over its entire length. As subsurface lines are removed, verification sampling will confirm the estimated volume of soil that is contaminated before actual excavation and confirmatory samples will be conducted after excavation. This sampling will ensure that if contamination is deeper than the 1-foot estimate it will be removed.

Action: Add the following text page D.2-98, line 4: As part of remedial design and remedial action, verification and confirmatory sampling, respectively, may be conducted as part of the removal of this line. Such sampling will provide sufficient characterization to ensure that contaminant concentrations above the final remediation levels, as defined in the Operable Unit 5 Record of Decision, are remediated.

268. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.24 Pg.#: D.2-106 Line#: 8
Original Specific Comment #: 203
Comment: The text states that no analyses were conducted for inorganic constituents, volatile or semivolatile organic compounds, PCBs, or pesticides. The text should explain why analyses were not conducted for these constituents.
Response: Agree.
Action: The text will be modified as follows, "No analyses were conducted for inorganic constituents, volatile and semivolatile organic compounds, PCBs, and pesticides since contamination from these parameters was not suspected.

269. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.27 Pg.#: D.2-116 Line#: 26
Original Specific Comment #: 204
Comment: The text states that no analyses were conducted for inorganic constituents in the subsurface soil samples collected from the southern area of the FEMP. The implied interpretation that no inorganic contamination exists in subsurface soil is misleading. The text should state that additional subsurface soil samples should be collected to determine the vertical extent of inorganic contamination in this area.
Response: Agree that the extent of inorganic contamination in subsurface soils has not been defined.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26)and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

270. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.27 Pg.#: D.2-117 Line#: 17
Original Specific Comment #: 205
Comment: The text states that possible sources for the elevated levels of uranium in subsurface soils in the southern area of the FEMP include: vertical migration of contaminated perched groundwater, cross-contamination of the samples, laboratory error, or mislabeling of samples. The text should be revised to state that a reevaluation of the data or additional sampling should be conducted to determine if the observed uranium contamination is site related.
Response: As indicated in Table 7-10, sampling is not required during the screening of alternatives for the FS. Additional sampling may be required during the RD and/or RA phases of the cleanup.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

271. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.3 Pg.#: D.2-26 Line#: 10
Original Specific Comment #: 180
Comment: The text states that uranium isotopes including uranium-238, uranium-234, and uranium-235/236 all exhibited elevated activity levels, primarily within the 3- to 5-foot-depth interval. Uranium-238 was detected at five times the background value in five samples from the 5- to 10-foot-depth interval; however, subsurface soil samples were not collected and analyzed for uranium-238 at the 10- to 15-foot-depth interval. Additional soil samples should be collected at

10 feet bgs and should be analyzed for uranium-238 to determine the extent and volume of uranium-238-contaminated soil at 10 feet bgs requiring remediation. Total uranium was also detected at five times the background value in 11 samples at the 10- to 15-foot-depth interval, but subsurface soil samples were not collected and analyzed for total uranium at the 15- to 20-foot-depth interval. The text should be revised to state that additional soil samples should also be collected and analyzed for total uranium to determine the total extent and volume of uranium-contaminated soil requiring remediation at 15 feet bgs.

Response: Agree that uranium contamination might not be fully characterized from 15 ft. below grade to the base of the glacial overburden.

Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

272. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.30 Pg.#: D.2-126 Line#: 9
Original Specific Comment #: 206

Comment: The text refers to Figure D.2-34; however, Figure D.2-34 is missing from this section. As a result, comments referring to this figure could not be verified. Figure D.2-34 should therefore be added to this section.

Response: Agree.

Action: The Figure D.2-34 will be included.

273. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.30 Pg.#: D.2-131 Line#: 7
Original Specific Comment #: 207

Comment: The text states that most of the radiological contamination detected in the area outside the boundary adjacent to the FEMP was present in the 0- to 2-inch samples from the 0- to 0.5-foot surface soil depth interval. However, no samples were collected below the 1.0-foot-depth interval. Furthermore, Appendix F-3 states that uranium contamination in surface soil from airborne deposition can migrate at least 30 feet below the ground surface. The text should be revised to state that samples should be collected below the 1.0-foot-depth interval to determine the vertical extent of radiological contamination.

Response: Agree that the vertical extent of contamination of the soil along the boundary may not be fully characterized. A uranium leaching study, known as the K_1 study, is currently underway to determine the extent of uranium transport through the top 30 inches of the soil matrix. The results of this study will further define uranium contamination and transport from air deposition in the soil surrounding the FEMP. The results of the K_1 study will be incorporated into the Operable Unit 5 FS.

Action: No action required.

274. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.31 Pg.#: D.2-134 Line#: 35
Original Specific Comment #: 208

Comment: The text states that the majority of surface soil samples collected from the area 2 to 5 miles outside the FEMP boundary in the 0- to 0.5-depth interval did not exhibit elevated uranium contamination. However, Table D.2-31 shows that only one sample was collected from the 0.5- to 1.0-foot-depth interval, which does not verify a lack of contamination. The text should be revised to state that additional surface and subsurface soil samples should be collected to determine the extent of the vertical radiological contamination.

Response: The reader should be reminded that only a few samples exhibited uranium concentrations at levels slightly above background. Although the analytical results do not rule out the FEMP as the source of contamination, laboratory precision, may contribute to the detection, of slightly

elevated isotopic uranium and total uranium levels. The K_L study is currently underway to determine the extent of uranium transport through the top 30 inches of the soil matrix. The results of this study will further define uranium contamination and transport from air deposition in the soil surrounding the FEMP. The results of the K_L study will be incorporated into the Operable Unit 5 FS.

Action: No action required.

275. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.4 Pg.#: D.2-31 Line#: 9
Original Specific Comment #: 181
Comment: The text states that levels of cadmium and cyanide at least five times background were detected in the 3- to 5-foot-depth interval in the Plant 6 area. Table D.2-4 shows no samples that were collected and analyzed for cadmium and two samples collected and analyzed for cyanide but from the 5- to 10-foot-depth interval. The text should be revised to state that additional subsurface soil sampling should be conducted to determine the vertical and lateral extent of cadmium and cyanide contamination in the Plant 6 area.
Response: Agree that cadmium and cyanide may not be fully characterized in the Plant 6 subsurface soils.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

276. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.4 Pg.#: D.2-32 Line#: 12
Original Specific Comment #: 182
Comment: The conclusion section of the report states that the elevated inorganic and organic levels were detected primarily in the upper 5 feet of soil in the Plant 6 area. Table D.2-4 shows that only two samples were collected and analyzed at the 5- to 10-foot-depth interval for inorganic and organic constituents. The available data indicate that the subsurface soil is not adequately characterized. The text should be revised to state that additional subsurface soil sampling should be conducted for inorganic and organic constituents to determine the vertical and lateral extent of contamination in the Plant 6 area.
Response: Agree. Additional sampling may be required during the RD and/or RA phases of the cleanup in the Plant 6 area.
Action: The paragraph shown in comment number 20 will be added to the beginning of Section 4.6 (Page 4-45 Line 26)and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

277. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.5 Pg.#: D.2-33 Line#: 35
Original Specific Comment #: 183
Comment: The text states that a program consisting of one surface soil sample (PA-SS-13) and one soil boring (11095) was completed as part of the 1993 investigation to analyze for inorganic and organic constituents in the Plant 8 area. One surface soil sample and one boring do not appear to be sufficient to characterize this significant source of contamination. The text should be revised to state that further data should be collected, or to discuss the absence of the data.
Response: Agree to modify text to discuss data limitations.
Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

278. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.5 Pg.#: D.2-35 Line#: 15

Original Specific Comment #: 184

Comment: The text states that no samples containing inorganic constituents were collected below the 5- to 10-foot-depth interval. Table D.2-5 shows that beryllium and cadmium were found to be elevated between two and five times the background value at the 5- to 10-foot-depth interval. However, no data are available from below this depth to characterize the extent of this contamination. The text should be revised to state that additional subsurface soil samples should be collected below the 10-foot-depth interval to determine the vertical extent of beryllium and cadmium contamination.

Response: Agree that additional sampling may be required during the RD and/or RA phases of the cleanup in the Plant 8 area.

Action: The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

279. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.6 Pg.#: D.2-38 Line#: 31
Original Specific Comment #: 185

Comment: The text states that levels of strontium-90 were detected in the Plant 9 area soils at levels greater than five times background at depths of 1.5 to 3.0 feet. Samples were not collected and analyzed for strontium-90 below the 3-foot-depth interval. Therefore, the text should state that additional subsurface soil samples should be collected below the 3-foot-depth interval to determine the vertical extent of strontium-90 contamination.

Response: Agree that radiological contamination in subsurface soil of the Plant 9 area might not be fully characterized.

Action: The text will be modified at follow, "strontium-90 were also detected at levels greater than five times background from 1.5 to 3.0 feet. Samples were not analyzed for strontium-90 below the 3.0 foot depth interval. The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26)and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

280. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.6 Pg.#: D.2-39 Line#: 1
Original Specific Comment #: 186

Comment: The text states that other radionuclide levels were typically found to be below the background value. Table D.2-6 shows that technetium-99 was detected in subsurface soil from the 1.5- to 3.0-foot-depth interval. The background value for technetium-99 is zero. Therefore, the text should be revised to indicate that technetium-99 was detected in subsurface soil. Also, the text should state that additional subsurface soil samples should be collected below the 3-foot-depth interval to determine the vertical extent of technetium-99 contamination.

Response: Agree that the extent of technetium-99 in the subsurface soil might not be fully characterized. The text will be modified as shown below.

Action: The text will be modified as follows, "two to five times background below 3.0 feet. Technetium-99 was detected down to the 3.0 - foot depth. Technetium-99 was detected in 1 out of 4 samples analyzed at a activity of 1.3 pCi/g. Samples were not analyzed below the 3-foot depth interval for technetium-99." The paragraph shown in comment number 257 be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

281. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.7 Pg.#: D.2-42 Line#: 15
Original Specific Comment #: 187

Comment: The text discusses levels of radionuclides in the Sewage Treatment Plant area. It is not known whether the level of radionuclide contamination given is for soil samples collected before or after the removal action. The text should be revised to indicate whether these levels were determined before or after the removal action occurred in this area.

Response: Agree. All results shown in the summary statistics and Table D.2-7 are post excavation. The text will be modified as shown below.

Action: Delete the sentence "Prior to the removal action, a number of radionuclide levels greatly exceeded the background values within the 0- to 5.0- foot depth interval.

282. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.7 Pg.#: D.2-43 Line#: 15
Original Specific Comment #: 188

Comment: The text states that the only radionuclides in the subsurface soil in this area to display values greater than twice background were the three uranium isotopes, total uranium, and strontium-90. However, Table D.2-7 shows that thorium-234, protactinium-231, actinium-227, and radium-224 were detected at significant levels in the 0- to 0.5-foot-depth interval, but samples were not collected and analyzed for these parameters below the 0.5-foot-depth interval. The text should be revised to state that additional surface and subsurface soil samples should be collected and analyzed to determine the vertical extent of thorium-234, protactinium-231, actinium-227, and radium-224 contamination.

Response: Agree that the radiological contamination in the surface and subsurface soils might not be fully characterized.

Action: The text will be modified as follows, "and strontium-90. However thorium-234, protactinium-231, actinium-227, and radium-224 were not analyzed below the 0 to 0.5 foot depth interval. The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26)and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

283. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.8 Pg.#: D.2-49 Line#: 11
Original Specific Comment #: 189

Comment: The text states that contamination is present generally from the ground surface to a depth of 15 feet. This statement underestimates the extent of contamination because total uranium was detected at a concentration 5 times background below the 15-foot-depth interval. In addition, Table D.2-8 shows that subsurface soil samples collected below the 15-foot-depth interval were not analyzed for uranium-238, uranium-234, radium-226, uranium-235/236, radium-228, strontium-90, or technetium-99. Each of these radionuclides were present at significant contaminant levels at the 15-foot-depth interval. The text should be revised to accurately describe the extent of contamination.

Response: Agree that the vertical extent of radiological contamination in the pilot plant area may not be fully characterized.

Action: The text will be modified as follow, "Radiological contamination is present generally from the ground surface to a depth of at least 20 feet, while chemical contamination is present primarily in the surface and subsurface soil to a depth of 15 feet." The paragraph shown in comment number 257 will be added to the beginning of Section 4.6 (Page 4-45 Line 26) and Appendix D.0 (Page D-4 Line 20) to clarify the subsurface soil sampling.

284. Commenting Organization: U.S. EPA Commentor: Saric
Section#: D.2.9 Pg.#: D.2-54 Line#: 11
Original Specific Comment #: 190

Comment: The text states that beryllium and zinc were found in samples collected from depth intervals of 10 to 15 feet and from 15 to 20 feet. Table D.2-9 shows that zinc was not detected at 10 to

15 feet, instead it was detected at a depth interval of 5 to 10 feet. The text should be revised to correct this discrepancy.

Response: Agree.

Action: The text will be modified as follows, "Zinc was found in samples collected from depth intervals of 5.0 to 10.0 feet and 15.0 to 20.0 feet while beryllium was found in samples collected from depth intervals of 10.0 to 15.0 feet and 15.0 to 20.0 feet.

285. Commenting Organization: U.S. EPA Commentor: Saric
Section#: E.1.1.2 Pg.#: E.3.1-7 Line#: 14 to 16
Original Specific Comment #: 209

Comment: Section E.1.1.2 discusses the occurrence of thorium-232 in the perched groundwater and concludes that elevated concentrations of thorium-232 are isolated and localized. This statement is misleading. A number of samples from wells in the production area (near the Pilot Plant and Plants 2/3) were not analyzed for thorium-232. The text should state that additional samples should be collected to more fully characterize the extent of contamination in the area.

Response: See responses to comment numbers 26 and 27.

Action: See actions for comment numbers 26 and 27.

286. Commenting Organization: U.S. EPA Commentor: Saric
Section#: E.1.1.3 Pg.#: E.1-12 Line#: 1
Original Specific Comment #: 210

Comment: Section E.1.1.3 discusses the occurrence of technetium-99 in the perched groundwater. Elevated concentrations of technetium-99 in the groundwater were found near Plant 2/3. Soil samples collected from this area show high concentrations of technetium-99 not only around Plant 2/3, but also in the area of the Pilot Plant. However, no wells in the vicinity of the Pilot Plant were analyzed for technetium-99. Therefore, elevated concentrations of technetium-99 in the perched groundwater may also extend further south under the Pilot Plant. The text should state that additional samples should be collected to more fully characterize the extent of contamination in the area.

Response: See response to comment number 26.

Action: See action for comment number 26.

287. Commenting Organization: U.S. EPA Commentor: Saric
Section#: E.1.2.24 Pg.#: E.1-38 Line#: 22 to 27
Original Specific Comment #: 211

Comment: Section E.1.2.24 discusses the occurrence of thallium in the perched groundwater. The text incorrectly states that thallium was only detected in three wells; however, thallium was actually detected in six wells. The three additional wells (wells No. 1770, 1771, and 1772) are all located in the waste pit area. The text should be revised to include these three wells in the analytical discussion.

Response: Agree. A discussion should be added to explain why the wells are not discussed.
The subject wells are completed with their screens inside the waste pit contents (Operable Unit 1); consequently, the wells sample leachate and not groundwater. The data from leachate wells are shown on the plates for informational purposes. The data are not directly applicable to Operable Unit 5, because Operable Unit 5 is responsible for soil and groundwater while Operable Unit 1 is responsible for the waste pit contents.

Action: The following paragraph will be added to the second plate of the plate volume, entitled Guide to Using Soil and Groundwater Contaminant Plates:
"Note that Type 1 wells located inside shaded waste units sample leachate of other operable units. The maps of Type 1 wells show leachate wells for illustrative purposes only -- data from such wells are the basis of evaluations for other operable units, and Operable Unit 5 does not use the data for fate and transport or risk assessment purposes.

288. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.1.2.1 Pg.#: F.1-2 Line#: 10 to 14
Original Specific Comment #: 212

Comment: Section F.1.2.1 states that a vegetative cover of 85 percent is assumed for the current land-use scenario, and 50 percent for the agricultural scenario. However, no evidence is provided to support these assumptions. The text should be revised to include supporting evidence for these assumptions.

Response: The vegetative cover of 85 percent was established in Fernald Risk Assessment Policy 93-9, "Particulate Dispersion Modeling," and was based on current land use conditions at the facility. The 50 percent vegetative cover is also mentioned in Fernald Risk Assessment Policy 93-9, "Particulate Dispersion Modeling," and was based on an agricultural land-use scenario which assumes the facility will be used for farming practices in the future.

Action: Risk Assessment Policy 93-9 will be appropriately referenced in the text.
Replace lines 10-14 in Section F.1.2.1 with: The conceptual model assumed two land-use scenarios, current and agricultural. The current land-use scenario assumed that a reasonable vegetative cover of 85 percent exists over the present surface soil areas not covered by buildings, concrete, asphalt or gravel. The vegetative cover of 85 percent was established in supplemental risk guidance, "Particulate Dispersion Modeling," and was based on current land-use conditions at the facility. The model assumes no remediation of Operable Unit 5 has taken place. In the agricultural scenario, a 50 percent vegetative cover was used to describe future land-use conditions. The 50 percent vegetative cover was also established in "Particulate Dispersion Modeling," and was based on an agricultural land-use scenario which assumes the facility will be used for farming practices in the future.

289. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.1.2.2 Pg.#: F.1-2 Line#: 22
Original Specific Comment #: 213

Comment: Section F.1.2.2 states that meteorological data from Dayton, Ohio, was used in this modeling effort because it is the closest source of data. However, Cincinnati International Airport is actually closer than the Dayton airport. The modeling results may need to be revised based on the use of Cincinnati information.

Response: The text states that the closest source of atmospheric sounding data is the National Weather Service in Dayton, Ohio. This remains correct since no atmospheric sounding data is recorded at the National Weather Service Office in Cincinnati, Ohio. In addition to on-site meteorological surface data, vertical mixing heights were calculated from the sounding data and are required input for the Industrial Source Complex Long-Term air dispersion model. The differences between atmospheric sounding data and on-site meteorological data in terms of definitions, purposes, and sources used in the modeling will be explained in the text.

Action: Replace line 20 in Section F.1.2.2 with: Vertical mixing heights were calculated from atmospheric sounding data. This data was collected by a radio transmitter (radiosonde) tethered to a hydrogen or helium filled balloon. Radiosondes were launched from the National Weather Service Office in Dayton, Ohio, twice a day and measured the vertical profile of temperature, dewpoint, barometric pressure, wind direction and wind speed at preselected levels during its ascent through the atmosphere. This information was recorded at the launch site by tracking receivers. From this information, vertical mixing heights (height of atmosphere which air parcels with greatest height exchange with those closest to the ground) were calculated and used in air quality modeling (see Table F.1-1).

290. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.1.2.5.6 Pg.#: F.1-7 Line#: NA
Original Specific Comment #: 214

Comment: Section F.1.2.5.6 states that the threshold wind speed of 5.4 meters per second (m/s) was used in the modeling calculations. However, Attachment F.1-I indicates that a threshold wind speed of 0.2 m/s was used. This is apparently based on calculations presented in Attachment F.1-III, which calibrates the model to measured dust concentrations. A consistent value for the threshold wind speed should be stated, and supporting calculations for this value provided.
In addition, the model calibration presented in Attachment F.1-III is flawed. The calibration first uses the maximum detected fenceline concentration to back-calculate an emission rate that assumed a limited erosion potential. Then the emission rate was used to calculate a threshold friction velocity and modal soil diameter, which assumed an unlimited erosion potential. These back-calculations mix two different models, the limited erosion potential and the unlimited erosion potential models. The source areas should be evaluated to determine which model is applicable, and then the Attachment F.1-III calibration should be recalculated using the correct erosion potential model.

Response: The threshold friction velocity of .20 m/s was calculated using site-specific soil and monitoring data and was valid for a roughness height of one centimeter above the ground surface. Interpolating this wind speed to a height of 7 meters, using the power law equation, increases the wind speed to 3.27 m/s. All model calculations for wind erosion were based on the equivalent wind speed of 3.27 m/s. The text should be rewritten to emphasize a wind speed of 3.27 m/s as the onset of wind erosion.
Disagree with the second paragraph. The back-calculation of a site-wide emission rate once the ISCLT2 model has been run with any emission rate is independent of the erosion potential. The "first guess" emission rate (1.21×10^{-6} g/s/m) from the site was developed assuming a limited erosion potential. The resulting fenceline air concentration (22.4 $\mu g/m^3$) from this emission was simply used to ratio the modeled emission rate to the emission rate necessary to produce a maximum fenceline concentration of 20 $\mu g/m^3$ (19.6 $\mu g/m^3$ in the spreadsheet). This ratio calculation is not dependent on the erosion potential of the site since the ISCLT2 model algorithms do not depend on the erosion potential.
Once the site-wide emission rate has been estimated, the estimate of the surface soil modal diameter is dependent on the erosion potential of the site. As stated previously, the site is assumed to have a limited erosion potential in its current condition and in future conditions that do not include on-property farming. However, future land uses which include on-property farming were assumed to have an unlimited erosion potential. The unlimited erosion model was used to estimate the surface soil modal diameter and threshold friction velocity. This threshold friction velocity was also applied to the limited erosion models, thus providing conservative emission estimate for all land-use conditions.

Action: Substitute Section F.1.2.5.6 with: It has been demonstrated through EPA wind tunnel experiments that the wind speed at which wind erosion begins (threshold friction velocity) is dependent on modal diameter of the soil (EPA 1985a). It was determined that the soil at the site has a modal diameter of 59 microns (see Attachment F.1-III). This results in a threshold friction velocity of 0.2 m/s at a roughness height of 1 cm (see Attachment F.1-II). Interpolating this wind speed to a height of 7 meters, using the power law equation, increases the wind speed to 3.27 m/s. Therefore, model calculations for the resuspension of surface soil particles assumed emissions to only occur when the surface wind speed equaled or exceeded 3.27 m/s.

291. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.1.3.1 Pg.#: F.1-7 Line#: 37
Original Specific Comment #: 215

Comment: The text states that inorganic and organic screening levels were derived using methods described by U.S. EPA (1989), and modified using commercial and industrial equations to account for an inhalation pathway. A more recent version of the same U.S. EPA document

(U.S. EPA 1991) includes equations to account for an inhalation pathway. The text should be revised to use the more recent U.S. EPA document.

Response: The U.S. EPA reference to 1989 in the text pertained to the year that the RAGS program was implemented. Organic and inorganic screening levels were derived by methods described in Risk Assessment Guidance for Superfund: Volume 1, Part B, dated December 1991.

Action: Replace sentence on line 35, Section F.1.3.1 with: Inorganic and organic screening levels were derived by methods described in Risk Assessment Guidance for Superfund (RAGS), Vol.1 (EPA 1991) and modified with commercial and industrial equations to account for an inhalation pathway. The radon screening level was derived from the "Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954," Subpart D, Section(2)i (EPA 1993).

292. Organization: U.S. EPA Commentor: Saric
Section#: F.2 and F.3 Page #: NA Line #: NA
Original General Comment #: 19

Comment: Figures F.3.7-15 and F.3.7-16 show modeled uranium concentrations in the Great Miami Aquifer without remediation at 210 and 1,000 years, respectively. The maximum uranium concentration shown at 210 years is 9,052 parts per billion (ppb) while the maximum concentration shown at 1,000 years is 9,063 ppb. Both maximum concentrations occur near the storm sewer outfall ditch (SSOD) and Paddys Run, implying that contaminant loading from these surface water bodies is the main influence of uranium concentrations in the Great Miami Aquifer. However, the SSOD and Paddys Run source terms used as input to calculate future Great Miami Aquifer uranium concentrations do not account for the high Great Miami Aquifer uranium concentrations generated by the model. According to Table F.2.5-1, the maximum measured and modeled surface water uranium concentrations for the SSOD and Paddys Run are 8,148 and 914 ppb, respectively. These maximum concentrations representing potential Great Miami Aquifer contaminant source terms are well below the modeled Great Miami Aquifer contaminant levels. The maximum surface water or sediment concentrations would most likely have occurred already because the production area, which is the main source of Operable Unit 5 soil contamination at the site, is no longer operating, and according to the attachments in Appendix F-3, most of the soluble uranium has already leached out of the soil. Appendix F.3 should further explain the modeled concentrations and contaminant source terms because the future concentrations predicted by the model appear unreasonable.

Response: Modeling results presented in Table F.2.5-1 are based on area-specific average uranium concentrations that are considered to be reasonable estimates of the current conditions. These results were generated during the model performance evaluation and were not used in the baseline risk assessment. For predicting the baseline and future conditions required in the risk assessment, the UCLs of the uranium concentrations were used as conservative (i.e., higher) source-term estimates in order to lower the chance of underestimating the baseline risk. Results of the surface water modeling with these higher source terms are presented in Tables F.2.4-1 to F.2.4-9. For example, the predicted Paddys Run and SSOD concentrations are 1980 and 2010 μg/L (Attachment F.2.III) for the future condition which are much higher than corresponding concentrations in Table F.2.5-1 (i.e., 23.5 and 23.7 μg/L). Estimated contaminant loading through surface water into the Great Miami Aquifer using these higher source terms was used in the groundwater contaminant fate and transport modeling.

Because the storm water retention basin is still in operation during current and baseline conditions, future runoff contaminant concentrations from the former production area into the SSOD will be higher after the storm water management system is no longer in operation. Because of the limited initial mass, soluble uranium outside of the former production area has already leached out of the surface soil, as described in Attachment F.3.I. However, the amount of remaining soluble uranium in the production area is much higher and can still release

contaminants in leachate for a long period of time. In addition, the assumption of removing the buildings in the production area exposes the underlying soil to surface water runoff and contributes to higher future runoff concentrations into the SSOD.

Contaminant loading through Paddys Run and the SSOD by surface water infiltration is assumed to not be retarded. Because groundwater flow is slower and contaminant migration in the Great Miami Aquifer is retarded, contaminant concentrations in the groundwater can become higher than the surface water concentrations due to accumulation of contaminant mass until a balance is reached between the inflow and outflow of contaminant mass in the Great Miami Aquifer in the vicinity of the SSOD. Before the balanced condition is reached, accumulated mass in the Great Miami Aquifer is distributed between aqueous and solid phases to maintain a constant ratio between the solid and aqueous concentrations (i.e., a K_d value of 1.78 L/kg). Therefore, both the solid and aqueous concentrations will increase before the balanced condition is reached. This phenomena is more significant during the simulation of the future condition in which highly contaminated runoff from the former production area can directly flow into the SSOD and recharge the Great Miami Aquifer.

Action: Accumulation of contaminant mass in the Great Miami Aquifer along the SSOD due to differences in retardation effect between surface water loading and contaminant migration in the aquifer will be explained in the text. The following text will be added in Section F.3 where the surface water contaminant loading is described:

Contaminant loading through Paddys Run and the SSOD by surface water infiltration is assumed to not be retarded. Because groundwater flow is slower and contaminant migration in the Great Miami Aquifer is retarded, contaminant concentrations in the groundwater can become higher than the surface water concentrations due to accumulation of contaminant mass until a balance is reached between the inflow and outflow of contaminant mass in the Great Miami Aquifer in the vicinity of the SSOD. Before the balanced condition is reached, accumulated mass in the Great Miami Aquifer is distributed between aqueous and solid phases to maintain a constant ratio between the solid and aqueous concentrations (e.g., uranium K_d value of 1.78 L/kg). Therefore, both the solid and aqueous concentrations will increase before the balanced condition is reached. This phenomena is more significant during the simulation of the future condition in which highly contaminated runoff from the former production area can directly flow into the SSOD and recharge the Great Miami Aquifer.

293. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.2.5.1 Pg.#: F.2-35 Line#: 22 to 24
Original Specific Comment #: 216

Comment: The text states that the average of the surface soil sampling data, instead of the upper confidence limit (UCL), was used for the source characterization in the surface water model because it provides a more reasonable, but less conservative, source concentration when comparing the surface water model output to sampling data for calibration. The text should be revised to state why the UCL gives a less reasonable surface water model source concentration, especially when the UCL was used for the source characterization in the groundwater fate and transport model.

Response: As the measurements and modeling results presented in corresponding tables of Sections F.2.4 and F.2.5 indicated, when the UCL was used to determine a source term the resulting surface water contaminant concentration was much higher than the measured concentrations. Therefore, average source concentrations were used in the surface water model performance evaluation. However, the UCL was used for all of the source concentrations terms in which the modeling results were used in the risk assessment including the surface water, groundwater and air modeling. Using the UCL is more conservative but can create much higher contaminant concentrations when compared to available field measurements. The UCL

provided the upper bound of the likely actual source concentration (the upper confidence limit on the mean of the surface soil data). In order to compare the model output to sample data in the surface water, sediment, and groundwater, it was felt that a representative concentration that reflected the central tendency of the surface soil data rather than the upper bound of the mean contaminant level would be closer to the actual representative concentration of the surface soil. As was indicated in the text, this results in less conservative source concentrations, but the concentrations are more likely to be close to the actual representative source concentration (the mean concentration of the source area).

Action: The text will be revised to clarify this point. The following text will be added to the first paragraph of section F.2.5: The UCL was used for all of the source-concentration terms in which the modeling results were used in the risk assessment including the surface water, groundwater, and air modeling. Using the UCL is more conservative but can create much higher contaminant concentrations when compared to field measurements. The UCL provided the upper bound of the likely actual source concentration (the UCL on the mean of the surface soil data). In order to compare the model output to sampling data taken in the surface water, sediment, and groundwater, it was felt that a representative concentration that reflected the central tendency of the surface soil data rather than the upper bound of the mean contaminant level would be closer to the actual representative concentration of the surface soil.

294. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.2.5.3 Pg.#: F.2-37 Line#: 26 to 30
Original Specific Comment #: 217

Comment: The text states that modeled sediment concentrations that are higher than measured concentrations in Paddys Run may be due to the difficulty of collecting samples that contain only sediment and not bed materials. The bed materials in Paddys Run would be less contaminated than sediment and would thereby decrease the overall measured concentration of sediment. The text should be revised to state if these difficulties occurred in other sediment sampling locations, and if not, why the difficulties were only encountered in Paddys Run. Additionally, other scenarios explaining the observed discrepancies should be evaluated, particularly the likelihood that contaminated sediments are washed downstream during high flow events.

Response: The difficulties in sampling sediment should be the same wherever the sediment is sampled. However, since the measured sediment concentrations are not consistently too low, the possible error in sampling is probably not the major source of the discrepancy between the measured and predicted sediment concentrations in Paddys Run. When comparing the modeled and measured sedminent concentrations, it is important to note that the modeling results represent sediment conditions before further mixing with bed materials and hydraulic transport processes (e.g., scouring and deposition) in Paddys Run and the SSOD.

The possibility does exist that contaminated sediment is washed downstream during high-flow events. Based on an interpretation of the sediment sampling data, Section 4.5 does offer the explanation that sediment does not accumulate in Paddys Run because it is being swept downstream to the Great Miami River during high-flow events. This is another possible explanation of the discrepancy between the modeled and predicted sediment concentrations in Paddys Run.

Action: The last two sentences on page F.2-37 will be deleted and replaced by the following text: This may be due to the possibility that contaminated sediment is washed downstream during high flow events. Based on an interpretation of the sediment sampling data, Section 4.5.2.5 indicates that sediment does not accumulate in Paddys Run because it is being swept downstream to the Great Miami River during high flow events. When comparing the modeled and measured sediment concentrations, it is important to note that the modeling results represent sediment conditions before further mixing with bed materials and hydraulic transport (e.g., scouring and deposition) in Paddys Run and the SSOD.

295. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.2.5.3 Pg.#: NA Line#: NA
Original Specific Comment #: 218

Comment: The text in Section F.2.5.3 discusses the significance of modeling results presented in Table F.2.5-2. According to the table, great discrepancies exist between the modeled and measured sediment concentrations in the Pilot Plant Drainage Ditch and the Waste Pit Area; however, these discrepancies are not discussed in the text in Section F.2.5.3. The data should be reevaluated to address these discrepancies between modeled and measured concentrations. Remaining discrepancies and their implications should be thoroughly discussed.

Response: Agree. Additional discussion concerning the differences between the modeled and measured sediment concentrations will be added.

The predicted concentrations of sediment in the pilot plant drainage ditch and the waste pit area are higher than the measured concentrations. The difference may be due in part to sediment being washed downstream into Paddys Run and eventually the Great Miami River during high-flow events. The high-flow events can cause scouring of the beds of the ditches leading to Paddys Run as well as the streambed of Paddys Run itself. The sediment sampling data does not show any accumulation of contaminated sediment in Paddys Run (see Section 4.5). The sampling of sediment in the Great Miami River also shows only slightly elevated concentrations of uranium.

The predicted sediment concentrations are slightly below the range of the measured sediment concentrations coming from the production area, which were taken in Manhole 175. In addition to surface water runoff, Manhole 175 collects and passes liquids from a variety of source from the production area. For this reason it is not unexpected that the concentrations measured in this manhole would be elevated above the concentrations predicted for surface water runoff alone.

Action: The following text will be added to the end of Section F.2.5.4: The predicted concentrations of sediment in the pilot plant drainage ditch and the waste pit area are higher than the measured concentrations. The difference may be due in part to the sediment being washed downstream into Paddys Run and eventually the Great Miami Aquifer during high flow events. The high flow events can cause scouring of the beds of the ditches leading to Paddys Run as well as the streambed of Paddys Run itself. The sediment sampling data does not show any accumulation of sediment in Paddys Run (see Section 4.5.2.5). The sampling of sediment in the Great Miami River also shows only slightly elevated concentrations of uranium (see Section 4.5.3). The predicted sediment concentrations coming from the production area are slightly below the range of the measured sediment concentrations coming from the production area. The sediment concentrations measured in the production area were taken in Manhole 175. In addition to surface water runoff, Manhole 175 collects and passes liquids from a variety of sources from the production area. For this reason it is not unexpected that the concentrations measured in this manhole would be elevated above the concentrations predicted for surface water runoff alone.

296. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.2.5.4 Pg.#: F.2-39 Line#: 9 to 12
Original Specific Comment #: 219

Comment: The text states that, of 5,100 kilograms (kg) of uranium within the plume of significant concentration in the Great Miami Aquifer, about 1,900 kg is attributed solely to surface water loading. The value of 1,900 kg is about 12 percent of the minimum range for the modeled total uranium and about 14 percent of the minimum range for the estimated total uranium released to Paddys Run and the SSOD, respectively. Because this value affects the groundwater fate and transport model, the text should be revised to state how 1,900 kg of uranium in the Great Miami Aquifer due to surface water loading was derived.

Response: The measured current plume of uranium contamination south of the SSOD was used to estimate the mass of uranium that was attributed solely to surface water loading. It was compared to surface water modeling results during the model performance evaluation as the minimum estimate that the model should account for. It does not represent the total accumulated mass from the surface water loading. Clearly surface water loading also contributed to the uranium plume north of the SSOD along the SSOD and Paddys Run. Because of the presence of other contaminant sources which have released uranium into the Great Miami Aquifer through the glacial overburden, such as Operable Unit 1 and 2, the uranium plume north of the SSOD cannot be solely attributed to surface water loading. However, the groundwater fate and transport modeling included the entire contamination plume and sources of additional mass loading, as explained in Section F.3.4.

Action: The portion of the uranium plume used to determine the mass that was attributed solely to surface water loading will be specified in the text. The following text will be added in Section F.2.5.4:

The measured current plume of uranium contamination south of the SSOD was used to estimate the mass of uranium that was attributed solely to surface water loading. It was compared to surface water modeling results during the model performance evaluation as the minimum estimate that the model should account for. However, it does not represent the total accumulated mass from surface water loading because the uranium plume north of the SSOD was also impacted by surface water loading as well as other contaminant sources.

297. Organization: U.S. EPA Commentor: Saric
Section#: F.3 Page #: NA Line #: NA
Original General Comment #: 20

Comment: Appendix F.3 primarily discusses historical airborne releases of uranium at the FEMP. While airborne releases of uranium from other Operable Unit s (waste pits, silos, and so forth) are discussed, it is not clear whether other OU mass loadings and geochemical concepts related to non-airborne releases (leachate) have been accounted for in the Operable Unit 5 fate and transport model. The fate and transport model should clearly indicate whether and how non-airborne, OU-specific source terms and geochemical factors have been integrated into the Operable Unit 5 fate and transport model.

Response: Other operable unit mass loadings and geochemical concepts related to nonairborne releases (leachate) have been accounted for in the Operable Unit 5 fate and transport model by directly including mass loading terms determined in previous RI fate and transport models. These mass loadings were simulated for 40 years in the Operable Unit 5 model and terminated as remedial actions are completed in the other operable units. This approach is explained in Section 5.1.1 and F.3.4.

Action: No action.

298. Organization: U.S. EPA Commentor: Saric
Section#: F.3 Page #: NA Line #: NA
Original General Comment #: 21

Comment: The text cites pH values used in the various fate and transport calculations. The pH of various waters at the site should not be expected to vary significantly; however, the pH values reportedly used in the calculations do vary significantly. For instance, the pH equilibrium constant used in the EQ3/6 database is reported on Page F.3.I.3-2 as 7.0, while a pH of 5.0 is reported in Table F.3.I.3-2. Similarly, the pH of FEMP groundwater is stated as "generally near 7.5" on Page F.3.I.3-6. Discrepancies also exist throughout the text for the reported Eh values. Because these equilibrium equations are extremely sensitive to changes in pH and Eh, accurate equilibrium constant input values are critical. The text should explain the variations in these input values and discuss their ramifications on the calculations.

Response: The reported pH value of 5 in Table F.3.I.3-2 is a typo, which should read 7.5. Three to four additional EQ3/6 model runs will be conducted to bound the range of pH and Eh values. The ranges of interest would be pH of 6.8 to 7.8 and Eh of 50 to 400 millivolts. Additionally, discussion will be added to highlight the effect of these variations on uranium solubility.

Action: The typo will be corrected in Table F.3.I.3-2. Three to four additional EQ3/6 model runs will be conducted to bound the range of pH and Eh values. The ranges of interest would be pH of 6.8 to 7.8 and Eh of 50 to 400 millivolts. Additionally, discussion will be added to highlight the effect of these variations on uranium solubility. The following specific changes (along with changes specified in response to Comment 325) will be incorporated into the text:

A. Add the following new section before line 20 on Page F.3.I.3-5:

F.3.I.3.3 Oxidation-Reduction Reactions

Oxidation-reduction reactions involve the transfer of electrons from one element to another. The ability of any soil, groundwater, or other natural environment to carry out an oxidation or reduction process is measured by a quantity called its redox potential or Eh. Eh measurements give insight on the ability of an environment to supply electrons to an oxidizing agent (reducing environment) or to obtain electrons from a reducing agent (oxidizing environment). For example, uranium metal (a reducing agent) placed in the presence of rainwater at pH = 5 and Eh = 500 millivolts (mV) will give up electrons to the rainwater as the metal is transformed into $UO_3 \bullet 2H_2O$ (schoepite). The transformation occurs in a number of steps that involve the release of electrons from the metal and the use of the electrons by oxygen to form intermediate uranium oxides and eventually schoepite. A simplified redox scenario for this transformation is given in the following reactions:

(23) $U <-> U^{+4} + 4e^-$

(24) $U^{+4} + 4e^- + O_2 <-> UO_2$

(25) $UO_2 <-> UO_2^{+2} + 2e^-$

(26) $UO_2^{+2} + 2e^- + \frac{1}{2}O_2 + 2H_2O <-> UO_3 \bullet 2H_2O$

In Reaction 23, four electrons are obtained from the uranium as it it tranformed into the aqueous specie U^{+4}. The products from Reaction 23 are reacted with oxygen in Reaction 24 to form the intermediate amorphous oxide UO_2. Further oxidation of UO_2 produces the uranyl ion and two electrons (Reaction 25), which react with oxygen and water in Reaction 26 to form the final product $UO_3 \bullet 2H_2O$. The above redox example consists of two oxidation steps; however, uranium may occur in several oxidation states in the environment and numerous other oxidation-reduction reactions probably take place in the transformation of uranium metal to schoepite.

Uranium has three common oxidation states (+4, +5, +6) in aqueous environments, designated as U(IV), U(V), and U(VI). Important aqueous oxidation-reduction reactions between these three uranium oxidation states are:

(27) $U^{+4} + 2H_2O <-> UO_2^{+} + 4H^+ + e^-$
(28) $U^{+4} + 2H_2O <-> UO_2^{+2} + 4H^+ + 2e^-$

(29) $UO_2^{+} <-> UO_2^{+2} + e^-$

In the above reactions, U(IV) is oxidized to U(V) (Reaction 27) or U(VI) (Reaction 28) and U(V) is oxidized to U(VI) (Reaction 29). In glacial overburden background groundwaters

having pH of 6.9 to 7.7, the dominant oxidation state is U(VI) when Eh is greater than 50 mV and U(IV) when Eh is less than 50 mV. The U(V) oxidation state is somewhat unstable with respect to the U(VI) and U(IV) states, and U(V) does not readily occur as the dominant oxidation state in aqueous environments (Brookins 1987). When uranium is in the U(VI) state, it is readily transported as the aqueous uranyl ion (UO_2^{+2}). However, under reducing conditions favorable to the U(IV) oxidation state, uranium is stabilized as the nearly insoluble UO_2 solid. Therefore, uranium is essentially immobile in aqueous environments under reducing conditions (i.e., Eh less than zero).

At the FEMP, Eh measurements at four monitoring wells in the glacial overburden (Wells 1012, 1058, 1059, and 1124) ranged from 84 to 485 mV, over a pH range of 6.9 to 7.7. These Eh values correspond to an environment that is transitional between oxidizing and reducing (84 mV) to oxidizing (485 mV). The measured Eh values indicate an aqueous environment that favors the U(VI) oxidation state and, therefore, uranium is expected to be mobile in the glacial overburden. Moreover, as shown in Reactions 17 and 18, uranium mobility is enhanced further when the uranyl ion forms anion complexes with carbonate ion. The speciation and solubility of uranium in glacial overburden groundwaters of variable pH, Eh, and composition are discussed further in Section F.3.I.3.5.

B. Line 20: Change F.3.I.3.3 to F.3.I.3.4

C. Line 21: As the redox potential of glacial overburden groundwater and the speciation of uranium into carbonate complexes....

D. Line 23: ...occur at observed uranium concentrations below about 1 mg/L (as discussed in Section F.3.I.3.5). ...

E. Lines 28 and 29: Change Reactions 21 and 22 to 30 and 31.

F. Line 31: Change 21 to 30.

G. Page F.3.I.3-6, Line 11: Change 22 to 31.

H. Page F.3.I.3-8, Line 1: Change F.3.I.3.4 to F.3.I.3.5

I. Page F.3.I.3-9, Line 4: Change F.3.I.3.5 to F.3.I.3.6

J. Table F.3.I.3-1

299. Organization: U.S. EPA Commentor: Saric
Section#: F.3 Page #: NA Line #: NA
Original General Comment #: 22
Comment: Time is a critical factor in the various chemical and physical processes affecting the fate and transport of uranium. The report presents numerous conclusions involving time factors for source input, source depletion, retardation, and transport. An example of such a conclusion is found on page F.3.I.3-3, lines 4 to 6: "UF_4 is not expected to persist in the environment for long periods of time due to its high solubility." While it is understood that chemical and physical processes affecting contaminant fate and transport are complex, most of the statements and conclusions regarding fate and transport processes are vague. In most cases, it is not clear whether reactions heading toward equilibrium require days, decades, or centuries. The report should more clearly indicate the amount of time that affects the fate and transport processes.

Response: It is very difficult to quantify the kinetic dissolution rate for the various uranium solids. No literature value of uranium kinetic dissolution rate is readily available. However, several reports from ORNL can be referenced to provide indirect information. The characterization and leaching reports by ORNL that indicate uranium is tied up with calcium, phosphate, and iron oxide solids, and that aqueous uranium concentrations in the soil leaching tests show equilibrium will be attained within a year when soluble uranium forms are present. This time frame and its uncertainty does not impact the fate and transport modeling which simulates a 1000-year time frame.

Action: The following changes will be incorporated into the text; several reports from ORNL will be referenced and discussed to provide additional information.

A. Page F.3.I.3-2, lines 5 through 19:

"....dissolution of a solid is a subset of leaching. The extent and time (kinetics) of dissolution are primarily functions of temperature, surface area, and bond type (e.g., ionic, covalent, etc.) in the mineral structure. The extent of mineral dissolution is expressed mathematically by the solubility product, and solubility products have been tabulated for a large number of minerals as a function of temperature. However, the time required to dissolve a given mineral to its solubility concentration is dependent on both temperature and mineral surface area. The surface area of a soil mineral is highly variable from soil to soil and this mineral commonly has an alteration rind, which precludes the use of results generated from laboratory studies on dissolution rates of unweathered minerals. What can be said in qualitative terms is that at ambient surface and subsurface temperatures, solids formed by ionic bonding (e.g., UF_4) will dissolve and approach their equilibrium concentrations on the order of days to months, whereas solids with covalent bonds (e.g., U_3O_8) may take months to years to approach their solubility concentrations.

To illustrate the extent of dissolution, consider the solubility of the two most common uranium species released from past FEMP operations (U_3O_8 and UF_4; Section F.3.I.2.2.2.1) in rainwater of pH 5 at 25°C with an oxygen partial pressure of 1×10^{-30} atmospheres (corresponding to an Eh of 0.5 volts at pH 5; Brookins, 1987). The reactions are:

(4) $U_3O_8 + \frac{1}{2}O_2 + 6H^+ <-> 3UO_2^{+2} + 3H_2O$

(5) $UF_4 + \frac{1}{2}O_2 + H_2O <-> UO_2^{+2} + 2H^+ + 4F^-$

Using the equilibrium constants reported in the EQ3/6 thermodynamic data base (Version 7.2; Wolery, 1992; Wolery and Daveler, 1992) for the above reactions, U_3O_8 will dissolve to yield 0.14 milligrams of uranium per kilogram of water (mg U/kg water) and dissolution of UF_4 yields 42 mg U/kg water. Therefore, the solubility of UF_4 under these conditions (i.e., pH = 5, Eh = 0.5 volts, and UO_2^{+2} is the only uranium species formed) is 300 times greater than U_3O_8. It is important.... "

B. Page F.3.I.3-2, line 26:

"The solubility calculation above predicts that U_3O_8 will remain in the environment much longer than UF_4 if the...."

C. Page F.3.I.3-2,lines 28 and 32: change UO_2 to U_3O_8

D. Page F.3.I.3-3, lines 1 through 7:

"Another point to emphasize from the kinetic perspective is the instantaneous release of uranium to the glacial till is tied to the rate of dissolution. Particles of UF_4 are likely to release more dissolved uranium to the glacial till than U_3O_8 particles during any given storm event (i.e., the rate of dissolution for UF_4 is greater than U_3O_8), if the mass (i.e., moles) and particle size of each form are similar. Evidence for the greater stability and persistence of uranium oxide particles in the environment (relative to uranium fluoride salts) can be gathered from the literature on uranium ore deposits. There are abundant ore deposits containing various uranium oxide minerals (Nash et al., 1981), but no reported occurrences of uranium fluoride deposits. Additionally, support for rapid dissolution and equilibration of soluble uranium salts can be found in the ORNL study on the solubility measurements of uranium in FEMP contaminated soils (Lee et al., 1993). In this study, two soils were leached to establish uranium solubility concentrations - one soil was obtained from the production area where soluble uranium is present and the other was obtained from the incinerator area where only uranium oxide particles have been released. The production area soil attained a steady uranium concentration of about 10 mg/L within a year, while the incinerator soil continued to increase its uranium concentration through 400 days (U = 4 mg/kg at 400 days). This study and research on uranium ore deposits imply that little, if any, of the UF_4 released from FEMP operations remains in the soils today. However, secondary uranium phases derived from spills of soluble uranium salts may persist in the production area. These secondary phases have moderate solubilities and their importance on the fate and transport of uranium is discussed in Section F.3.I.4.0."

E. Page F.3.I.3-4, Lines 1 through 14:

Important dissolution reactions for uranium minerals in past and present near-surface sources (Table F.3.I.3-2) are given below:

(6) $UF_6 + 2H_2O <-> UO_2^{+2} + 4H^+ + 6F^-$
(7) $UO_2(NO_3)_2 \cdot 6H_2O + H_2O <-> UO_2^{+2} + 2NO_3^- + 7H_2O$
(8) $UCl_4 + \frac{1}{2}O_2 + H_2O <-> UO_2^{+2} + 2H^+ + 4Cl^-$
(9) $(NH_4)_2U_2O_7 + 3H_2O <-> 2NH_4^+ + 2UO_2^{+2} + 6OH^-$
(10) $NH_4UO_2PO_4 <-> NH_4^+ + UO_2^{+2} + PO_4^{-3}$
(11) $UF_4 + \frac{1}{2}O_2 + H_2O <-> UO_2^{+2} + 2H^+ + 4F^-$
(12) $Na_2U_2O_7 + 3H_2O <-> 2Na^+ + 2UO_2^{+2} + 6OH^-$
(13) $UO_2F_2 <-> UO_2^{+2} + 2F^-$
(14) $UO_2 + \frac{1}{2}O_2 + 2H^+ <-> UO_2^{+2} + H_2O$
(15) $U_3O_8 + \frac{1}{2}O_2 + 6H^+ <-> 3UO_2^{+2} + 3H_2O$
(16) $UO_3 + 2H^+ <-> UO_2^{+2} + H_2O$

F. Page F.3.I.3-4, Lines 14 and 16: Change 11 to 13

G. Page F.3.I.3-4,Line 28: Change Reaction 15 to 17

I. Page F.3.I.3-4,Line 28:Line 29: Change Reaction 16 to Eq. 18

J. Page F.3.I.3-5, Lines 1 through 4: Change Reactions 17, 18, 19, and 20 to 19, 20, 21, and 22.

K. Page F.3.I.3-5, Line 8: Change 15 to 17 and 20 to 22.

L. Page F.3.I.3-5, Line 9: Change 14 to 16.

M. Page F.3.I.3-5,Line 14: Change 15 to 17 and 20 to 22.

300. Organization: U.S. EPA Commentor: Saric
Section#: F.3 Page #: NA Line #: NA
Original General Comment #: 23

Comment: The fate and transport models use only two different leaching coefficient (K_l) and partition coefficient (K_d) values. Low K_l and K_d values represent areas where high-concentration, aqueous sources are present; and high K_l and K_d values represent areas where airborne or depleted sources dominate. Given the large amount of analytical data available and the great diversity of uranium contaminant types and concentrations, the use of only two K_l and K_d values appears to oversimplify actual FEMP conditions. Wherever possible, K_l and K_d values as determined by site-specific data should be used to characterize as many distinct source terms as possible.

Response: As presented in Table F.3.II-2 and Figure F.3.II-2 the variation of uranium geochemical parameters can be very significant in a relatively small area. Therefore, a simplified conceptual model was required to develop a manageable fate and transport model. Using only two sets of K_l and K_d values in the Operable Unit 5 area (in addition to all the other values used in other operable units that are directly incorporated in the Operable Unit 5 fate and transport model) may seem to oversimplify actual conditions. However, as long as the selected K_l and K_d values present reasonably conservative conditions at the FEMP, the fate and transport modeling results can support the baseline risk assessment. Additional K_l and K_d values for specific areas are being evaluated in the Operable Unit 5 FS to develop preliminary soil remediation goals and waste acceptance criteria for disposal facilities. A higher resolution and better presentation of distributions of geochemical parameters will be achieved in the FS. Please also see the responses to comments #244 and #249.

Action: No action in the RI.

301. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.1 Pg.#: F.3-2 Line#: 8 and 9
Original Specific Comment #: 220

Comment: The text references Figure F.3.1-2 for the overall surface source areas considered in the groundwater modeling; however, the text does not state how these areas were defined. The text should be revised to state how these areas were defined, and justification should be provided for delineating the various boundaries as shown. Also, the text should provide evidence that the area west of Paddys Run does not have surface soil contamination that can serve as a source of groundwater or surface water contamination. These comments should also be addressed for Figure F.3.4-1.

Response: The objective of Section F.3.1.1 was only to introduce the overall groundwater modeling domain. Text in Section F.3.4.2 provides details of the delineation of Operable Unit 5 source areas in the groundwater pathway.
Area west of Paddys Run is relatively clean and does not contain significant amounts of contamination that can create cross-media impacts. Therefore, this area was not included in the fate and transport modeling domain. However, this area was still evaluated for direct contact and exposure scenarios in the baseline risk assessment.

Action: The following text will be added to the first paragraph in Section F.3.4.2
"In general the area west of Paddys Run is relatively clean and does not contain significant amounts of contaminants that can create long-term cross-media impacts. Therefore, this area is not included in the fate and transport modeling domain. However, this area was evaluated for direct contact and exposure scenarios in the baseline risk assessment."

302. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.2.1 Pg.#: F.3-4 Line#: 13 to 15
Original Specific Comment #: 221

Comment: The text states that contaminants that flow overland can reach erosional features in the glacial overburden, such as Paddys Run or the SSOD, and can then flow into the Great Miami Aquifer. This type of contaminant flow is included in the groundwater modeling. It is not apparent in the text if overland contaminant flow to the south where the glacial overburden disappears (see OU2 RI) is included in the groundwater modeling. Overland contaminant flow and loading in this area should be included because it can serve as an additional source of groundwater contamination. The text should be revised to address this issue.

Response: As described in Section F.2, surface runoff that can reach the edge of glacial overburden along the SSOD and Paddys Run was simulated in the surface water modeling, including infiltration through the unsaturated sand into the Great Miami Aquifer. As indicated in Figure 5-27, approximately 96 percent of the contaminated runoff is assumed to directly infiltrate through the unsaturated sand and gravel. The surface water modeling loaded all of the contaminant from the surface water into the Great Miami Aquifer at Paddys Run and the SSOD. The contaminant loading rates into the Great Miami Aquifer determined in the surface water modeling were also included in the Operable Unit 5 groundwater modeling. Any surface water runoff that infiltrates before reaching the streambed is still accounted for in the surface water loading terms used in the groundwater model. The size of the groundwater model grid (i.e., 125 feet by 125 feet) also makes the distance between the edge of the glacial overburden in Operable Unit 2 area and the SSOD streambed insignificant.

Action: Text will be added in Section F.3.2.1 to clarify the surface water loading term used in the groundwater model. The following text will be added after line 15 on page F.3-4: Surface water runoff traveling overland can reach the end of the glacial overburden and infiltrate to the Great Miami Aquifer before reaching either Paddys Run or the SSOD (e.g., in the Operable Unit 2 area). This overland infiltration is accounted for in the loading terms for the SSOD and Paddys Run. As indicated in Figure 5-27, approximately 96 percent of the contaminated runoff is assumed to directly infiltrate through the unsaturated sand and gravel. Any surface water runoff that infiltrate before reaching the streambed is still accounted for in the surface water loading terms used in the groundwater model. The size of the groundwater model grid (i.e., 125 feet by 125 feet) also makes the distance between the edge of glacial overburden in the Operable Unit 2 area and the SSOD streambed insignificant.

303. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.2.3 Pg.#: F.3-6 Line#: 1 and 2
Original Specific Comment #: 222

Comment: The text references Figure F.3.2-3, which shows generalized cross-sections for the infiltration zones in the groundwater model and the vertical hydraulic conductivity (K_v) used for the respective layers in each zone. For the brown clay and brown clay and sand, K_v is derived from horizontal hydraulic conductivity (K_h) slug test values, while the K_v for the brown and gray sand is derived from K_h slug test values divided by 10. The text should state why the K_v values for the brown clay and brown clay and sand are not derived from K_h values divided by 10.

Also, it is not apparent why K_h and K_v are determined for these layers because they are not included in the groundwater fate and transport model. According to Section F.3.2.3, contaminant loading starts below the brown clay; therefore, it is not apparent why K_h and K_v values are determined for layers above the brown clay. The text should be revised to state whether these layers are included in the fate and transport model.

Response: Because vertical fractures exist in the oxidized layers (brown clay and brown clay/sand), K_v and K_h in these layers are assumed to be similar and are represented by the slug test results. Fractures in the brown/gray sand layer are less likely to occur due to the coarse nature of sand;

K_v is commonly determined to be the slug test result (K_h) divided by 10. In addition to the gray clay layer the weathered glacial overburden (i.e., brown clay, brown clay/sand, and brown/gray sand) is included in the HELP model for determining the surface infiltration and recharge rates to the Great Miami Aquifer through the overburden. The weathered overburden functions like a reservoir in the HELP model and results in a higher infiltration rate. However, the weathered layers are not included when simulating contaminant transport through the overburden. Therefore, no slowdown of contaminant migration due to retardation or adsorption through weathered layers is considered in the modeling. The objective was to ensure that the overall modeling approach is conservative for estimating infiltration rate and contaminant migration.

Action: The text will be expanded to describe the different approaches used in 1) the HELP modeling and contaminant transport model and 2) determining vertical hydraulic conductivity. The following text will be inserted at the end of Line 20 on Page F.3-6:

Because vertical fractures exist in the oxidized layers (brown clay and brown clay/sand), K_v and K_h in these layers are assumed to be similar and are represented by the slug test results. Fractures in the brown/gray sand layer are less likely to occur due to the coarse nature of sand; K_v is commonly determined to be the slug test result (K_h) divided by 10. In addition to the gray clay layer the weathered glacial overburden (i.e., brown clay, brown clay/sand, and brown/gray sand) is included in the HELP modeling for determining the surface infiltration and recharge rates to the Great Miami Aquifer through the overburden. The weathered overburden functions like a reservoir in the HELP model and results in a higher infiltration rate. However, the weathered layers are not included when simulating contaminant transport through the overburden. Therefore, no slowdown of contaminant migration due to retardation or adsorption through weathered layers are considered in modeling. The objective was to ensure that the overall modeling approach is conservative in estimating infiltration rate and contaminant migration.

304. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.2.3 Pg.#: F.3-6 Line#: 11 and 12
Original Specific Comment #: 223

Comment: The text states that perched groundwater occurs exclusively within the sand lens by the waste pits located in Zone I. However, according to OU2 investigations, perched water also occurs beneath OU2 by the South Field, the Inactive Flyash Pile, and the Active Flyash Pile. These areas of OU2 should be included in the perched groundwater modeling because the glacial overburden thins and pinches out in this area, and therefore, contaminants emanating from perched groundwater have direct access to the Great Miami Aquifer.

Response: Contaminant mass loading terms determined in the Operable Unit 2 RI which include contaminants emanating from perched groundwater beneath the South Field, the inactive flyash pile, and the active flyash pile have already been included in the Operable Unit 5 model. Yield within the glacial overburden is generally not uniform. Contamination in the Zone I area (which represents a fictitious inter-connected high-yield perched groundwater zone in the Operable Unit 5 area) does not extend to the southern edge of the till. Drilling indicates that silt blocks the zone to the south. Therefore, it is very unlikely for additional contaminated perched groundwater within Zone I to pass under the pilot plant drainage ditch and laterally reach the edge of the glacial overburden in the South Field area.
Contaminants in perched groundwater in the Zone I area can migrate vertically through overburden to the Great Miami Aquifer or laterally to the pilot plant drainage ditch and Paddys Run. As shown in Figure F.3.6-4, these additional pathways for contaminated perched groundwater in the former production area, silo area, and waste pit area were evaluated in the Operable Unit 5 fate and transport modeling.

Action: The sentence in line 11 will be deleted.

305. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.3.1 Pg.#: F.3-8 Line#: 35 to 37
Original Specific Comment #: 224

Comment: The text states that initial groundwater conditions in the Great Miami Aquifer were delineated as the highest concentration for a particular block from 40-year (present day) model runs with loading from OUs 1, 2, and 4 and contoured monitoring data for Types 2, 3, and 4 monitoring wells. It is assumed that the 40-year model runs are SWIFT model runs and should have been calibrated to present-day monitoring well data. The output, therefore, for these 40-year model runs should be similar to present-day monitoring well data to ensure proper calibration. The text should be revised to state why 40-year calibrated model data or present-day measured data were used for present-day conditions in the Great Miami Aquifer. The text should also explain why one set of data was preferred over the other.

Response: Contaminant fate and transport models for other operable units have been calibrated considering all the available monitoring data. However, any single monitoring datum is just a point measurement in an area impacted by contaminant loading. It is clear that not all the impacted areas are covered by monitoring wells. Modeling results supplement monitoring data by estimating a relatively more complete 3-dimensional distribution of contaminants in the Great Miami Aquifer. Although the modeling results generally matched the monitoring data when available, modeling results can be higher than monitoring data due to conservative assumptions used in the modeling. At any location where no contoured monitoring data is available, modeling results of past contaminant loading are required to set the initial Great Miami Aquifer conditions for Operable Unit 5. It is also more conservative to use the higher value when both modeling and contoured monitoring data are available in a model block.

Action: No action.

306. Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.2 Page #: NA Line #: NA
Original General Comment #: 24

Comment: The groundwater model source term development presented in this section uses soil samples collected from the top 1.5 feet of soil. According to Appendix F-3, a great deal of soil contamination favoring uranium desorption exists at depth at the site; however, this deeper contaminated soil is not used in the source term development. The text should be revised to state why contaminated soil greater than 1.5 feet below ground surface was not used in the source term development for the groundwater fate and transport model.

Response: Based on available soil data, 1.5 feet is a conservative estimate of the average thickness of contaminated soil outside of the former production area and other operable units which become the source of future Operable Unit 5 contaminations. Additional field data outside the production area collected to support the Operable Unit 5 FS show that at 30-inch depths most of the soil samples contain uranium concentrations close to background level and have K_l values in the range close to 1000 L/Kg (i.e., contain very insignificant amounts of leachable uranium). The low-K_d environment (i.e., not favoring adsorption) in the deeper soil described in F.3.I actually kept most of the contaminant in the leachate when uranium migrated through the overburden in the past. Therefore, the deeper soil is relatively clean when compared to the surface soil and does not contain significant amounts of contaminant mass that can affect the modeling results for future conditions. Therefore, soil below 1.5 feet outside of the production area and other operable units was not treated as a future contaminant source. However, contaminated perched groundwater and corresponding solid phase contamination deeper than 1.5 feet in the Zone I area is included as one of the contaminant sources in the groundwater pathway, as shown in Figure F.3.3-2.

Action: Additional text will be added to describe the general soil contamination conditions below 1.5 feet and why it is not included in the source term development. The following paragraph will be added before the last paragraph of Section F.3.4.2: Based on available soil data, 1.5 feet is

a conservative estimate of the average thickness of contaminated soil outside of the former production area and other operable units which become the source of future Operable Unit 5 contamination. Additional field data outside the production area collected to support the Operable Unit 5 FS show that at 30-inch depths most of the soil samples contain uranium concentrations close to background level and have K_1 values close to 1000 L/kg (i.e., contain very insignificant amounts of leachable uranium). The low K_d environment (i.e., not favoring adsorption) in the deeper soil described in F.3.I actually kept most of the contaminant in the leachate when uranium migrated through the overburden in the past. Therefore, the deeper soil is relatively clean when compared to the surface soil and does not contain significant amounts of contaminant mass that can affect the modeling results for future conditions. Therefore, soil below 1.5 feet outside of the production area and other operable units was not treated as a future contaminant source.

307. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.2 Pg.#: F.3-21 Line#: 24 to 26
Original Specific Comment #: 225

Comment: The text states that one assumption in the groundwater model assumes uniform concentration within each source area shown in Figure F.3.4-1. Because Appendix F-3 stresses the differences of the loading effect between aqueous spills and airborne contaminant deposition, the procedure of using uniform source terms in each source area is not advised. This approach will likely "smooth out" hot spots. The model should be revised to use source terms based on observed soil concentrations, or further information justifying the uniform source term approach should be provided. Also, if uniform concentrations are used, maps should be provided showing (1) the soil concentrations that were contoured to define the source areas and (2) the uniform concentration assigned to each source area.

Response: The contaminant source areas for Operable Unit 5 groundwater modeling were determined based on surface drainage areas, types and level of uranium contaminations. Therefore, different loading effects can be separately considered. Within each area the UCL of measured soil concentrations was used to determine the representative source concentration. When the number of samples is small the UCL is usually the highest measured concentration in an area. This approach actually "smoothed out" clean spots. The overall approach for delineating source areas and determining source concentration for the Operable Unit 5 RI Report are very conservative. Figure F.3.4-1, Table F.3.4-2, Table F.3.4-3, and Attachment F.3.III summarize the source areas and contaminant mass used in the groundwater modeling.

Action: No action.

308. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.2 Pg.#: F.3-21 Line#: 32 and 33
Original Specific Comment #: 226

Comment: The text states that contaminants in the Operable Unit 5 area are generally confined in the surface soil (less than 1.5 feet deep) except in localized areas in the production area. The text references Table F.3.4-2 to support this statement. According to Table F.3.4-2, other OUs are included as sources for the Operable Unit 5 groundwater modeling. Investigations in these other OUs identified contamination at depths greater than 1.5 feet. Also, according to Appendix F-3, uranium particulates move down as deep as 15 feet and are dissolving and adding contamination to the aqueous phase. The text should be revised to state why only contamination less than 1.5 feet deep in other OUs was used in the source characterization for the groundwater fate and transport modeling.

Response: The general information in Table F.3.4-2 regarding other operable units only represents their surface conditions for surface water modeling purposes and not for the Operable Unit 5 groundwater modeling. The actual contaminant loadings determined in previous RI reports for

these areas were used directly in the Operable Unit 5 groundwater modeling to determine their impacts to date. The contaminant sources in the model were not limited to 1.5 feet.

Action: Footnotes will be added to Table F.3.4-2 for areas related to other operable units. The following footnote will be added to each of the areas listed in Table F.3.4-2 (Solid Waste Landfill, South Field/Inactive Flyash Pile, Active Flyash Pile, Waste Pit Area, and Silo Area): [c] Areas which are included in other operable units at the FEMP. The actual contaminant loadings determined in previous RI reports for these areas were used directly in the Operable Unit 5 groundwater modeling to determine their impacts to date.

309. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.3 Pg.#: F.3-23 Line#: 13 and 14
Original Specific Comment #: 228

Comment: The text references Figure F.3.2-2 for the zones of uranium K_l/K_d values. The figure shows that the production area has a K_l/K_d value much lower than the rest of the site. The text should state the ratio of K_l to K_d (K_l/K_d) and how it is used in the model.

Response: The referenced figure should be Figure F.3.4-2. "K_l/K_d" actually means "K_l or K_d" and not the ratio between K_l and K_d. The notation will be changed to avoid possible confusion.

Action: The notation in Section F.4.3 and in Table F.3.4-2 will be changed to avoid possible confusion. Line 13 on page F.2-23 will be changed to state: Figure F.3.4-2 shows the zones of uranium K_d or K_l values for the FEMP.

310. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.3 Pg.#: F.3-23 Line#: 6 and 7
Original Specific Comment #: 227

Comment: The text states that source leaching coefficients K_l or K_l^{calc} were determined either by using laboratory tests or by calculations of field data. The text should be revised to state how well the K_l values determined from the two different methods correlated. The text should also provide the rationale for using K_l versus K_l^{calc} and vice versa.

Response: The K_l^{calc} obtained from soil and perched groundwater data are in very good agreement with the K_l determined by using batch tests. In general, K_l values for soil contaminated with soluble uranium are between 5 and 30 (see Table F.3.II-6) when a geometric mean of K_l^{calc} equals 14 (see Table F.3.II-2). K_l values for soil contaminated with nonsoluble uranium are between 147 and 1870 (see Table F.3.II-6) when a geometric mean of K_l^{calc} equals 325 (see Table F.3.II-2).

Action: The following text will be added to the end of Line 15 on Page F.3-23: K_l values obtained from soil and perched groundwater data are in very good agreement with the K_l determined by using batch tests. In general, K_l for contaminated soil with soluble uranium are between 5 and 30 (see Table F.3.II-6) when a geometric mean of K_l^{calc} equals 14 (see Table F.3.II-2). K_l for contaminated soil with nonsoluble uranium are between 147 and 1870 (see Table F.3.II-6) when a geometric mean of K_l^{calc} equals 325 (see Table F.3.II-2).

311. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.3 Pg.#: F.3-26 Line#: 18 and 19
Original Specific Comment #: 229

Comment: The text discusses initial leachate concentrations for contaminant sources defined in Operable Unit 5. The text should provide a map showing the initial leachate concentrations defined for each Operable Unit 5 contaminant source area.

Response: The requested map and initial source leachate concentrations for contaminant sources are presented in Attachment F.3.III. This Attachment is referenced in Section F.3.4.2. However, line 13 on page F.3-22 should be corrected.

Action: Change line 13 on page F.3-22, to also presented in Attachment F.3.III.

312. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.4 Pg.#: F.3-27 Line#: 18 to 20
Original Specific Comment #: 230

Comment: The text states that loading occurs on reaches CD and DE of Paddys Run and the lower reach of the SSOD, because in these regions the streambed is directly on the unsaturated Great Miami Aquifer. According to Figures 5-17 and 5-25, loading also occurs on reach EF of Paddys Run. The text should be revised to state why the loading from reach EF of Paddys Run was not included in the model, or the model should be revised to include this loading.

Response: Contaminant loading does occur in reach EF of Paddys Run and has been included in the SWIFT Great Miami Aquifer model for primary CPCs with the other reaches, as summarized in Table F.3.4-6. ECTran modeling for other contaminants only estimated the maximum impacts due to surface water contaminant loading to specific off-property receptor locations, as shown in Figure F.3.4-4. ECTran simulation of the surface water pathway does not include contaminant loading terms from reach EF of Paddys Run because they are usually smaller and already downstream from the pre-selected receptors along the southern fenceline.

Action: The text will be clarified to state the reason why reach EF was not included in the ECTran modeling for the surface water pathway. Specifically, lines 18 through 20 will be replaced by the following sentence and the addition of another paragraph.
Reaches CD and DE of Paddys Run and the lower reach of the SSOD are the reaches where the maximum loadings occur because in these reaches the streams flow directly on the unsaturated zone of Great Miami Aquifer and the unsaturated zone has a significant thickness.

Contaminant loading does occur in reach EF of Paddys Run and has been included in the SWIFT Great Miami Aquifer model with the other reaches for primary CPCs, as summarized in Table F.3.4-6. ECTran modeling for other contaminants only estimated the maximum impacts due to surface water contaminant loading to specific off-property receptor locations, as shown in Figure F.3.4-4. ECTran simulation of the surface water pathway does not include contaminant loading terms from reach EF of Paddys Run because they are usually smaller and already downstream from the preselected receptors along the southern fenceline.

313. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.4.4 Pg.#: F.3-28 Line#: 1 and 2
Original Specific Comment #: 231

Comment: The text states that Table F.3.4-7 summarizes the maximum surface water contaminant loading rates to the Great Miami Aquifer used in the ECTran modeling to evaluate exposure risk at receptor locations. The contaminants listed in Table F.3.4-7 do not include neptunium-237, radium-226, strontium-90, or technetium-99. However, these contaminants are shown in Table F.3.4-6, which also summarizes contaminant loading rates. The text should be revised to include these contaminants in the ECTran risk exposure evaluation or to provide justification for eliminating these isotopes from the source term.

Response: Table F.3.4-6 summarizes all the contaminant loading rates from the surface water modeling. Two different models were used to simulate these loading terms. For the primary contaminants (e.g., neptunium-237, radium-226, strontium-90, and technetium-99) these mass loading rates were included in the SWIFT Great Miami Aquifer model. Surface water contaminant loading rates of all the other contaminants were modeled by using the ECTran model. Table F.3.4-7 lists input parameters derived from information summarized in Table F.3.4-6 that was required in the ECTran model. Only the contaminants modeled by using ECTran were listed. This approach has been described in the first part of Section F.3.4.4.

Action: No action.

314. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.5.1 Pg.#: F.3-31 Line#: 20

Original Specific Comment #: 232

Comment: The text states that a porosity value of 0.2 was used for the clay units in the HELP model. Typical values for clay porosity range from about 0.3 to 0.6. Furthermore, geotechnical data from the OU2 RI presented much higher clay porosity values. The text should be revised to state why a porosity value of 0.2 was used to determine infiltration through the clay.

Response: This comment is very similar to Original Comment #76. The porosity of the gray clay was determined from density measurements performed on core samples collected with Shelby tubes. Table 3-18 of the RI Report presents the data collected from the laboratory core tests. The sampling locations are shown in Figure 3-37. A writeup of the calculation and testing method used is presented on page 3-49. Porosity calculations for the gray clay range from 23 percent to 30 percent with an average porosity of 26 percent. Seepage velocity calculations, using a porosity of 26 percent, are presented in Table 3-21.

The gray clay is a clay-rich glacial till deposit. Porosity ranges for glacial till are lower than the 30 percent to 60 percent range given above for clay. Fetter (1989) reports a range from 10 percent to 20 percent. Driscoll (1989) reports a range from 10 percent to 25 percent.

A smaller porosity was used to model infiltration through the gray clay using the HELP model. A value of 20 percent was modeled instead of the calculated 26 percent average value. Seepage velocity is inversely proportional to effective porosity; the smaller the porosity the faster the seepage velocity. Therefore, using a smaller porosity results in faster calculated velocities for the movement of contaminants. It is also more realistic to use a lower velocity for seepage calculations. Seepage velocity only considers effective porosity. Effective porosity, for clayey units, is usually smaller than total porosity. It was assumed that effective porosity was 20 percent. This represents a 23 percent decrease in porosity but still keeps the value on the high side of the reported ranges.

Action: The following text will be added immediately following the sentence in question:

Total porosity for the gray clay was calculated to range from 23 percent to 30 percent, with an average of 26 percent (see Section 3.6.1) For modeling infiltration it was assumed that effective porosity was 20 percent. This represents a 23 percent decrease in porosity from the calculated average of 26 percent. Infiltration was modeled using a smaller porosity because effective porosity for clayey units is usually smaller than total porosity and seepage velocity is inversely proportional to effective porosity; the smaller the effective porosity the faster the seepage velocity and the faster the infiltration.

315. Commenting Organization: U.S. EPA Commentor: Saric

Section#: F.3.5.4.1 Pg.#: F.3-38 Line#: NA

Original Specific Comment #: 233

Comment: The text discusses the SWIFT model and loading rates. It is not apparent from the text whether loading from surface water sources is included in the SWIFT model. The text should indicate whether surface water loading was used, and if not, the text should be revised to include the results of surface water loading in the groundwater fate and transport model.

Response: Section F.3.4 identifies all the contaminant sources and migration pathways to be considered in the groundwater modeling. As described in Section F.3.4.4, surface water contaminant loading was one type of source and has been incorporated in the Operable Unit 5 groundwater fate and transport modeling. As indicated by its title, the objective of Section F.3.5 was to describe the approaches used to simulate vertical contaminant migrations from other sources (i.e., contaminated soil and perched groundwater) through the overburden to the Great Miami Aquifer. Both types of contaminant loading to the Great Miami Aquifer have been included in the groundwater modeling. The text at the end of Section F.3.5.4.1 also states that both the vadose zone and surface water pathways were included in the modeling results. The overall groundwater modeling procedure shown in Figure F.3.3-2 clearly indicates that surface water loading has been included.

Action: No action.

316. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.5.4.2 Pg.#: F.3-40 Line#: 16 to 19
Original Specific Comment #: 234

Comment: The text in the first and second bulleted items states that the ECTran model was used in investigating (1) the combined vertical contaminant loading from leachate to the Great Miami Aquifer due to surface soil and perched water, and (2) contaminated surface water as a source of vertical loading to the Great Miami Aquifer. However, Section F.3.3.3.5 and Figures F.3.3-1 and F.3.3-2 do not describe ECTran as being used for these purposes. The text should be revised to address this discrepancy.

Response: At the beginning of Section F.3.3.3.5, it is stated that the ECTran model was used for simulating 1-dimensional lateral perched water transport, 1-dimensional vertical vadose zone transport, 1-dimensional vertical surface water loading, and 1-dimensional lateral transport in the Great Miami Aquifer. The first and second bulleted items listed in Section F.3.5.4.2 both fall into these types of simulation. Figures F.3.3-1 and F.3.3-2 will be modified to include these simulations.

Action: Figures F.3.3-1 and F.3.3-2 will be modified to include these simulations.

317. Organization: U.S. EPA Commentor: Saric
Section #: F.3.7.1 Page #: F.3-47 Line #: NA
Original General Comment #: I

Comment: This section lists time estimates required for uranium to migrate through the glacial till unit and enter the Great Miami Aquifer for various locations within the FEMP. These breakthrough times appear to be largely overestimated. The breakthrough times are listed as 350 and 950 years for the Plant 9 and Plant 2/3 areas respectively. Perched groundwater in the glacial till beneath the Plant 6 area has a total uranium concentration of over 100,000 μ/L within 6 feet of the unsaturated portion of the Great Miami Aquifer. In addition, the perched groundwater in the glacial till beneath the plant 2/3 area has a total uranium concentration of over 50,000 μ/L within 15 feet of the unsaturated portion of the Great Miami Aquifer. It appears unlikely that it will require the large amount of time estimated in this section to impact the Great Miami Aquifer. DOE should review the assumptions made in formulating the estimates and compare the modeled results against the field data.

Addendum to 317, received October 21

The response states that a k_d value of 15 results in a retardation factor of 165. Using the information provided in Table F.3.II-8 and F.3.II-9, PRC calculated a retardation factor of about 76. DOE should explain this discrepancy. The response also states that as a check on the model assumption, DOE converted the source leachate concentration for Plant 2/3 and Plant 6 into total solid phase concentrations. Using the information provided in the RI it is not clear how soil concentrations of 2,500 mg/Kg and 5,000 mg/Kg were derived. DOE should provide the sample calculations. In addition DOE should justify the use of 50 percent extractable uranium in this calculation.

Response: The uranium breakthrough time through the glacial overburden (as defined in Section 5.4.3.5) is controlled by area-specific thickness, groundwater infiltration rate, and retardation factor in the gray clay layer of the glacial overburden. Source concentrations have less impacts on the breakthrough time. The highly contaminated perched groundwater observed in the glacial overburden is located in the weathered portion of the overburden which contains fractures and has been distributed by construction activities. However, similar contaminant concentrations cannot be found in the Great Miami Aquifer directly under these perched groundwater plumes after more than 30 years because the gray clay layer underlying the contaminated perched groundwater is relatively intact and has much lower permeability.

As described in the text, vertical contaminant fate and transport modeling through the glacial overburden only includes the gray clay layer. Vertical migration of contaminant through the weathered overburden was assumed to be instantaneous. Based on measured data and model

calibrations presented in the Attachments F.3.I and F.3.II, K_d values of uranium in the gray clay layer range between 4 L/kg (i.e., from lysimeter calibration) to higher than 2000 L/kg. A calculated K_d value of 15 L/kg was used to represent the baseline conditions in the Plant 2/3, Plant 6, and Plant 9 areas for fate and transport modeling. This K_d value was also verified by the model calibration presented in F.3.II. As information presented in Attachments F.3.I and F.3.II indicated, a K_d value of 15 L/kg is conservative but not the minimum value. The retardation factor in the gray clay layer calculated using a K_d value of 15 L/kg is about 165. In other words, uranium migrates 165 times slower than the groundwater seepage velocity which is about 1 to 2 feet per year. This low migration speed explains the long breakthrough times through the glacial overburden (i.e., gray clay layer) presented in the baseline conditions.

The uranium retardation factor value of 165 in the gray clay layer is listed in Table F.3.4-4. Parameters used to calculate this value are included in Table F.3.4-5. The retardation factor is used in the ODAST model but not used in the ECTran screening model. The ECTran model uses total mass flow rate and K_d partitioning coefficient directly (instead of seepage velocity and retardation factor as in the ODAST model) to simulate contaminant migration in the overburden. The ECTran model also assumes instantaneous mixing of contaminant mass in the entire model layer to account for dispersion. The parameter values used in the ODAST model (i.e., the values in Table F.3.4-5) represent site-wide average conditions while values used in ECTran calibrations are more local to the Plant 2/3 and Plant 6 areas. However, the parameter values (i.e., K_d, bulk density, and moisture content) listed in Tables F.3.II-8 and F.3.II-9 are generally very similar to values listed in Table F.3.4-5. Also, it is important to point out that moisture content (i.e., about 20 percent in Table F.3.4-5) is used in the calculation of retardation factor in the overburden instead of the total porosity (i.e., 34 percent in Table F.3.II-8). This is the major reason why the retardation factor calculated by PRC is only about half of 165.

The 2500 mg/kg and 5000 mg/kg total solid phase uranium concentrations discussed on Page F.3.II-15 are calculated by converting the source leachate concentrations listed in Tables F.3.II-8 and F.3.II-9 with a K_l value of 15 L/kg and an estimated K_e value of 50 percent). For example, for the Plant 6 case, the total solid phase concentration is obtained by the following calculation:

$$167 \text{ (mg/L)} \times 15 \text{ (L/kg)} / 0.5 = 5010 \text{ (mg/kg)}$$

The K_e value used in the calculation is estimated using available information from the soil leachability study conducted by ORNL, as mentioned in Section F.3.II.3.2. In addition, results from the recent K_l study, conducted to support the Operable Unit 5 FS, also support this range of K_e value. The K_e value is only used for calibration purpose in order to explain the contaminant release history at the site. It is not used in the Operable Unit 5 RI to determine any future source terms.

For the purpose of Operable Unit 5 RI, these long breakthrough times did not change the conclusions regarding the maximum level and sources of future Great Miami Aquifer groundwater contamination. Based on modeling results, Great Miami Aquifer uranium concentrations can reach 9 mg/L in about 200 years due to future surface water loading. Relative breakthrough times between source areas also provided information for prioritizing the cleanup efforts.

It is also important to point out that a K_d value between 3 L/kg and 4 L/kg for the gray clay layer throughout the FEMP is currently being used in the Operable Unit 5 FS to develop soil preliminary remedial goals and waste acceptance criteria for disposal facilities. This value is

representative for conditions observed in the southeast lysimeter data where the gray clay layer has a relatively high silt content. Selection of this lower K_d value to represent the whole site will allow the combined geochemical and hydrogeological uncertainties in the natural environment which control the migration rate of uranium through the overburden to be better enveloped in the Operable Unit 5 remedial alternatives. With this lower K_d value, the breakthrough time is about 5 times shorter than the baseline cases.

Action: Replace the text of Section 5.4.3.5 by the following:

5.4.3.5 Uranium Breakthrough Time

Breakthrough time is defined as the time it takes for significant uranium concentration (i.e., a concentration higher than 1 percent of the original source leachate or 20 μg/L) to vertically migrate through the overburden from its current location and reach the Great Miami Aquifer. Breakthrough times in various contaminated areas of the site is information required by the Operable Unit 5 FS to prioritize the cleanup efforts. The breakthrough time is generally controlled by the area-specific infiltration rate, gray clay thickness and chemical-specific retardation factors.

As previously described in Section 5.4.3.1, vertical migration of contaminants through overburden in every 125-foot by 125-foot area was determined by using the ODAST/SWIFTLOAD model to screen CPCs and determine mass loading terms into the Great Miami Aquifer models. By comparing all the area-specific loading terms, locations of the contaminant-specific maximum loading and corresponding loading curves (i.e., leachate concentrations vs. time) within each of the six baseline risk assessment zones (see Figure 5-6) can be identified. These results are the area-specific contaminant breakthrough times that need to be considered in the FS.

Relative breakthrough times between source areas provide information for prioritizing the cleanup efforts. As an example, Figures 5-37 and 5-38 show the zone-specific locations of the maximum loading and corresponding loading curves for total uranium, respectively. As mentioned in Section 5.4.3.3, the uranium breakthrough time in the Plant 6 area is about 350 years based on the 20 μg/L breakthrough criterion. The breakthrough time based on the 1 percent of the original source leachate for the Plant 6 area is approximately 380 years. The breakthrough times in the following specific source areas were also evaluated in the modeling based on the 20 μg/L and 1 percent criteria respectively:

- Plant 2/3 - about 835 years; and about 975 years
- Sewage treatment plant - greater than 1000 years (both cases)
- Plant 9 - about 890 years; and about 910 years
- Fire training area - greater than 1000 years (both cases).

The above-listed breakthrough times were estimated with geochemical and hydrogeological parameter values used in the baseline conditions described in previous sections. It is important to point out that, although they provide useful relative comparisons between source areas, the actual breakthrough times may be quite different from these baseline values. Parameter values used in simplified numerical models all have inherent uncertainties when simulating complex natural systems such as uranium contaminant migration through glacial overburden. In order to estimate the possible ranges of the area-specific breakthrough times considering the uncertainties of controlling geochemical and hydrogeological parameters, model simulations were also conducted with parameter values other than the ones used in the baseline case to bracket the uncertainty. With the uranium K_d value in the gray clay of 3 to 4 L/kg, determined through model calibration of the southeast lysimeter data (see Attachment II of Appendix F.3) and without including the retardation effect in the unsaturated Great Miami Aquifer sand and

gravel layer, the following breakthrough times can be obtained for the 20 μg/L and 1 percent cases respectively:

- Plant 6 - about 45 years, and about 55 years
- Plant 2/3 - about 155 years, and about 185 years
- Sewage treatment plant - about 210 years, and about 260 years
- Plant 9 - about 160 years, and about 180 years
- Fire training area - about 290 years, and about 330 years.

The second set of breakthrough times are about 5 to 6 times shorter than the first set. However, for the purpose of the Operable Unit 5 baseline risk assessment, these shorter breakthrough times do not change the conclusions regarding the maximum level and sources of future Great Miami Aquifer groundwater contamination. Based on modeling results, aquifer uranium concentrations can reach 9 mg/L under the SSOD in about 200 years due to future surface water loading from contaminated surface runoff which also originates from these same source areas. The highest uranium aquifer concentration under the former production area is due to loading from Plant 6 which occurs within 700 years in the baseline case. Earlier arrival of contaminated leachate in the vertical migration pathway through the glacial overburden to the Great Miami Aquifer from sources other than Plant 6 may create a larger plume below the former production area within the model simulation time frame; however, it will not significantly increase the maximum Great Miami Aquifer concentration or off-property receptor concentrations.

Although the need for soil remedial actions is clear, the Operable Unit 5 FS area- and pathway-specific soil cleanup goals will be determined using more conservative estimates of parameter values, such as the ones used in the above set of breakthrough time simulations. This will allow uncertainties of conditions in the natural environment, such as geochemical and hydrogeological conditions which control the migration rate of uranium through the glacial overburden, to be better addressed in the Operable Unit 5 remedial alternatives."

318. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.7.1 Pg.#: F.3-47 Line#: 9 to 11
Original Specific Comment #: 235
Comment: The text references Figure F.3.7-1 for uranium concentrations at the end of the baseline condition (that is, 70 years) during which the South Groundwater Contamination Plume recovery well system and storm water runoff controls are in operation. Information pertaining to the effectiveness of the recovery well system and storm water runoff controls should be provided or referenced because, based on initial groundwater concentrations presented in Figures F.3.4-6 through F.3.4-8, the recovery well system and the runoff controls would diminish the amount of contamination in the Great Miami Aquifer.
Response: The modeling result at the end of first 70 years presented in Figure F.3.7-1 (also in Figure 5-29) was discussed in Section 5.4.3.2 on page 5-71. It is also important to point out that without additional remedial action, contaminant loading through the glacial overburden and the SSOD under future conditions can eventually increase the amount of contaminant in the Great Miami Aquifer to a level much higher than the current conditions, as shown in the other modeling results. Overall the amount of contamination in the Great Miami Aquifer does not diminish under the no-additional-action scenario simulated in the Operable Unit 5 RI Report.
Action: No action.

319. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.7.1 Pg.#: F.3-48 Line#: 27 and 28
Original Specific Comment #: 236

Comment: The text references Table F.3.7-3 for the maximum contaminant concentrations and time of maximum concentration in the Great Miami Aquifer on site and at the fenceline. According to the table, some contaminants, such as total uranium, have maximum concentrations at the fenceline sooner than maximum on-site concentrations. It is not apparent how maximum fenceline concentrations can occur prior to maximum on-site concentrations. The text should be revised to address this issue.

Response: The fenceline maximum concentration can occur before the maximum on-site concentration in two situations. In the first case the maximum fenceline concentration and the maximum on-property maximum concentration were caused by two different sources and the source for the on-property maximum concentration was farther away from the fenceline than the other source. One example of this case is mercury. The maximum on-property concentration is caused by loading from source area 1 and the maximum fenceline concentration is caused by loading from source area 2, as shown in Figure F.3.7-20.

In the second case both the on-property and off-property maximum concentrations were due to constant contaminant loading from the SSOD as defined in the future conditions. Concentrations at these two locations eventually reached steady state values in this case. With a constant surface water contaminant loading rate, the concentration under the SSOD reached its steady state faster than the fenceline concentration. However, for certain contaminants the concentration under the SSOD which became the on-property maximum may still increase slightly before the end of 1000-year time frame. The increase in the maximum fenceline concentration during the remaining time frame was usually insignificant and the time when the steady state was reached was reported in Table F.3.7-3. In reality the maximum fenceline concentration occurred after the on-property maximum. Neptunium, uranium and lead are the three examples of this case. On-property maximum concentrations of all the other contaminants listed in Table F.3.7-3 occurred earlier than the corresponding maximum fenceline concentrations.

Action: No action.

320. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.2 Pg.#: F.3.I.3-2 Line#: 9
Original Specific Comment #: 237

Comment: The text provides constants used to calculate the solubility of uranium dioxide (UO_2) and uranium tetrafluoride (UF_4) in distilled water. The partial pressure of oxygen is given as 10×10^{-39} atmospheres (corresponding to an Eh of 0.24 volts). Water in equilibrium with atmospheric oxygen generally has an Eh of approximately 0.75 volts and partial pressures much greater than 10×10^{-39} atmospheres. The text should be revised to indicate a more accurate oxygen partial pressure. More important, the text should indicate the used in the EQ3/6 thermodynamic database for the solubility calculations.

Response: Agree. The referenced EQ3/6 run will be redone at atmospheric conditions and all P_{O2} values used in the calculations will be justified and reported.

Action: See response and action for Comment 299.

321. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.2 Pg.#: F.3.I.3-3 Line#: 5 to 7
Original Specific Comment #: 238

Comment: The text states that little, if any, UF_4 released from operations and accidents remains in soil at the FEMP today. This implies that the less soluble uranium oxides are the predominant uranium contaminant left in production area soils. However, the text tries to show that distinctly different K_l and K_d values apply for UF_4 spills and airborne oxide or depleted sources. In fact, large areas in the production area have been mapped (see Figure F.3.4-1) where the lower K_l and K_d values associated with UF4 spills are supposedly dominating the fate and transport process. This contradiction should be addressed. Also, wherever possible, only

observed K_l and K_d values should be used to define the geochemical parameters describing source terms.

Response: Agree. Clarification is needed on describing the relative solubility of various uranium solids. Emphasis needs to be placed on secondary uranium solids that may have precipitated when aqueous spills or leaks occurred in the production area. Unlike the highly soluble UF_4 or relatively insoluble UO_2 solids, these secondary uranium phases would be moderately soluble and may persist for some time in the production area. Additional clarification is also needed to note that much of the uranium derived from soluble uranium solids or spills is probably present in the perched groundwater zone as aqueous uranium. However, all the uranium K_l and K_d values used in the fate and transport modeling were from observed data.

Action: See response and action for Comment 299.

322. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.3 Pg.#: F.3.I.3-6 Line#: 3 to 7
Original Specific Comment #: 239

Comment: The text states that adsorption/desorption reactions become irreversible with time, and that only a fraction of what is initially chemisorbed to a solid can be removed or extracted by desorption. Although chemisorption may become irreversible with time, its effect is not very significant if, for instance, it takes many decades for complete chemisorption to occur. This highlights the need to clearly understand and convey the time over which the various geochemical processes are occurring. The text should be revised to provide all available information regarding the length of time required to render these reactions irreversible.

Response: The irreversible nature of adsorption/desorption reactions can be discussed in the time frame of adsorption batch tests (about six months) and FEMP history (about 40 years). The preliminary batch tests show values of 15 to 40 L/kg for adsorption and several hundred to several thousand L/kg for apparent desorption from contaminated soil. Therefore, the time frame for chemisorption to become irreversible is relatively short in the overall modeling time frame of 1000 years. Furthermore, any sources initially contaminated with soluble uranium were simulated by using low K_l and K_d values throughout the whole modeling time frame. The irreversible nature of adsorption/desorption reactions did not affect the modeling results.

Action: Page F.3.I.3-6, Line 8: Insert the following text: ....partition coefficient (i.e., K_d). Evidence for the irreversible nature of adsorption on the time frame of several decades is provided by adsorption and desorption batch tests with FEMP soil. The test results show mean values of 24 L/kg for adsorption and 270 L/kg for desorption. These studies and the use of adsorption and desorption....

323. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.3 Pg.#: F.3.I.3-6 Line#: NA
Original Specific Comment #: 240

Comment: The text introduces the processes involved in physical and chemical adsorption and desorption. However, it is not clear from the data presented, how much of the total mobile contaminants, in terms of total volume or percentages, are actually involved in adsorption/desorption reactions. A discussion of this issue should be presented.

Response: The K_e is used to describe how much of the mobile (or extractable) uranium is involved in adsorption/desorption reactions. Based on the recent K_e study conducted for the Operable Unit 5 FS, K_e values for contaminated surface soil outside of the production area values are less than 2 percent. Values of K_e increase in and between the production area and the waste pit area. K_e values in these areas are usually higher than 15 percent.

Action: A. Page F.3.I.3-7, Table F.3.I.3-3, Line 7: Change Calcide to Calcite.

B. Page F.3.I.3-7, Line 24: ...to catalyze the adsorption reactions. A discussion on the mass of uranium available for sorption reactions will be presented as part of the Operable Unit 5 FS Report in November, 1994.

C. Page F.3.I.3-7, Lines 34 through 36: ... This implies that the carbonate minerals in the glacial overburden will not be very efficient at adsorption of uranyl carbonate species, and this is reflected in the low adsorption values selected for the fate and transport model. Specific adsorption ....

324. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.3 Pg.#: F.3.I.3-7 Line#: 34 to 36
Original Specific Comment #: 214
Comment: The text states that carbonate minerals in the fractured and weathered glacial overburden should be more efficient in adsorbing uranyl carbonate species because the partial pressure of carbon dioxide will be kept lower by communication with the air reservoir. While this may be true for carbonate minerals located immediately adjacent to fractures, the bulk of the upper intervals of the overburden would be expected to have high because of the organic matter in the soils. This seems to imply that the bulk of the upper overburden soils, with the possible exception of those immediately adjacent to large fractures, would be inefficient at adsorbing uranyl carbonate species. This apparent contradiction and its implications for the fate and transport models should be addressed.
Response: It is important to note that lower P_{CO2} affects the adsorption of uranium on carbonate minerals only. However, the carbonate minerals are not expected to adsorb appreciable uranium under any P_{CO2} condition. The fate and transport modeling results are not affected by the P_{CO2} condition.
Action: See action for Comment 323.

325. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.4 Pg.#: F.3.I.3-8 Line#: NA
Original Specific Comment #: 242
Comment: Section F.3.I.3.4 discusses the factors controlling uranium solubility and concentrations in perched groundwater. The discussion is based primarily on geochemical factors. However, the effects of hydrogeological controls such as groundwater flow rates, flow volumes, and residence times should also be discussed.
Response: Agree. Perched groundwater flow rates, flow volumes, and residence times will be integrated with the geochemical discussion on uranium concentrations in the perched groundwater zone.
Action: **A.** Page F.3.I.3-8

Lines 2 through 8: The concentration of uranium in glacial overburden groundwater will be controlled by the dissolution rates of uranium solids in the soil, the adsorption of uranium onto glacial till solids, the solubility of uranium minerals in perched groundwater, and hydraulic factors such as flow rates, flow volumes, and residence times (hydraulic factors are discussed in detail in Section 3.6). Observed uranium concentrations in glacial overburden groundwater at the FEMP range from 0.00029 to 129 mg/L (Table E.1-1;) Using groundwater constituent concentrations for Monitoring Wells 1060 (pH 7.67) and 1065 (pH 6.97) (Appendix I) and a uranium concentration of 129 mg/L, mineral SIs were calculated at Eh values of 84 and 485 mV to evaluate the saturation state of uranium phases over the range of pH and Eh conditions found in glacial overburden groundwater (Tables F.3.I.3-4 and F.3.I.3-5).

Lines 10 through 21: In groundwater obtained from Monitoring Wells 1060 (pH = 7.67, UO_2^{+2} = 146 mg/L) and 1065 (pH = 6.97, UO_2^{+2} = 146 mg/L), nine uranium phases are predicted to be supersaturated (SI > 0.4) or saturated (0.4 > SI > -0.4) at an Eh of 84 mV,

but only four phases at an Eh of 485 mV (Tables F.3.I.3-4 and F.3.I.3-5, respectively). At an Eh of 84 mV, haiweeite, soddyite, U_3O_7, U_3O_8, U_4O_9, and uraninite are supersaturated in groundwater from both wells, $CaUO_4$ and coffinite are respectively supersaturated in groundwater from Wells 1060 and 1065, coffinite and sklodowskite are saturated in groundwater from Well 1060, and $(UO_2)_3(PO_4)_2 \cdot 4H_2O$ and schoepite are saturated in groundwater from Well 1065. Note that the SI values for minerals containing uranium in the U(VI) oxidation state do not change as a function of Eh, indicating U(VI) is the stable oxidation state over the Eh range of 84 to 485 mV. However, the uranium oxides containing uranium in the U(IV) and U(V) oxidation states are thermodynamically unstable at an Eh value of 485 mV, and their SI values decrease to less than -10 (indicating they will not precipitate in the glacial overburden under this Eh condition). However, these thermodynamic calculations do not consider dissolution kinetics, and although the U(IV) and U(V) oxidation states are thermodynamically unstable at an Eh value of 485 mV, minerals with U(IV) and U(V) that are currently present in the environment may persist for decades to thousands of years if the dissolution kinetics are slow (e.g., UO_2). Additionally, groundwater flow volumes and residence times will affect the degree to which uranium solids are dissolved. Lacking kinetic data on the dissolution rates of the uranium phases, all that can be said is that the observed uranium concentrations in glacial overburden groundwater show that residence times are great enough to achieve concentrations that can saturate a number of uranium phases.

It is of interest that the elements comprising the supersaturated and saturated uranium phases listed above (i.e., Si, P, Ca, Mg, O) have all been detected in uranium grains found in contaminated FEMP soil (Lee and Marsh 1992), although specific minerals could not be identified by this ORNL study because the SEM and EDX analysis did not yield stoichiometric information. However, the thermodynamic solubility calculations and ORNL elemental data suggest that the predicted saturated phases can be present in FEMP soil.

Assuming precipitation kinetics allow any of the supersaturated and saturated phases to form at ambient temperature over the time frame of FEMP operations (e.g., decades), it is useful to identify the minimum uranium concentration required to precipitate a given mineral (i.e., the uranium concentration that will set a mineral SI equal to zero). These concentrations have been calculated for the supersaturated and saturated phases in Tables F.3.I.3-4 and F.3.I.3-5 at an Eh of 84 mV (Table F.3.I.3-6). Note that the presented concentrations cover the range of observed uranium concentrations in glacial overburden groundwaters, indicating groundwater residence times are great enough to achieve saturation with respect to the indicated phases.

For the uranium minerals in Table F.3.I.3-6 containing the U(IV) and U(V) oxidation states (β-U_3O_7, U_3O_8, U_4O_9, UO_2, and $USiO_4$), higher uranium concentrations are required to saturate these phases in groundwater from Well 1060. This is primarily due to a partial pressure of oxygen (P_{O2}) that is about three orders of magnitude higher in groundwater from Well 1060. Higher P_{O2} destablizes the U(IV) and U(V) oxidation states, which increases the solubility of the indicated minerals. The higher P_{O2} in groundwater from Well 1060, relative to Well 1065, is due to a higher pH value - as P_{O2} is a function of pH at constant Eh (i.e., 84 mV). Variation in the uranium concentrations required to saturate minerals containing uranium in the U(VI) oxidation state is largely due to the difference in pH and element concentrations (e.g., Ca, P, Si, Mg) in the groundwater from the two wells. Although any one or several of the phases in Table F.3.I.3-6 may precipitate from this groundwater when the observed maximum uranium concentration and lowest Eh value, it is important to note that the minerals containing U(IV) and U(V) will not precipitate when the P_{O2} exceeds 10^{-44} atmospheres (about 200 mV at pH 6.97). Therefore, under most Eh and pH conditions measured in glacial overburden groundwater, the precipitation of secondary uranium phases is expected to be limited to minerals containing the U(VI) oxidation state.

326. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.3.5 Pg.#: F.3.I.3-9 Line#: 17 to 18
Original Specific Comment #: 243

Comment: The text states that when uranium is released to pore waters and groundwater, the uranium is homogenized throughout the area as uranyl carbonate species. However, the information presented indicates that secondary uranium complexes such as uranyl phosphate are also formed. It would be useful in evaluating the fate and transport models to know how much of the mobile uranium (stated in terms of a percentage) forms uranyl carbonate complexes and how much is used in forming the secondary complexes. This information should be provided.

Response: It is very difficult to quantify the mass balance between forms of uranium, as there are no snapshots of uranium concentrations in groundwater at the time of aqueous spills or leaks. However, uranium solids are expected to precipitate if they exceed a solubility limit, and the mass of uranium removed from each liter of groundwater to satisfy the predicted solubility limit can be quantified. In the Operable Unit 5 fate and transport modeling no solubility limits were used to determine the leachate concentrations. Therefore, the modeling results were not affected by the precipitation process.

Action: **A.** Page F.3.I.3-9, Lines 18 and 19:

...as uranyl carbonate species (Reactions 17 and 18), with the exception of secondary uranium precipitates that may form (e.g., $CaUO_4$, $(UO_2)_3(PO_4)_2 \cdot 4H_2O$). If present, the secondary precipitates will influence the uranium groundwater concentrations at some future date, although mass balance information is not available to estimate the amount of uranium that may be tied up in these secondary precipitates. This conceptual picture....

B. Page F.3.I.4-1, Lines 27 and 28:

...may have occurred (see Tables F.3.I.3-4, F.3.I.3-5 and F.3.I.3-6 in Section F.3.I.3.5). ....

C. Page F.3.I.4-2, Lines 14 and 15:

...by precipitation of uranium solids listed in Table F.3.I.3-6. Site specific.....

D. Page F.3.I.4-2, Lines 23 and 24:

...by precipitation of uranium solids listed in Table F.3.I.3-6, if a large mass...

E. Page F.3.I.4-3, Lines 20 and 21:

...subsurface include the minerals listed in Table F.3.I.3-6.

F. Page F.3.I.4-3, Line 23:

...range from 0.00029 to 129 mg/L in ...

G. Page F.3.I.4-3, Lines 26 through 29:

...adsorption process. The maximum observed uranium concentration (129 mg/L) is sufficient to saturate a number of uranium phases (Table F.3.I.3-6) in perched groundwater having high bicarbonate activity, implying some of the saturated phases may be present in the glacial overburden.

H. Page F.3.I.4-3, Lines 30 through 32:

...noted the association of calcium, phosphorous, silicon and magnesium with uranium particles (Lee and Marsh 1992), supporting the presence of the listed uranium phases (Table F.3.I.3-6) in the soil.

327. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.4.1 Pg.#: F.3.I.4-1 Line#: 31
Original Specific Comment #: 244

Comment: The text states that aqueous forms of uranium releases outside of the production area are absent. However, aqueous uranium sources occur at OU1, OU2, and OU4 as well as at the K-65 slurry trench. The entire Great Miami Aquifer is covered under the Operable Unit 5 RI and as such, aqueous sources from OU1, OU2, and OU4 should be evaluated in the Operable Unit 5 fate and transport models. The K-65 slurry trench is not covered by previous OU RIs and is known to have released aqueous uranium contaminants. The text should indicate whether these sources have been evaluated in the Operable Unit 5 fate and transport models.

Response: Other operable unit mass loadings and geochemical concepts related to nonairborne releases (leachate) have been accounted for in the Operable Unit 5 fate and transport model by including mass loading terms determined in previous RI fate and transport models. These mass loadings were simulated for 40 years in the Operable Unit 5 model and terminated as remedial actions are completed in the other operable units. This approach is explained in Section 5.1.1 and F.3.4. The K-65 slurry trench was also included in the Operable Unit 5 RI (Source Area 570b).

Action: The text will be clarified to explain how other operable unit mass loading and geochemical concepts were incorporated in the Operable Unit 5 fate and transport modeling. The following paragraph will be added to Section F.3.I.4.1 after line 2 on page F.3.I.4-2:

Other operable unit mass loadings and geochemical concepts related to nonairborne releases (leachate) have been accounted for in the Operable Unit 5 fate and transport model by directly including mass loading terms determined in previous RI fate and transport models. These mass loadings were simulated for 40 years in the Operable Unit 5 model and terminated as remedial actions are completed in other operable units. This approach is explained in Section 5.1.1 and F.3.4. The K-65 slurry trench was also included in the Operable Unit 5 RI (Source Area 570b).

328. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.4.3 Pg.#: F.3.I.4-4 Line#: 1 to 10
Original Specific Comment #: 245

Comment: The text provides data from lysimeter studies; however, very little information is provided. The text should present or reference information on lysimeter locations, depths, thicknesses of overlying glacial overburden, and overlying contamination sources.

Response: Agree. Some of the lysimeter information is presented in Attachment F.3.II. A brief summary will be provided in F.3.I.

Action: The first sentence and first few words of the second sentence, on page F.3.I.4-4 will be revised to read as follows:

Lysimeters placed near the base of the unweathered glacial overburden recovered fluid samples with uranium concentrations that varied from 0.002 to 0.052 mg/L. The lysimeters are installed at three different locations (Figure 3-37). At each of the three locations one lysimeter is installed in the base of the gray clay and one is installed in the upper unsaturated portion of the Great Miami Aquifer, immediately below the base of the gray clay.

Lysimeters 11234 and 11129 are located a few hundred feet northwest of the inactive flyash pile. The lysimeter cup in 11234 is located 13.6 feet below the ground surface in

approximately 10 feet of gray clay. The lysimeter cup in 11129 is located beneath 11234, approximately 21.6 feet below the ground surface, in the unsaturated portion of the Great Miami Aquifer.

Lysimeters 11130 and 11131 are located approximately 1000 feet southeast of the southeast corner of the east parking lot. The lysimeter cup in 11130 is located 21.5 feet below the ground surface in approximately 20 feet of gray clay. The lysimeter cup in 11131 is located beneath 11130, approximately 35.6 feet below the ground surface, in the unsaturated portion of the Great Miami Aquifer.

Lysimeters 11132 and 11133 are located just northeast of the northeast corner of the former production area. The lysimeter cup in 11132 is located 25.6 feet below the ground surface in approximately 30 feet of gray clay. The lysimeter cup in 11133 is located beneath 11132, approximately 47.6 feet below the ground surface, in the unsaturated portion of the Great Miami Aquifer.

Sampling results for the lysimeters are presented in Table 3-19; results are also discussed in Section 4.7 Sampling information indicates uranium mobilized on the .....

329. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.4.5 Pg.#: F.3.I.4-5 Line#: 29 to 33
Original Specific Comment #: 246

Comment: The text states that perched groundwater data represents complete equilibrium of the water and soil system, and lysimeter data have solute concentrations somewhere between the disequilibrium conditions at the surface and the equilibrium conditions in perched groundwater. It is not clear why lysimeter concentrations do not reflect equilibrium conditions similar to perched groundwater because this water likely emanates from perched groundwater in the overburden and represents longer residence time in the system. Also, it is unlikely that all perched groundwater represent equilibrium given the multitude of geochemical and hydrogeological factors affecting these reactions. Additional information supporting these conclusions should be provided.

Response: Agree. The lysimeter and groundwater compositions will be reevaluated with respect to the equilibrium discussion. Clarification will be given with respect to groundwater being equilibrated with carbonate minerals, but perhaps not with all mineral components in the system.

Action: **A.** Page F.3.I.4-5, Lines 30 and 31:

... perched groundwater analyses represent deeper waters in the water/soil system, and lysimeter data have....

B. Page F.3.I.4-5, Line 32:

...analog of percolating porewater. It is noted here that the groundwater and lysimeter water are saturated with the carbonate minerals calcite and dolomite, and that the distilled water used in the ORNL study becomes saturated with these carbonate minerals within 300 days. Therefore, solubility equilibrium between rainwater and carbonate minerals will be established within a year, and this equilibria is the most important from the standpoint of uranium mobility. A significant....

330. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.4.5 Pg.#: F.3.I.4-7 Line#: 15
Original Specific Comment #: 247

Comment: The text states that remediation activities will result in uranium concentrations of 150 mg/kg in the glacial overburden. Section F.3.I.4.4 states that this soil concentration will result in an equilibrium groundwater concentration of 0.064 to 12.5 mg/L uranium. Both of these predicted groundwater values are above the proposed maximum contaminant level (MCL) of 20 μg/L. The text should explain the significance of the predicted equilibrium groundwater values and explain how the 150 mg/kg soil cleanup level was determined.

Response: This comment has misinterpreted the original text. The original text states a hypothetical remediation level of 150 mg/kg, not that the remediation level **is** 150 mg/kg. These hypothetical calculations were given to show the utility of using solubility and K_d values to evaluate future uranium release. The calculation will be redone using specific PRGs from the FS. It will also be clarified that the calculated uranium concentrations are for glacial overburden perched groundwater, and there is a large dilution factor involved when perched groundwater leaks into the Great Miami Aquifer.

Action: **A.** Page F.3.I.4-4

Line 10: ...unweathered glacial overburden....

Lines 22 and 23: Change 150 to 50.

Lines 29 and 30: ...concentrations of 4.1 and 0.02 mg/L in groundwater equilibrated with a soil containing 50 mg of adsorbed U/kg soil (i.e., 50 mg/kg ÷ 12 L/kg and 50 mg/kg ÷ 2344 L/kg). It should be noted that these predicted groundwater concentrations exceed or equal the proposed maximum concentration level of 0.02 mg/L. However, these calculations are for illustrative purposes only and are not intended to serve as the soil or groundwater concentrations that will be evaluated in the Operable Unit 5 FS.

B. Page F.3.I.4-5

Lines 2 through 4: Therefore, a groundwater MCL of 0.02 mg/L for uranium can be achieved if the soil contains less than 50 mg of adsorbed U/kg and the K_d for desorption is greater than 2400 L/kg.

Lines 11 and 13: Change 150 to 50.

Line 12: Change 891 to 297.

Line 15: Change 0.89 and 40 to 0.3 and 13.

Line 16: ..the ORNL study and using the calculated upper concentration of 13 mg/L, uranium porewater...

Line 18: .. can exceed the solubility of $(UO_2)_2SiO_4 \cdot 2H_2O$, U_3O_7, U_3O_8, U_4O_9, $(UO_2)_3(PO_4)_2 \cdot 4H_2O$, and $Mg(UO_2)_2(PO_4)_2$ at a pH of 7.2 and Eh of 100 mV if bicarbonate....

Line 26: ...composition of the solid, the pH, Eh, and composition...

C. Page F.3.I.4-6

Line 2: ...perched groundwater (> 350 mg/L). ....

Lines 15 and 16: ..precipitate silicate minerals (Lasaga 1981. Saturation of ....

Line 25: Change 15 and 16 to 17 and 18.

Line 27: ...concentrations have the ability...

Lines 28 through 30: ...lysimeter data indicate $(UO_2)_2SiO_4 \cdot 2H_2O$, U_3O_7, U_3O_8, U_4O_9, $(UO_2)_3(PO_4)_2 \cdot 4H_2O$, and $Mg(UO_2)_2(PO_4)_2$ are saturated in the porewater if the uranium concentration reaches 13 mg/L at a pH of 7.2 and Eh of 100 mV. A possible ...

D. Page F.3.I.4-7

Lines 6 through 8: delete the sentence ...As noted in previous ..... or (UO2)3(PO4)2 · 4H2O.

Line 10: ...the presence of secondary precipitates in the...

Lines 15 and 16: ....from the surface source. Proposed remediation activities are currently calling for a preliminary remediation goal for uranium in glacial overburden of less than or equal to 50 mg/kg.

331. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.5.1 Pg.#: F.E.I.5-2 Line#: 10 to 20
Original Specific Comment #: 248

Comment: The text gives an example calculation for determining initial aqueous loading of uranium. The equation uses initial soil (source) concentration, the extraction coefficient (K_e) for uranium, and K_l. It is not clear why the initial source concentration is multiplied by K_e because K_l appears to already account for the amount of extractable uranium in the source material. The calculated result appears to underestimate the resulting uranium concentration by a factor of two. A thorough explanation should be provided justifying the use of K_e values in conjunction with K_l values.

Response: For contaminated soil, a value of K_l can be calculated considering either the total or only the extractable contaminant mass in the soil. As stated in F.3.4.3 on page F.3-24, when K_e less than 100 percent is applied in the modeling, K_l will only be determined for the extractable portion of the contaminant mass. The value of K_l is lower when only the extractable mass is considered. For example, when K_e is about 1 percent the corresponding K_l is usually less than 1 percent of the K_l value based on total contaminant mass. When a value of K_l is determined only for the extractable portion, it is relatively constant throughout the site. Conceptually, for contaminated soil, K_e will decrease with time and K_l, based only on the extractable mass, remains the same when extractable contaminant mass is dissolving. As a result, K_l based on the total mass will increase with time.

In the current Operable Unit 5 RI, K_e for all the contaminants was assumed to be 100 percent. Therefore, the K_l was based on the total contaminant mass and has high value for soil outside of the former production area. The Operable Unit 5 K_l study being conducted to support the FS will demonstrate the current distributions of uranium K_e and K_l values as well as the differences between K_l values calculated based on total contaminant mass and only the extractable mass for the same contaminated soil.

Action: The text will be clarified to explain the difference between K_l values based on total mass and extractable mass only.

A. The following text will be added in F.3.I.5.1:

For contaminated soil, a value of K_l can be calculated considering the total or only the extractable contaminant mass in the soil. Value of K_l is lower when only the extractable

contaminant mass is considered. For example, when K_e is about 1 percent, the corresponding K_l is usually less than 1 percent of the K_l value based on total contaminant mass. In this RI report, K_e for all the contaminants was assumed to be 100 percent. Therefore, the K_l was based on the total contaminant mass and has a high value for soil outside of the former production area.

B. Page F.3.I.5-2

Line 10: In the Operable Unit 5 RI Report, the fate and transport....

Lines 11 through 15: ... is used to define the initial loading of uranium. For example, a kilogram of soil contains 150 mg of uranium and the K_l is determined to be 20 L/kg. Using these values, the first volume of rainwater to move through this soil is estimated to have a uranium concentration of 7.5 mg/L (i.e., 150 mg/kg ÷ 20 L/kg). Each.....

332. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.I.5.2 Pg.#: F.3.I.5-5 Line#: 1 to 7
Original Specific Comment #: 249

Comment: The text states that in areas around Plants 2/3, 6, and 9, the large source of soluble uranium has not been depleted, the plume concentration is increasing, and adsorption is occurring. Analytical soil data has been provided that demonstrates the presence of soluble uranium at the surface in these areas. Furthermore, the boundaries of these areas with low K_l values appear to have been arbitrarily "boxed in" without any data to support the actual delineation of the boundaries. Analytical data demonstrating both the actual presence of soluble uranium and the boundaries of these spill areas should be provided to justify the mapped locations shown in Figure F.3.4-1.

Response: The areas with low K_l were conservatively defined in the Operable Unit 5 RI Report because of the potential uncertainty in the locations of actual boundaries. In the Operable Unit 5 FS, perched groundwater analyses that show elevated uranium concentrations are being mapped to wells in the production area to delineate the suspected areas of spills and/or leaks in higher resolution. These perched groundwater plumes will be used with soil data to refine the delineation of low K_l areas and to appraise their correlation. The refined delineation will be used to determine extents of required soil excavation during the cleanup.

Action: The approach being used in the FS will be described in the text.

A. The following text will be added in F.3.I.5.2:

In order to present the general geochemical conditions at the FEMP, the areas with low K_l are conservatively defined as shown in Figure F.3.4-1. This areal delineation of low K_l areas considers the potential uncertainty in the locations of actual boundaries. However, in the Operable Unit 5 FS, perched groundwater analyses that show elevated uranium concentrations will be mapped to wells in the production area to delineate the suspected areas of spills and/or leaks in higher resolution. These perched groundwater plumes will be used with soil data to refine the delineation of low K_l areas and to appraise their correlation. The refined delineation will be used to determine extents of required soil excavation during the cleanup.

B. Page F.3.I.5-4

Line 10: Replace months to years with decades.

Line 15: Replace years with decades.

Lines 21 and 22: ...due to the presence of a soluble uranium source that is increasing uranium concentrations in the plume. .....

Line 23: ...because discreet, limited past releases of....

Line 25: ... has passed through the overburden (the Operable Unit 5 FS is currently delineating the boundaries for production areas contaminated by aqueous spills and those areas receiving only air emissions). The less soluble uranium oxides....

C. Page F.3.I.5-5

Line 17: ...and the plume peak takes decades to pass through the glacial.....

D. Page F.3.I.5-6

Line 5: Change 15 and 16 to 17 and 18.

E. Page F.3.I.REF-1: Add the following reference

Brookins, D.G., 1987, Eh-pH Diagrams for Geochemistry, Springer-Verlag, New York.

333. Commenting Organization: U.S. EPA Commentor: Saric
Section#: F.3.II.2.1.1 Pg.#: F.3.II-5 Line#: 29 to 32'
Original Specific Comment #: 250
Comment: The text states that K_e will be assumed to be 100 percent for all contaminants except uranium. The text should indicate why K_e values for all contaminants except uranium is 100 percent. Also, the proposed K_e value for uranium should be presented.
Response: Because results of previous treatability studies of uranium-contaminated soil at the FEMP show that a significant portion of uranium mass cannot be chemically removed from soil, the concept of K_e was introduced to describe the leaching process of uranium contamination from contaminated soil in Operable Unit 5 sources. However, at the time the Operable Unit 5 RI was completed, laboratory experiments to measure a site-specific uranium K_e value were still going on. Therefore, uranium K_e was also conservatively assumed to be 100 percent in the fate and transport modeling like all the other contaminants. This approach is stated in line 29 on page F.3.II-5. A K_e of 100 percent means the entire contaminant mass is leachable at the same rate and therefore is a very conservative assumption. Measured uranium K_e values and distribution at the FEMP will be summarized in the Operable Unit 5 FS. A K_e value of 100 percent will still be used for other contaminants in the Operable Unit 5 FS.
Action: No action.

Ohio EPA

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DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
334	OEPA	OFFO	1	General			NA
335	OEPA	DDAGW	2	Glossary	xiv	Aquiclude	Glossary
336	OEPA	DDAGW	3	Glossary	xivi	Confined	Glossary
337	OEPA	DDAGW	4	Glossary	xlix	Grdwtr	Glossary
338	OEPA	DDAGW	5	Glossary	li	Lower Aquifer	Glossary
339	OEPA	DDAGW	6	Glossary	lii	Radiation	Glossary
340	OEPA	OFFO	7	1			NA
341	OEPA	GeoTrans	8	1.3.1.1	1-14	13	1-13
342	OEPA	OFFO	9	1.3.2.6	1-34	28	1-33
343	OEPA	OFFO	10	1.3.4.4	1-40	22	1-39
344	OEPA	OFFO	11	1.3.4.6	1-41	15	1-40
345	OEPA	OFFO	12	1.3.4.10	1-42	31	1-41
346	OEPA	OFFO	13	1.4.5	1-46	25	1-45
347	OEPA	OFFO	15	1	1-5 Tbl		NA
348	OEPA	GeoTrans	16	1			NA
349	OEPA	OFFO	21	2.1.2.3	2-7	12	NA
350	OEPA	OFFO	22	2.1.2.4	2-8	24	NA
351	OEPA	DDAGW	23	2.1.3.1	2-10		2-9
352	OEPA	DDAGW	24	2.1.3.4	2-14	40-41	2-14
353	OEPA	DDAGW	25	2.1.3.4	2-15	14	2-14
354	OEPA	DDAGW	26	2.1.3.5	2-15		NA
355	OEPA	OFFO	28	2.3.1	2-24	4	2-23
356	OEPA	OFFO	30	2.4.4.1	2-28	19	NA
357	OEPA	OFFO	32	2.4.6.1	2-32	8	NA
358	OEPA	OFFO	33	2.4.6.2	2-33	16-20	NA
359	OEPA	OFFO	34	2.4.6.4	2-34	11	2-34
360	OEPA	GeoTrans	35	2.5.5.2	2-44	12	2-43
361	OEPA	OFFO	36	2.8.1	2-57	10	2-56, Figure 2-41
362	OEPA	OFFO	37	2.8.3	2-58	5	2-57
363	OEPA	OFFO	38	2.9.5	2-70		2-69, 3-83
364	OEPA	DDAGW	40	3.2.4	3-5	28-29	NA
365	OEPA	GeoTrans	41	3.2.4	3-6	11	3-6
366	OEPA	GeoTrans	42	3.2.5	3-7	23-24	NA
367	OEPA	GeoTrans	43	3.3.1	3-10	5	3-9, 3-10

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368	OEPA	DDAGW	44	3.4.1	3-14	32-33	3-14
369	OEPA	DDAGW	45	3.4.1	3-15	1	3-14
370	OEPA	DDAGW	47	3.4.4	3-22	4-7	NA
371	OEPA	GeoTrans	48	3.4.4.1	3-23	7	3-21
372	OEPA	GeoTrans	50	3.4.4.2			Figure 3-19, 3-20, Plate 3-1
373	OEPA	DDAGW	51	3.4.4.2	3-24	22	3-23
374	OEPA	DDAGW	52	3.4.5.3	3-30	22-24	3-28
375	OEPA	GeoTrans	53	3.5.2	3-38	10-13	3-36
376	OEPA	GeoTrans	55	3.6	3-39	25	3-37
377	OEPA	GeoTrans	58	3.6.1	3-41	10	3-39
378	OEPA	GeoTrans	59	3.6.1	3-41	19	3-39
379	OEPA	GeoTrans	60	3.6.1	3-41	19	Figure 3-36
380	OEPA	GeoTrans	64	3.6.1.1	3-44	15	3-41
381	OEPA	GeoTrans	65	3.6.1.1	3-45	27-28	NA
382	OEPA	DDAGW	67	3.6.1.1	3-47	4	NA
383	OEPA	DDAGW	68	3.6.1.1	3-48	10	3-46
384	OEPA	GeoTrans	69	3.6.1.1	3-48	13	3-46
385	OEPA	DDAGW	70	3.6.1.1	3-48	18	NA
386	OEPA	GeoTrans	71	3.6.1.1	3-48	26-27	3-46
387	OEPA	GeoTrans	72	3.6.1.1	3-48	31-34	NA
388	OEPA	GeoTrans	73	3.6.1.2	3-53	1-3	3-50
389	OEPA	GeoTrans	75	3.6.1.2	3-54	21	3-52
390	OEPA	GeoTrans	76	3.6.1.2	3-55	27-28	3-53
391	OEPA	DDAGW	77	3.6.2.2	3-59		3-56
392	OEPA	GeoTrans	79	3.6.2.2	3-62	9-10	3-59
393	OEPA	GeoTrans	81	3.6.2.2	3-64	13	NA
394	OEPA	GeoTrans	85	3.6.2.2	3-69	39-40	3-66
395	OEPA	GeoTrans	88	3.6.3	3-73		3-69, 3-70
396	OEPA	GeoTrans	89	3.6.3	3-72 to 3-74		3-69, 3-70
397	OEPA	DDAGW	90	3.6.3	3-73	22-25	3-69
398	OEPA	GeoTrans	92	3.6.3	3-74	7-9	NA
399	OEPA	OFFO	93	3.7.1	3-75	25-34	3-71
400	OEPA	OFFO	94	3.8	3-79		2-59, 3-76
401	OEPA	GeoTrans	95	4.0	4-2	10	4-2
402	OEPA	GeoTrans	96	4.1.5	4-10	6	4-1, 4-9

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403	OEPA	GeoTrans	97	4.2	4-14	26	4-14
404	OEPA	GeoTrans	98	4.2	4-15	13-14	4-15
405	OEPA	GeoTrans	99	4.3.2	4-17	26	4-17
406	OEPA	OFFO	100	4.4.1	4-19	7	NA
407	OEPA	GeoTrans	102	4.5.2.3	4-28	14	4-28
408	OEPA	GeoTrans	103	4.5.2.5	4-29	27	4-29
409	OEPA	GeoTrans	105	4.5.3.3	4-35	34	4-35
410	OEPA	GeoTrans	106	4.6.1.1	4-48	15-17	4-48
411	OEPA	GeoTrans	107	4.6.1.1.1	4-51	11	4-52
412	OEPA	GeoTrans	108	4.6.1.1.1	4-54	14	4-55
413	OEPA	OFFO	110	4.6.1.1.3	4-64	31	NA
414	OEPA	OFFO	111	4.6.1.2	4-67	25	4-68
415	OEPA	OFFO	114	4.6.1.3	4-79	25	NA
416	OEPA	OFFO	117	4.6.4	4-90	1	4-45
417	OEPA	GeoTrans	119	4.6.6	4-96		NA
418	OEPA	OFFO	120	4.6.7	4-97	18	4-97
419	OEPA	OFFO	121	4.6.7	4-98	4	4-43
420	OEPA	GeoTrans	124	4.6.9	4-105	25-26	4-105
421	OEPA	GeoTrans	125	4.7.1	4-107	27	4-108
422	OEPA	GeoTrans	126	4.7.1.1.1	4-119	16-26	Figures 4-82b, 483b
423	OEPA	GeoTrans	127	4.7.1.1.1	4-120	4-7	4-121
424	OEPA	GeoTrans	128	4.7.2	4-130	15-17	Figure 4-92
425	OEPA	GeoTrans	129	4.8.1	4-141	29	NA
426	OEPA	GeoTrans	130	4.8.1.1.1	4-95 Fig		Figure 4-95
427	OEPA	GeoTrans	132	4.8.1.1.1	4-146	15-17	4-147
428	OEPA	DDAGW	135	4.8.1.1.1	4-151	1-6	4-152
429	OEPA	DDAGW	136	4.8.1.1.1	4-151	14-16	NA
430	OEPA	GeoTrans	137	4.8.1.1.1	4-151	27	4-150
431	OEPA	GeoTrans	138	4.8.1.1.1	4-152	16	4-153
432	OEPA	DDAGW	140	4.8.1.1.3	4-154	21	4-156
433	OEPA	DDAGW	141	4.8.1.2	4-157	11-13	NA
434	OEPA	GeoTrans	142	5.1.1.3	5-5	6-9	NA
435	OEPA	GeoTrans	143	5.1.2.3	5-8	20	5-8
436	OEPA	GeoTrans	144	5.1.2.3	5-8	15-29	5-8
437	OEPA	GeoTrans	146	5	5-9 Tbl		Table 5-9

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438	OEPA	GeoTrans	147	5	5-12 Tbl		Table 5-12
439	OEPA	GeoTrans	149	5	5-11 Fig		NA
440	OEPA	OFFO	150	5.2.1.4	5-20	28	NA
441	OEPA	GeoTrans	151	5.2.3.1	5-26	7	5-26
442	OEPA	GeoTrans	153	5.2.3.3	5-29		Table 5-10, Table 5-11
443	OEPA	GeoTrans	156	5.4.2.4	5-66	7-8	5-66
444	OEPA	GeoTrans	157	5.4.2.5	5-69	24	5-69
445	OEPA	GeoTrans	158	5.4.3.2	5-71	17	5-71
446	OEPA	GeoTrans	159	5.4.3.6	5-76 to 5-77		5-77
447	OEPA	GeoTrans	160	5.5.3	5-81	40	5-83
448	OEPA	GeoTrans	161	5	5-28-32 Figs		5-82
449	OEPA	GeoTrans	162	6			NA
450	OEPA	GeoTrans	163	6			NA
451	OEPA	OFFO	169	6	6-18	25	6-13
452	OEPA	OFFO	170	6	6-21	30	6-22
453	OEPA	GeoTrans	171	6	6-3 Tbl		Table 6-3
454	OEPA	GeoTrans	172	6	6-4 Tbl		Table 6-4
455	OEPA	GeoTrans	176	7.3.2	7-12	19	7-12
456	OEPA	GeoTrans	177	7.3.3	7-14	22	NA
457	OEPA	GeoTrans	178	7.3.6	7-20	1	NA
458	OEPA	GeoTrans	179	7.5.2	7-43	4	7-42
459	OEPA	OFFO	181	7	7-10 Tbl		NA
460	OEPA	OFFO	182	7	7-10 Tbl		Table 7-12
461	OEPA	OFFO	183	7	7-11 Tbl		NA
462	OEPA	OFFO	185	A	A.1-10	9	A.1-10
463	OEPA	OFFO	186	A	A.1-10	15-25	A.1-11
464	OEPA	OFFO	187	A	A.1-11	30	A.1-12
465	OEPA	GeoTrans	188	A	A.2-6	13	No Action A.2-7
466	OEPA	GeoTrans	191	A	A.2-7	15	NA
467	OEPA	GeoTrans	192	A	A.2-9	14	A.2-10
468	OEPA	GeoTrans	194	A	A.2-1, A.2-2 Tbls		A.2-15
469	OEPA	GeoTrans	195	A	A.2-16	36	A.2-19
470	OEPA	GeoTrans	197	A	A.2-17	2	No Action Attach. III

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471	OEPA	OFFO	198	A	A.2-1, A.2-2 Tbls		Tables A.2-1 & A.2-2; A.2-11
472	OEPA	GeoTrans	203	A	A.3-35	22-26	A.3-36
473	OEPA	GeoTrans	210	A	A.3-63	28-29	N/A
474	OEPA	GeoTrans	211	A	A.3-20 Tbl		Table A.3-20
475	OEPA	GeoTrans	212	A	A.3-20, 3-21b Tbl		N/A
476	OEPA	GeoTrans	214	A	A.4-5	26	A.4-5
477	OEPA	GeoTrans	none given	A	A.4-8	3-4	A.4-7
478	OEPA	GeoTrans	216	A	A.4-3 Tbl		Table A.4-3
479	OEPA	GeoTrans	217	A	A.4-3 Tbl		Table A.4-3
480	OEPA	GeoTrans	218	A	A.4-3 Tbl		Table A.4-3
481	OEPA	GeoTrans	219	A	A.4-3 Tbl		Table A.4-3
482	OEPA	GeoTrans	220	A	A.4-3 Tbl		Table A.4-3
483	OEPA	GeoTrans	221	A	A.4-3 Tbl		Table A.4-3
484	OEPA	GeoTrans	222	A	A.4-3 Tbl		Table A.4-3
485	OEPA	GeoTrans	223	A	A.4-3 Tbl		Table A.4-3
486	OEPA	GeoTrans	224	A	A.4-3 Tbl		Table A.4-3
487	OEPA	GeoTrans	225	A	A.4-3 Tbl		Table A.4-3
488	OEPA	GeoTrans	226	A	A.4-3 Tbl		Table A.4-3
489	OEPA	GeoTrans	227	A	A.4-3 Tbl		Table A.4-3
490	OEPA	GeoTrans	228	A	A.4-3 Tbl		Table A.4-3
491	OEPA	GeoTrans	229	A	A.4-3 Tbl		Table A.4-3
492	OEPA	GeoTrans	230	A	A.4-3 Tbl		Table A.4-3
493	OEPA	GeoTrans	231	A	A.4-3 Tbl		Table A.4-3
494	OEPA	GeoTrans	232	A	A.4-3 Tbl		Table A.4-3
495	OEPA	GeoTrans	233	A	A.4-3 Tbl		Table A.4-3
496	OEPA	GeoTrans	234	A	A.4-3 Tbl		Table A.4-3
497	OEPA	GeoTrans	235	A	A-V-95	17	Table A.4-3
498	OEPA	GeoTrans	236	A	A.4-3 Tbl		Table A.4-3
499	OEPA	GeoTrans	237	A	A.4-3 Tbl		Table A.4-3
500	OEPA	GeoTrans	238	A	A-V-23	7	Table A-V
501	OEPA	GeoTrans	239	A	A.40		Table A-V
502	OEPA	GeoTrans	242	A	A.5-9	11	A.5-9
503	OEPA	GeoTrans	244	A	A.5-19	7	Tables in A-VII

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504	OEPA	GeoTrans	245	A	A.5-25	25	Tables in A-VII
505	OEPA	GeoTrans	246	A	A.5-5 Tbl		NA
506	OEPA	GeoTrans	247	A	A.5-6 Tbl		NA
507	OEPA	GeoTrans	248	A.6	A.6-1-A.6-7 Tbls		Tables 5-21 and 5-22
508	OEPA	GeoTrans	249	A	A.6-1	18	A.6-1
509	OEPA	GeoTrans	250	A	A.7-1	8-10	A.7-1
510	OEPA	GeoTrans	254	6			Table A.4-3
511	OEPA	GeoTrans	255	A	A.VI-9c & 10c A.VII-9c & 10c Tbls		Tables in A-VII
512	OEPA	GeoTrans	256	A	A.VI-9 & 10 Tbls		Table A.3-20
513	OEPA	GeoTrans	257	A	A.VII-23c Tbl		Tables in A-VII
514	OEPA	GeoTrans	258	A	A.VII-12a Tbl		Tables in A-VII
515	OEPA	GeoTrans	259	A	A.VI-1 & 2 Tbls		Table A.3-25
516	OEPA	GeoTrans	260	A	A.VI-15 Tbl		Table A.3-21a
517	OEPA	GeoTrans	261	A	A.VI-5 & 6 Tbls		Table A.3-20
518	OEPA	GeoTrans	262	A	A.VI-6k Tbl		NA
519	OEPA	OFFO	263	B.1.3	B-13	17-18	B.1-13
520	OEPA	GeoTrans	264	B.2.2.1	B-6	20-29	B.2-6
521	OEPA	GeoTrans	265	B.2.2.1	B-6	31	B.2-7
522	OEPA	OFFO	266	B.2.2.1	B-7	16-19	B.2-7
523	OEPA	GeoTrans	267	B.2.2.1	B-7	18	B.2-7, B.2-14
524	OEPA	OFFO	269	B.2.2.1	B-9	1-7	B.2-9
525	OEPA	GeoTrans	270	B.2.2.1	B-9	11-13	B.2-9
526	OEPA	OFFO	271	B.2.2.1	B-9	17-20	NA
527	OEPA	GeoTrans	272	B.2.2.1	B-9	22-23	Tables B.III-3 thru B.III-5
528	OEPA	GeoTrans	273	B.2.2.1	B-9	17	B.2-9
529	OEPA	OFFO	274	B.2.2.3	B-13	14-16	B.2-9, B.2-13
530	OEPA	GeoTrans	275	B.2.3	B-14	20-21	B.2-15
531	OEPA	GeoTrans	276	B.2.3	B-14	22-25	B.2-15
532	OEPA	GeoTrans	277	B.2.3			B.2-23

COMMENT CROSS REFERENCE LIST
JUNE 1994 FEMP OU5 RI REPORT
(Cont'd)

DOE No.	Commenting Organization	Commentor	Commentor No.	Section	Original Page No.	Line No.	New Page No.
533	OEPA	OFFO	280	B.2.4.1	B-27	31-33	B.2-6, B.2-14, B.2-29
534	OEPA	GeoTrans	281	B.2.4.1	B-29	2	B.2-30
535	OEPA	GeoTrans	282	B.2.4.1	B-30	23	B.2-33
536	OEPA	GeoTrans	283	B.2.4.1	B-30	26	B.2-33
537	OEPA	GeoTrans	284	B.2.4.1	B-31	9	B.2-34
538	OEPA	GeoTrans	287	B.2.4.1	B-31	29-31	B.2-34
539	OEPA	GeoTrans	288	B.2.4.1	B-32	6	B.2-34
540	OEPA	GeoTrans	291	B	B-33	28-32	B.2-36
541	OEPA	GeoTrans	292	B.2.4.4	B-35		B.2-38
542	OEPA	GeoTrans	294	B	B.2-1 Tbl		Table B.2-1
543	OEPA	GeoTrans	295	B	B.2-2 Tbl		Table B.2-2
544	OEPA	OFFO	296	B.3.1.2	B-3	32-33	B.3-3
545	OEPA	GeoTrans	297	B	B.4-9	8-10	B.4-9
546	OEPA	GeoTrans	298	B.4.2	B.4-10	12-14	B.4-10
547	OEPA	Error	erroneous				NA
548	OEPA	OFFO	300	B	B.II-1 Tbl		B.2-29
549	OEPA	OFFO	301	B	B.II-3 Tbl		Table B.II-1
550	OEPA	OFFO	302	B	B.II-4 Tbl		B.2-7, B.2-14, Table B.II-1, Table B.II-2
551	OEPA	OFFO	303	B	B.III-2 Tbl		B.2-9
552	OEPA	OFFO	303	B	B.III-3 Tbl		B.2-9
553	OEPA	OFFO	304	B	B.III-4 Tbl		B.2-29
554	OEPA	OFFO	305	B	B.III-7 Tbl		B.2-29
555	OEPA	OFFO	306	F.3.I.2	F-11	14	F.3.I.2-11
556	OEPA	OFFO	307	F.3.I.3			NA
557	OEPA	OFFO	314	F.3.II	F-9	32	F.3.II-3, F.3.II-9
558	OEPA	OFFO	316	F.3.II	F-10	1-17	NA
559	OEPA	OFFO	317	F.3.II	F-12	4,9,14	F.3.II-7

OHIO EPA REVIEW COMMENTS
OPERABLE UNIT 5 DRAFT REMEDIAL INVESTIGATION REPORT

334. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: General Pg.#: Line#: Code: C
Original Comment#: 1
Comment: The figures and tables in the Operable Unit-5 RI document have been placed at the end of each section. This placement makes it difficult to refer to the figures and tables while reading the text. Please place all illustrative items immediately after their reference in the text.
Response: DOE agrees that placing tables and figures within the text is the preferred mode. However, due to the extremely large number of tables and figures in this document and the difficulty of correctly placing and paginating so many graphics, the draft final iteration of the Operable Unit 5 RI Report will continue to place tables and figures at the end of each section.
Action: None required.

335. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: Glossary Pg.#: xiv Line#: Aquiclude Code:
Original Comment #: 2
Comment: An aquiclude is located so that it forms an upper or lower boundary to a ground water flow system.
Response: Agree.
Action: Definition will be revised: A saturated but poorly permeable bed, formation, or group of formations that does not yield water freely to a well or spring. An aquiclude is located so that it forms an upper or lower boundary to a groundwater flow system. However, an aquiclude may transmit appreciable water to or from adjacent aquifers.

336. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: Glossary Pg.#: xivi Line#: Confined
Aquifer Code:
Original Comment #: 3
Comment: The aquifer does not have to be under pressure to be confined.
Response: Disagree. If the water level in a well does not rise above the top of the aquifer, the aquifer is not confined. It requires pressure to make the water rise in the well.
Action: None required.

337. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: Glossary Pg.#: xlix Line#: Groundwater
contour Code:
Original Comment #: 4
Comment: Revise to state elevations in unconfined aquifers and potentials in confined aquifers.
Response: Disagree. For the purposes of this RI report, where only unconfined aquifers are involved, it is not necessary to add terminology for confined aquifers when that terminology is not used anywhere in the report.
Action: None required.

338. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: Glossary Pg.#: li Line#: Lower Aquifer Code:
Original Comment #: 5
Comment: This is misleading. DOE needs to specify that it is below the clay interbed, or below the elevation which corresponds to where the interbed would be anticipated to be found in areas that lack the clay interbed.

Response: Agree.
Action: Definition will say: The portion of the Great Miami Aquifer below the clay interbed or below the elevation which corresponds to where the interbed would be anticipated to be found in areas that lack the clay interbed.

339. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: Glossary Pg.#: lii Line#: Radiation Code:
Original Comment #: 6
Comment: Can be a release of a particle or a wave.
Response: Agree that a more comprehensive definition should be provided.
Action: Revise definition: radiation - The energy released as particles or waves when an atom's nucleus spontaneously loses or gains neutrons and/or protons. The three main types are alpha particles, beta particles, and gamma rays.

340. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1 Pg.#: GENERAL Line#: Code: C
Original Comment #: 7
Comment: Please check all figures within this section, they appear to be off by a sequence of one.
Response: Agree that figures numbers were off by one.
Action: Correct figure numbering and call-outs through Section 1.0.

341. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 1.3.1.1 Pg.#: 1-14 Line#: 13 Code: C
Original Comment #: 8
Comment: What is UCl_4?
Response: It is uranium tetrachloride, a product of Plant 8. The use of the chemical abbreviation wasn't properly set up.
Action: Revised text will say: ...with some amounts of UAP [6 percent] and uranium tetrachloride [UCl_4]).

342. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1.3.2.6 Pg.#: 1-34 Line#: 28 Code: C
Original Comment #: 9
Comment: Eliminate the sentence which reads, "Therefore, it is impractical...". This sentence is unnecessary as there are no final DFO's.
Response: Agree.
Action: Delete this sentence from Section 1.3.2.6.

343. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1.3.4.4 Pg.#: 1-40 Line#: 22 Code: C
Original Comment #: 10
Comment: This section describes additional material to be excavated under Removal Action No. 14 in July, 1994. Please provide an update on this additional excavation.
Response: The excavation was completed as scheduled.
Action: Update text: Excavation and removal of this additional material was completed in July 1994. The final report is in preparation.

344. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1.3.4.6 Pg.#: 1-41 Line#: 15 Code: C
Original Comment #: 11
Comment: Please describe a "low-uranium stream."
Response: A low-uranium stream is one below the EPA's proposed treatment level of 20 ppb.

Action: Revise text: ...treatment of low-uranium streams (less than the treatment goal of 20 ppb) from Phase II...

345. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1.3.4.10 Pg.#: 1-42 Line#: 31 Code: C
Original Comment #: 12
Comment: Please provide a timetable for the proper procedures to be in place for the operation of the Pilot Plant Warehouse Sump.
Response: As of late September 1994, the pump is still not working properly.
Action: Replace last sentence: By late summer 1994, the pump had been repaired, tested and began operating.

346. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 1.4.5 Pg.#: 1-46 Line#: 25 Code: C
Original Comment #: 13
Comment: Please update this section which describes the FEMP splitting environmental samples with Ohio Department of Health. These samples are now split with Ohio EPA.
Response: Commentor is correct.
Action: Revise text: The OEPA (recently replacing the ODH) and the FEMP continue to conduct a split-sampling program;

347. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table 1-5 Pg.#: Line#: Code: C
Original Comment #: 15
Comment: How does the FEMP account for the high level of uranium discharge in 1992-93?
Response: Although uranium discharges have decreased by almost half since production ended in mid 1989, the commentor indicates that the amounts shown for 1992 and 1993 in the table seem high. The measured amounts listed in Table 1-5 are the result of an increase in site control of storm water run off and the effective cleanup and abatement activities taking effect at the FEMP facility. In particular, surface water that once moved unhindered into the soil or Paddys Run is now collected, treated, and included in the measured discharge due to the implementation of Removal Actions 2 and 16. No revision to the table is appropriate as it is one in a series of Section 1 tables listing emissions and discharges over the life of the facility.
Action: None required.

348. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 1 Pg.#: Line#: Code: C
Original Comment #: 16
Comment: Two FEMP site location maps are included as Figures 1-1 and 1-2. Only one location map is referenced in the text, however. As a result, the figure numbers referenced in the text and shown on the actual figures are all sequentially off beginning with Figure 1-2.
Response: Figure 1-2 should have been removed from the report.
Action: Remove Figure 1-2 from Section 1.0, and correct subsequent figure numbering.

349. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.1.2.3 Pg.#: 2-7 Line#: 12 Code: C
Original Comment #: 21
Comment: This line states that VOC surface soil samples were collected in 40ml vials. This statement appears to be incorrect. Water samples are collected in 40ml vials. Please verify, and correct.
Response: The VOC soil samples were collected in 40 ml vials as stated in the text.
Action: No action deemed necessary.

350. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.1.2.4 Pg.#: 2-8 Line#: 24 Code: C
Original Comment #: 22
Comment: This line states that VOC subsurface soil samples were transferred to 2-40ml vials if a volatile release was detected using a PID. The sample jars stated in the text seem incorrect. Please correct.
Response: See response for Comment #349.
Action: No action deemed necessary.

351. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 2.1.3.1 Pg.#: 2-10 Line#: Code:
Original Comment #: 23
Comment: Need to specify the frequency and methodology of sampling and analyzing potable water prior to introduction to the borehole.
Response: The on-site water plant personnel sample daily for alkalinity, stability, and total hardness. They sample monthly from two rotating locations for free and available chlorine, coliforms, and total uranium. Approximately every three months, samples are collected and analyzed for organics, including VOCs and TOC. Lead and copper are sampled and analyzed every six months. The sampling schedule strictly follows OEPA guidelines and is based on site population. When water trucks were filled at an on-site fire hydrant, the site utility engineer would attach a portable back flow preventer to the hydrant valve before any water was loaded into the water truck.
Action: The following sentence will be added to the text in section 2.1.3.1: Potable water is routinely sampled by site water plant personnel in accordance with OEPA drinking water quality guidelines.

352. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 2.1.3.4 Pg.#: 2-14 Line#: 40-41 Code:
Original Comment #: 24
Comment: Wells are also developed to remove all water added during boring and monitoring well installation.
Response: This should have been made clearer.
Action: The sentence will be revised to read: After the wells were completed, they were developed to remove fines from the area around the screened zone and to remove water added during boring advancement before well installation.

353. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 2.1.3.4 Pg.#: 2-15 Line#: 14 Code:
Original Comment #: 25
Comment: Add "were decontaminated according to the SOP.".
Response: It would be inappropriate to add the suggested wording. Section 2.1.2, page 2-5, lines 21 to 25 explains that sampling programs were conducted in accordance with the requirements of the RI/FS QAPP and the CERCLA SCQ. Also, Section 2.1.3.9, Decontamination Methods, explains the types of decontamination used.
Action: The following will be add at the end of the Section 2.1.3.4 "(see Section 2.1.3.9)."

354. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 2.1.3.5 Pg.#: 2-15 Line#: Code:
Original Comment #: 26
Comment: Were any RI samples taken using the Micropurge technique? If so, Micropurging should be described in this section.
Response: No, this technique was never used for RI sampling.

Action: None.

355. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.3.1 Pg.#: 2-24 Line#: 4 Code: C
Original Comment #: 28
Comment: Please describe a photochopper.
Response: A photochopper is an air speed measuring device. It is comprised of wind cups attached to a shaft. The shaft is attached to a base which has a flat plate with holes in it. As the wind cups move in the wind, the shaft spins the photochopper base. A light sensor counts the number of flashes given off by the light emitting diode per second to determine the wind speed.
Action: The following sentences will be added for clarification: It is comprised of wind cups attached to a shaft. The shaft is attached to a base which has a flat plate with holes in it. As the wind cups move in the wind, the shaft spins the photochopper base. A light sensor counts the number of flashes given off per second by the light-emitting diode to determine the wind speed.

356. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.4.4.1 Pg.#: 2-28 Line#: 19 Code: C
Original Comment #: 30
Comment: Are surface water grab samples collected weekly, or should this read monthly?
Response: They are collected weekly along Paddys Run, as stated in the text.
Action: No action deemed necessary.

357. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.4.6.1 Pg.#: 2-32 Line#: 8 Code: C
Original Comment #: 32
Comment: Are total metals not included in the laboratory analysis of samples collected from the drainage ditch locations? If not, why?
Response: Total metals were analyzed in select surface water samples from the drainage ditches as mentioned on page 2-32, line 13.
Action: No action deemed necessary.

358. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.4.6.2 Pg.#: 2-33 Line#: 16-20 Code: C
Original Comment #: 33
Comment: This paragraph states that river water was sampled for a full range of radiological parameters. Yet, the text states that only total dissolved uranium concentrations were used for the river water quality evaluation. Please explain why the other parameters were analyzed for if only total dissolved uranium was to be evaluated.
Response: This sampling program was not part of the RI/FS. The data from this study was useful but supplemental for nature and extent and fate and transport sections of the RI. After re-examination of the final report from this program, we could not determine why a full range of radiological parameters were analyzed when only total dissolved uranium concentrations were used for the river water quality evaluation.
Action: No action deemed necessary.

359. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.4.6.4 Pg.#: 2-34 Line#: 11 Code: C
Original Comment #: 34
Comment: Why is 2-19 highlighted?
Response: This was an oversight during the editing of the figure number for the report in June.

Action: Remove the redlining.

360. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 2.5.5.2 Pg.#:2-44 Line#:12 Code: C
Original Comment #: 35
Comment: The first and second full paragraphs on this page appear to contradict each other. The first paragraph states that 30 samples were collected from the three depths, whereas the second paragraph states that 21 samples were collected from the lowest of the three sample intervals.
Response: The first full paragraph was unclear. The sentence in question will be clarified.
Action: The second sentence in the first full paragraph will be corrected to read: The project specific plan called for samples to be collected from three depths, 0 to 6, 36 to 42, and 48 to 54 inches at 30 locations.

361. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.8.1 Pg.#: 2-57 Line#: 10 Code: C
Original Comment #: 36
Comment: The text lists 16 air monitoring stations with high volume samplers while Fernald's Site Environmental Report lists 20. Please clarify.
Response: Twenty monitoring stations exist. Stations 17 - 20 were added in 1992 to monitor emissions from the waste pits during remediation. Figure 2-41 will be corrected to show all twenty stations and the text will be corrected.
Action: Add monitoring stations 17 - 20 to Figure 2-41. Correct text on page 2-57 to read: Twenty monitoring stations...

362. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.8.3 Pg.#: 2-58 Line#: 5 Code: C
Original Comment #: 37
Comment: Radon is also monitored at boundary stations with the use of alpha scintillation detectors. Please include these instruments and a description of their operation in the text.
Response: In 1993, continuous radon monitoring using alpha scintillation detectors was conducted at air monitoring stations 1, 6, and 7, at the perimeter of the K-65 silo berm, and at the headspace of the silos. This information will be added to Section 2.8.3.
Action: Revise sentence to read: Alpha-track etch detectors are used to collect airborne radon measurements at 49 preestablished...
Add the following third paragraph to Section 2.8.3:
Alpha scintillation detectors were used in 1993 to continuously monitor radon concentrations at air monitoring stations 1, 6, 7, at the perimeter of the K-65 silo berm, and at the headspace of the silos. An alpha scintillation cell detects alpha particles from the decay of radon gas. The alpha particles interact with a material inside the detector to produce light pulses which are amplified and counted. The number of light pulses is proportional to the concentration of radon gas entering the detector.

363. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 2.9.5 Pg.#: 2-70 Line#: Code: C
Original Comment #: 38
Comment: The section should be updated to include the most recent information regarding Threatened and Endangered species surveys conducted during 1994.
Response: Agree. This section will be updated as information on threatened and endangered species surveys becomes available.
Action: Section 2.9.5 will be replaced with the following text:
2.9.5 <u>Threatened and Endangered Species Surveys</u>
Section 121 of CERCLA requires that remedial actions at hazardous waste sites meet the

substantive — but not the administrative or permitting — requirements of other federal and state environmental laws, including the Endangered Species Act (ESA) of 1973.
Section 7(a)(2) of the ESA, as amended, requires federal agencies to ensure that their actions are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species..." Further, EPA guidance on ecological investigations at CERCLA sites (EPA 1988a, 1989a) emphasizes identification of the threatened and endangered species resident on the site, including delineation of any critical habitat essential to the survival of these organisms.
No federally listed threatened or endangered species were observed on the FEMP or in its immediate vicinity by Facemire et al. (1990). However, two federally listed endangered species, the Indiana bat and the running buffalo clover, have ranges overlapping the area of the FEMP (DOE 1993e). Several state-listed threatened and endangered species of plants and animals are also known to occur in this area or have been recorded on the FEMP during previous ecological surveys (DOE 1993e; Facemire et al. 1990). The following paragraphs describe the various species being investigated at the FEMP.
The cave salamander (*Eurycea lucifuga*) is a state-listed endangered species. An initial survey was performed from May to August 1988 in support of the RI/FS to locate potential cave salamander habitat and look for individuals at the FEMP and in the vicinity. Based on location information from the ODNR, information from local investigators, prior documented populations and museum accessioned specimens, investigators determined possible habitats. The areas which appeared to be potential cave salamander habitat were thoroughly investigated for individuals and larvae. Detailed surveys were performed in the former Girl Scout camp (located in the northeastern portion of the study area), Camp Fort Scott (located in the southeastern portion of the study area near the Great Miami River), Paddys Run, and in the deciduous woodland in the northern part of the FEMP (Figure 2-48).
A follow-up on-property survey was completed in August and September 1993 (Davis 1994). Suitable on-property habitats in a ravine in the north woodlot and in a limestone-lined well (Monitoring Well 1124) at an old homestead east of the north access road were visually examined for adult and larval salamanders. The on-property well was also investigated by lowering a camera into the well to examine between crevices in the walls. Another limestone-lined well (Monitoring well 1060) south of the FEMP property was also visually examined.
The Indiana bat (*Myotis sodalis*), a federally listed endangered mammal, is characteristically a summer inhabitant of mature wooded areas lining both sides of small- to medium-sized streams (Humphrey et al. 1977). A survey was conducted in support of the RI/FS from June through August 1988 to evaluate potential habitats and determine the presence and distribution of the Indiana bat in areas near the FEMP (DOE 1993e). An updated comprehensive survey of on-property habitat including Paddys Run and the SSOD was conducted in June and July 1994 (Whitaker 1994). Both the riparian areas along Paddys Run and the SSOD were surveyed for suitable bat habitat, including the presence of hollow trees or trees with loose or dead bark that could be used for summer maternity colonies and tree canopy suitable for bat flyways. To collect the data, 11 mist nets were placed at 10 locations along Paddys Run and SSOD (Figure 2-49). To aid in the net efficiency, bat detectors recorded bat activity by measuring echolocation calls emitted by bats in the survey area. This activity gave an assessment of net success in relationship to bat activity. Species, age, reproductive status and gender were recorded from captured bats, which were then released.
The Sloan's crayfish (*Orconectes sloanii*) was included in the macroinvertebrate survey of Paddys Run in 1986-87 (Facemire et al. 1990). This crayfish is classified as state-listed threatened, referring to a species whose survival in Ohio is not in immediate jeopardy but to which a threat exists. Continued or increased stress of this species will result in its becoming endangered (ODNR 1992). A follow-up survey was completed in September 1993 (St.

John 1993). Qualitative seining was conducted in three locations along Paddys Run during a period when the stream was at low flow. Two locations were on-property pools under the train trestle at the northern edge of the FEMP property and the off-property location was a pool south of New Haven Road. An additional survey was completed in May 1994 which focused on the entire section of Paddys Run that runs through the FEMP as well as the off-property location at New Haven Road (St. John 1994). This survey was completed during a period when water flowed throughout the length of the creek and included 25 sampling locations along Paddys Run.

The cobblestone tiger beetle (*Cicindela marginipennis*) was found in the area of the FEMP, along the Great Miami River, during the RI/FS survey for the Indiana bat in 1988 (DOE 1993e). This species is found on sparsely vegetated gravel floodplains of large rivers, which are frequently flooded. Because of the fragile habitat, this beetle is listed as a federal category two species, as well as a special interest species for the state of Ohio. Category two species are considered appropriate for federal listing as threatened or endangered; however, biological data on the distribution and life history of this species are insufficient to support the protection of the cobblestone tiger beetle under the ESA.

The running buffalo clover (*Trifolium stoloniferum*) is a federally listed endangered species. Running buffalo clover has been observed approximately 1.5 miles southwest of the FEMP at Miami Whitewater Forest (ODNR 1992). The FEMP has areas of similar habitat where this species might occur. In 1992, a limited survey of habitats suitable for this species was conducted using random transects on the FEMP property (Wood 1992). A comprehensive survey was completed for the Fernald property in June 1994 (RUST Environment and Infrastructure, Inc. [RUST] 1994b). Using transects, suitable habitat in the northern woodlands, the wooded and grassland riparian areas along Paddys Run and the SSOD and the inactive flyash pile and South Field were surveyed.

Slender fingergrass (*Digitaria filiformis*), a state-listed endangered crabgrass, was reported during the 1986 botanical survey (Facemire et al. 1990). This species is found in native prairie habitat. A survey for this species was conducted in June-August 1994 to update its status at the FEMP (RUST 1994c). Areas that were surveyed in transects included the riparian areas, the northern woodlands and the inactive flyash pile, the South Field and the pine plantations.

Mountain bindweed *(Polygonum cilinode)* was also reported in the botanical survey in 1986 (Facemire et al. 1990). The ODNR states that the only other populations of this state-listed endangered plant have been reported from two counties near Lake Erie. A survey was completed in June-August 1994, in conjunction with the slender fingergrass survey, to update the status of this species (RUST 1994d). Transects were completed in the riparian areas, northern woodlands, the inactive flyash pile, the South Field and the pine plantations.

The spring coralroot (*Corallorhiza wisteriana*) is a state-listed threatened orchid. It is found locally at Miami Whitewater Forest in forested wetlands (ODNR 1992). Northern areas of the FEMP appear to be appropriate habitat for this species. Surveys were completed in May 1994, using transects along the northern woodlot and along the riparian areas of Paddys Run (RUST 1994a).

The northern harrier (*Circus cyaneus*, state endangered), the dark-eyed junco (*Junco hyemalis*, state endangered), the northern waterthrush (*Seiurus noveboracensis*, state endangered), the red-shouldered hawk (*Buteo lineatus*, state species of special interest), and the Cooper's hawk (*Accipiter cooperii*, previously listed as a threatened breeding species in Ohio) were included in bird surveys that included transects and incidental sightings (Facemire et al., 1990).

Sections 3.8.5, 3.8.5.1, 3.8.5.2, 3.8.5.3, 3.8.5.4, and 3.8.5.5 will be replaced with the following text:

3.8.5 <u>Threatened and Endangered Species</u>

To date, no federally listed threatened or endangered species have been observed at the FEMP property (Facemire et al. 1990; DOE 1993). However, two federally listed endangered

species, the Indiana bat and the running buffalo clover, have ranges overlapping the area of the FEMP (DOE 1993). Several state listed threatened and endangered plant and animal species are also known to occur in this area or have been recorded during surveys on the FEMP property. Additional surveys have been conducted in the spring and summer of 1994.

3.8.5.1 Amphibians

The cave salamander (*Eurycea lucifuga*) is a state-listed endangered species. During the 1988 survey salamander populations were found at the former Ross Trails Girl Scout Camp and north of New London Road, but no individuals were found on the FEMP property. Marginal habitat was designated along the majority of Paddys Run on the property (DOE 1993). During the 1993 follow-up survey, no individuals of this species were found on the property (Davis 1994). However, moderate cave salamander habitat exists in both an on-property limestone-lined well (Well 1124) east of the north access road and an off-property limestone-lined well (Well 1060) south of the FEMP property. Marginal habitat exists in a wooded ravine north of the northern pine plantation on the FEMP property. The areas along Paddys Run are no longer considered potential habitat because of additional knowledge regarding the life history of this species and the lack of surface limestone in these areas.

3.8.5.2 Mammals

The previous study, performed in 1988, located 63 bats along Paddys Run and the Great Miami River including eight Indiana bats which were captured near Ross, Ohio on Banklick Creek, 3 miles to the northeast of the FEMP (DOE 1993e). It is likely that these bats were part of a maternity colony nearby. During the 1994 survey (which was limited to Paddy Run and the SSOD) for the federally endangered Indiana bat, 29 bats, representing three species, were captured. No Indiana bats were identified; the bats captured included 18 big brown bats (*Eptesicus fuscus*), 8 red bats (*Lasiurus borealis*) and 3 little brown bats (*Myotis lucifugus*) (Whitaker 1994). Areas sampled in the northern sections of Paddys Run had more bats captured than the southern sections of Paddys Run and the SSOD, which both lacked water during the 1994 survey. The absence of water seemed to be a limiting factor for bats, because the bats rely on aquatic invertebrates for food. However, the riparian habitat of Paddys Run and the SSOD were designated as excellent habitat based on the maturity of the trees and quality of the riparian habitat (Whitaker 1994).

3.8.5.3 Arthropods

The state-listed threatened Sloan's crayfish (*Orconectes sloanii*) was recorded as common in Paddys Run in 1986-87 (incorrectly referred to as the Cincinnati crayfish) (Facemire et al. 1990). An updated survey was completed in October 1993 (St. John 1993). Despite the fact that Paddys Run was completely dry for most of the section on the FEMP, pools exist in the north section of the property and downstream off property. *Orconectes sloanii* resided in these pools with *Orconectes rusticus*. An additional survey was conducted in May 1994 (St. John 1994) to determe crayfish distribution when Paddys Run flowed throughout the entire length of the FEMP. The distribution of the crayfish is limited to a section of Paddys Run south of the train trestle in the northern section of the FEMP (Sampling Locations 6 through 10) and an off-property location at New Haven Road (Sampling Location 24) (Figure 3-69). It appears that the crayfish migration is restricted because of the lack of suitable rocky habitat and limited periods of water flow. When the water level of Paddys Run decreased, the crayfish retreated to areas where water remained year round such as the pools under the train trestle.

The cobblestone tiger beetle (*Cicindela marginipennis*) was found during the 1988 Indiana bat survey on a gravel bar in the Great Miami River, approximately two river miles downstream of the bridge at New Baltimore, Ohio (DOE 1993e). The two specimens captured were identified by Dr. William Buskirk, Professor of Biology at Earlham College. The total population on the gravel bar was estimated to be approximately 30 individuals. Another gravel bar was surveyed during the course of the Indiana bat survey, but no additional beetles of this species were found. This species is listed as a federal category two species, as well as

a special interest species for the state of Ohio. A survey may be conducted in September 1994, pending the outcome from additional investigation and consultation with the U.S. Fish and Wildlife.

3.8.5.4 Plants

Federally endangered running buffalo clover (*Trifolium stoloniferum*) has a distribution which may include the FEMP property (ODNR 1992). In 1992, a limited survey of habitats suitable for the running buffalo clover failed to find any populations on property (Wood 1992). A comprehensive survey to determine the presence of the federally listed endangered running buffalo clover was conducted in June 1994. The survey did not locate any individuals of this species on the Fernald property (RUST Environment and Infrastructure, Inc. [RUST] 1994b)

The Ohio-listed threatened spring coralroot (*Corallorhiza wisteriana*) also has distributions that overlap the Fernald property. A survey was completed at the FEMP in May 1994. Field surveys at the FEMP for this species did not locate any individuals of spring coralroot (RUST 1994a). It is likely that the appropriate mesic conditions and habitat do not exist at the FEMP.

Slender fingergrass (*Digitaria filiformis*), a state-listed endangered crabgrass, was recorded as rare in the riparian area along Paddys Run (Facemire et al. 1990). A survey to update the data for this species occurred in August 1994.

State-listed endangered mountain bindweed (*Polygonum cilinode*) was also recorded during the 1986 botanical survey as rare in the riparian areas of Paddys Run and the pine plantations (Facemire et al. 1990). In June-August 1994, a survey was performed to confirm the presence of this species at the FEMP. No individuals of this species were located at in the riparian habitats, the northern woodlots, the inactive flyash pile and South Field or the pine plantations (RUST 1994c).

3.8.5.5 Avians

The northern harrier (*Circus cyaneus*), a state-listed endangered species, was sighted on one occasion northeast of the production facility in 1990. The dark-eyed junco (*Junco hyemalis*), a state-listed endangered species, was observed throughout the FEMP during the winter of 1986-1987 by Facemire et al. The northern waterthrush (*Seiurus noveboracensis*), a state-listed endangered species, was recorded as a spring migrant along the riparian woodlands. The red-shouldered hawk (*Buteo lineatus*), listed as a state species of special interest, has been sighted once over the northern deciduous forest habitat of the FEMP. The Cooper's hawk (*Accipiter cooperii*), previously listed as a threatened breeding species in Ohio, has since been removed from the ODNR list. Facemire reports observing the hawk over the introduced pine woodlands and pasture habitat throughout the FEMP.

364. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.2.4 Pg.#: 3-5 Line#: 28-29 Code:
Original Comment #: 40
Comment: What site specific conditions support this assumption?
Response: This is a simplifying assumption to keep the discussion of evapotranspiration from being overly detailed. As is shown later in Section 3.2.5, the water budget includes six inches of annual recharge from the glacial overburden to the aquifer.
Action: None required.

365. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.2.4 Pg.#: 3-6 Line#: 11 Code: C
Original Comment #: 41
Comment: The report indicates that "On an annual basis, precipitation exceeds PET by about 5 to 9 inches." Yet, on page 3-4, line 14, the report indicates that, between 1963 and 1993, the

average annual precipitation was 40.86 inches, and the range of annual precipitation was 27.99 to 57.58 inches. Given that the average annual PET is reported as 26.73 inches, why is the upper limit of precipitation exceeding PET given as only 9 inches?

Response: Agree. The estimate is based on round number of average precipitation of 41 inches (Page 3-4 Line 14) and the range of annual PET of 20 to 33 inches (Page 3-6 Line 10) makes the precipitation exceed PET on a range of 8 to 21 inches.

Action: The sentence will be changed to read, "Using an annual average rainfall of 41 inches, precipitation exceeds PET by approximately 8 to 21 inches."

366. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.2.5 Pg.#: 3-7 Line#: 23-24 Code: C
Original Comment #: 42

Comment: How much of the estimated 9 inches of precipitation per year available for the "surface water runoff pathway" is lateral subsurface flow and discharge above the glacial till? How much of the surface runoff reinfiltrates to become groundwater? (p3-13, 14 inches/year along Paddy's Run)

Response: As is indicated in Figure 3-5, all of the surface run off is assumed to reach a surface stream without passing through the glacial overburden. There has been no attempt to quantify the amount of rainfall that infiltrates the glacial overburden and then emerges as surface water in streams flowing on the glacial overburden. The 14 inches of recharge to the aquifer is along the bed of Paddys Run and the SSOD where they have eroded into the Great Miami Aquifer. The rate of infiltration is limited by the permeability of the aquifer. Any excess surface water continues downstream and is discharged into the Great Miami River as surface water. The full detail of surface water interaction with the aquifer is discussed in DOE 1994i, "Surface Water Flow and Infiltration Modeling," which is discussed in Section 5.3.2 of this RI report.

Action: None required.

367. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section #: 3.3.1 Pg.#: 3-10 Line#: 5 Code: C
Original Comment #: 43

Comment: Because Figure 3-7 does not indicate the area where runoff is controlled and directed to the SWRB, it appears that the reference to Figure 3-7 should be changed to Figure 3-8. This is also true for Section 3.3.1.1, Page 3-10, line 27.

Response: Agree. The two references to Figure 3-7 on page 3-10 will be corrected to reference Figure 3-8.

Action: Change "3-7" to "3-8" in the figure references on lines 5 and 27.

368. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.4.1 Pg.#: 3-14 Line#: 32-33 Code:
Original Comment #: 44

Comment: This sentence is awkwardly worded. DOE may want to change "as" to "was".

Response: Agree.

Action: Change "as" to "was."

369. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.4.1 Pg.#: 3-15 Line#: 1 Code:
Original Comment #: 45

Comment: Change "shale" to "interbedded shale and limestone."

Response: Agree.

Action: Change text to "interbedded shale and limestone."

370. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.4.4 Pg.#: 3-22 Line#: 4-7 Code:
Original Comment #: 47
Comment: DOE needs to clarify that the clay interbed is discontinuous throughout the site. An occurrences of holes or small scale discontinuities in the interbed at the site should also be discussed here.
Response: ~~Agree:~~ Figures 3-19 and 3-20 have been corrected to show features suggested by the commentor and they are based on all the borings available.
Action: None required

371. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.4.4.1 Pg.#: 3-23 Line#: 7 Code: C
Original Comment #: 48
Comment: Justification for the assumption that the clay interbed extends to the bedrock wall of the buried valley in the north should be included. Are there data to support this assumption or is it assumed to be extensive to the north because it is perceived to have no effect on the conceptual model? Note that Figure 3-19 shows zero thickness to the northeast.
Response: The interpretation is based on a comparison of the bedrock contours in Figure 3-15, the clay interbed topographic surface in Figure 3-20 and the clay interbed isopach Figure 3-19. There is sufficient drilling information to justify this interpretation under the north side of the FEMP; however, the evidence is less direct to the northwest and west. The northwest and west areas are upgradient from the FEMP; thus the presence or absence of the clay interbed has no impact on contaminant migration under or downgradient of the FEMP.
In the northcentral part of the FEMP, Figure 3-15 shows that Well 3678 encountered bedrock at an elevation of 464 feet and Well 4436 encountered bedrock at 388.5 feet. The depth of bedrock in Well 3678 is above the elevation of the clay interbed in Well 4436. The two wells are approximately 600 feet apart and there is 10 feet of clay interbed in Well 3678; therefore, it is reasonable to assume that the clay interbed extends to the north to the bedrock.
Drilling data is less compelling to the northwest; however, Wells 3679 and 1755 in Figure 3-15 encountered bedrock at elevations above the elevation of the top of the clay interbed. Wells 3024 and 3037 indicate 12 and 3 feet of clay interbed, respectively. Again, it is reasonable to make the interpretation that the clay interbed extends to the north to bedrock.
The origin of the clay interbed is debatable. The report of the presence of varves at scattered locations and the wide-spread distribution of this layer at the FEMP and in the Mill Creek Valley (Durrell 1961) suggest that the clay interbed is a lake deposit which would be distributed fairly uniformly over a wide area. In the Mill Creek Valley exposures in sand quarries clearly show that erosion by streams has removed part of the clay interbed. The pattern of the isopach in Figure 3-19 suggests that a stream removed the clay interbed on the south and east sides of the FEMP. Figure 3-20 shows the topographic surface of the clay interbed which slopes generally to the south and east. Whether this is a depositional or erosional surface, the slope of the topographic surface indicates that erosion by a down-cutting stream entering the area from the northeast would be deflected to the southeast. Thus the erosion of the clay interbed along the bedrock contact north of the FEMP seems unlikely.
Model assumptions are based on the geologic interpretation; the geologic interpretation is not adjusted to fit the needs of the modeling.
Action: Change the word "assumed" to "interpreted" in line 7.

372. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.4.4.2 Pg.#: Line#: Code:C
Original Comment #: 50
Comment: Why is the clay interbed depicted as extensive to the north and west along cross-section lines I-I', II-II', and V-V' and not III-III' ? There appears to be limited data to support either

interpretation. Further, locations 4011 and 3009 appear to have 0.0 ft of clay interbed; this, however, is not reflected in Figures 3-19, 3-21, and 3-22.

Response: For the area to the north see the response to comment 371 above.
Figures 3-19 and 3-20 are being revised to include more wells and the contouring will change slightly. Where the interbed pinched to zero thickness in Section III-III' the section will be corrected. The clay interbed does not have any impact on the development of remedial actions for the Great Miami Aquifer.
There is virtually no data to the west except Well 41241 which was installed as a replacement water supply well in Removal Action 3. Well 41241 was drilled to bedrock and encountered two feet of the clay interbed; thus, it is interpreted as extending to the west. The clay interbed west of the FEMP does not impact the interpretation of groundwater flow under the FEMP or contaminant migration.

Action: Figures 3-19 and 3-20 will be regenerated and Plate 3-1 will be corrected to show all the wells used in the RI.

373. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.4.4.2 Pg.#: 3-24 Line#: 22 Code:
Original Comment #: 51
Comment: This sentence is very awkward and unclear.
Response: Agree.
Action: The sentence will be revised to read: ... because the water table is depressed on the west side of the river by SWOC Collector Well 2 ... Plate 3-1 will be revised to show the location of all the wells used in the geologic model including the SOWC wells.

374. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.4.5.3 Pg.#: 3-30 Line#: 22-24 Code:
Original Comment #: 52
Comment: DOE should remove the last sentence. Loess may not be very significant, but its location is not the reason why.
Response: Disagree. The text is setting the stage for the discussion of hydraulic properties of the glacial overburden materials. This statement is required to explain the absence of any discussion of the hydraulic properties of the loess in the hydraulic properties section.
Action: ~~None required.~~ The sentence has been revised to read: Since the loess is a near-surface deposit generally found above the water table it is not significant to the migration of contaminants or the movement of groundwater within the glacial overburden.

375. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.5.2 Pg.#: 3-38 Line#:10-13 Code: C
Original Comment #: 53
Comment: A saturation index >0 indicates that the solution is supersaturated with respect to the particular mineral, and therefore, is in disequilibrium.
Response: Agree.
Action: Beginning with "Using this convention,..." replace text with following: Using this convention, minerals having a saturation index equal to zero are saturated, while values greater than and less than zero represent supersaturated and undersaturated conditions, respectively. The saturation indices are evaluated with thermodynamic data of variable quality, resulting in an estimated range of saturation that corresponds to 0.5 saturation index units. Mineral saturation indices reported in Table 3-13 indicate the groundwater is saturated to supersaturated with the minerals listed in Table 3-5. The supersaturated conditions calculated for many of the minerals in Table 3-13 indicate the difficulty in nucleating and precipitating some phases (i.e., kinetics are unfavorable) and/or the presence of colloidal particles (e.g., FeOOH, AlOOH, etc.,) in the analyzed samples. Colloidal aluminum and

iron particles are common in most groundwater, and acidification of groundwater samples before analysis can dissolve these particles and elevate the 'true' dissolved concentration. Elevated aluminum and iron concentrations will result in elevation of the calculated saturation index numbers, and this has occurred to some extent for all the aluminum and iron phases in Table 3-13.

376. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6 Pg.#: 3-39 Line#: 25 Code: C
Original Comment #: 55
Comment: Change ". . . the glacial overburden" to ". . . the glacial overburden, where present."
Response: Agree.
Action: Add at the end of the sentence: ..., where present.

377. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1 Pg.#: 3-41 Line#: 10 Code: C
Original Comment #: 58
Comment: Also note that "Similarly, the depiction of discrete highlighted areas is not meant to indicate a complete lack of connection between coarser grained sediment in the different highlighted areas."
Response: Agree.
Action: The sentence will be modified to read: Although interconnections may occur, the highlighted areas...

378. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1 Pg.#: 3-41 Line#: 19 Code: C
Original Comment #: 59
Comment: Figure 3-36 which demonstrates the distribution of coarse grained sediment bodies is potentially misleading. The text states that the highlighted areas do not represent continuous interconnected units but simply indicate where most of the coarser material is located. Why are some units shown to be extensive and others not? The figure shows that coarse grained sediment bodies north and east of the site are not extensive. It is understood that this interpretation results from the limited number of borings in the vicinity of those borings that encountered coarse grained sediment. However, the representation in Figure 3-36 portrays the existence of isolated and relatively small coarse grained sediment bodies that happened to be detected by each of the borings.
Response: The intent of Figure 3-36 is to illustrate where most of the coarser sand and gravel sediment within the glacial overburden is located. The shaded area does not represent an interconnected system of sand and gravel. It is easy though, to infer that the shaded areas represent interconnected units. To keep the reader from jumping to this conclusion, the statement was made that the highlighted areas do not represent continuous interconnected areas. There is a higher probability of finding sand and gravel in the shaded area than outside of the shaded area and no interpretation as to interconnection is being made.
Based on our understanding of the depositional environments it is unlikely that additional borings east and north of the production area will reveal extensive interconnected sand bodies.
Action: The following text will be added to page 3-41, following the sentence in line 11: No interpretation of interconnection is presented in Figure 3-36.

379. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1 Pg.#: 3-41 Line#: 19 Code: C
Original Comment #: 60
Comment: Figure 3-36 does not include boring locations 1740, 1494, 1497, 2731, 1028, 1239, 1522, 1267, and 1411 which contain coarse grained sediment.

Response: The intent of Figure 3-36 is to illustrate where most of the coarser sand and gravel sediment within the glacial overburden is located.
With the exception of Well 1411, drilling logs indicate that the borings listed encountered clay with occasional coarse fragments or at best thin stringers of coarse material within a clay matrix. Therefore, they were not included in the figure. If wells containing this small amount of coarser grained sediment were included, the figure would become meaningless for the purpose of trying to define the areas where the greater likelihood of finding coarser-grained sediment are located.
Well 1411 is within the area of coarse-grained sediment; however, it did not appear on the map.
Action: Add Well 1411 to Figure 3-36.

380. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.1 Pg.#: 3-44 Line#: 15 Code: C
Original Comment #: 64
Comment: The report should note that core permeameter tests measure vertical hydraulic conductivity which (in sediments) is typically lower than horizontal hydraulic conductivity. The report should also note that K values derived from slug and pump tests typically reflects the horizontal hydraulic conductivity. This is another factor resulting in higher K values derived from slug and pump tests compared to permeameter tests.
Response: It is agreed that this information would add value to the report.
Action: The following text will be added to page 3-43, following line 32: Core permeameter tests measure vertical hydraulic conductivity while slug and pump tests measure horizontal hydraulic conductivities; vertical hydraulic conductivities are usually lower than horizontal hydraulic conductivities.

381. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.1 Pg.#: 3-45 Line#: 27-28 Code: C
Original Comment #: 65
Comment: The brown and gray silt had higher mean K values than the brown and gray clay.
Response: This is a statement, not a comment. While true it does not seem to be required in the referenced text.
Action: None.

382. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.6.1.1 Pg.#: 3-47 Line#: 4 Code:
Original Comment #: 67
Comment: Ground water can also migrate through cracks and fissures in the till.
Response: The comment is correct; however adding this phrase to the discussion of the pumping test would be awkward. In addition, as was discussed at the top of page 3-41, all the field evidence indicates that secondary porosity decreases with depth rather than increases.
Action: None required.

383. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.6.1.1 Pg.#: 3-48 Line#: 10 Code:
Original Comment #: 68
Comment: This sentence needs to be reworded. The ground water yields in the glacial overburden are not negligible. This unit is contaminated and the contaminated ground water within it is migrating. It would be more accurate to state that the ground water yields in the glacial overburden are approximately two (2) orders of magnitude smaller than the yields in the buried valley aquifer system.

Response: Disagree with the suggested change. To express this in terms of orders of magnitude would be deceptive in that the truly low yield of the glacial overburden would not be brought out. However, the sentence can be modified to be more specific.

Action: Replace the sentence with: Groundwater yields of a few gallons per minute from the glacial overburden are insignificant when compared to the hundreds of gallon per minute yields typical of the Great Miami Aquifer.

384. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.1 Pg.#: 3-48 Line#: 13 Code: C
Original Comment #: 69
Comment: Change "were capable" to "were found capable".
Response: Agree.
Action: Change "were capable" to "were found capable.

385. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.6.1.1 Pg.#: 3-48 Line#: 18 Code:
Original Comment #: 70
Comment: DOE should add, "and possible increases in secondary permeability." to the line.
Response: Disagree. There is no justification for the supposition that secondary permeability increases with depth. All the field evidence indicates that the opposite is true. If there were significant secondary permeability in the lower part of the glacial overburden, there would not be a perched groundwater system present. This is the single greatest piece of evidence that the till is a good aquitard.
Action: None required.

386. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.1 Pg.#: 3-48 Line#: 26-27 Code: C
Original Comment #: 71
Comment: Was not this area determined capable of sustaining >1 gpm for more than one week?
Response: Yes, this area was determined capable of sustaining >1 gpm for more than a week, but not much more than one gallon per minute. The text refers to a yield of approximately 1 gallon per minute.
Action: The text will be changed to read: The data indicate that this area could sustain a yield slightly greater than 1 gpm for longer than a week.

387. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.1 Pg.#: 3-48 Line#: 31-34 Code: C
Original Comment #: 72
Comment: The conclusion that most channel features are probably located [due?] south of the Shandon Tributary is not well-supported in the report. Are there other citations or evidence that further support this concept? Or, are coarse-grained channel features just as likely to be present anywhere in the glacial overburden due to deposition in crevasses, subglacial drainage, etc.?
Response: As discussed in Section 3.4 a small ice lobe advanced from the Shandon area across the buried valley to the vicinity of the village of Fernald. It is very likely that the ice advance was in small steps and took many years; however, there is no evidence that there was more than one major advance and retreat. Once the ice stopped advancing a topographic low was established with Paddys Run along its axis. Given this geometry, it is difficult to construct a scenario where surface water and associated sands could have come from anywhere but the Shandon Trough area.
As this ice advanced there likely were subglacial coarse-grained deposits, crevasse deposits, and terminal moraine deposits which were overrun by the advancing ice. As the pump tests

show, these sand deposits were encapsulated in the till. The lacustrine basin is the dominant area where coarse-grained materials are present and interconnected; however, this coarse-grained material contains a considerable percentage of silt and clay as demonstrated by the sieve analysis (Figure 3-29). This material is underlain by till and covered by loess. The fact that a perched water table exists and does not show any evidence of water table depressions further indicates that although undiscovered sand bodies may be present they do not form a relatively high velocity conduit to the aquifer below. The only place where such drains are evident in the perched water table is in the production area where perched groundwater is leaking into the storm sewer system. This leakage is confirmed by TV surveys and sampling at manholes.

Action: None required.

388. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.2 Pg.#: 3-53 Line#: 1-3 Code: C
Original Comment #: 73

Comment: The described correlation between water-table fluctuation and coarse-grained sediment bodies is not readily apparent.

Response: The sentence does not imply that there is a one-to-one correlation between the water table fluctuations and the presence of coarse-grained bodies. It says that the distribution of the two features is similar in that the occurrence of each is scattered to the north and east of the production area.

Action: The sentence will be clarified to read: The wells with high standard deviations occur as isolated features north and east of the production area.

389. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.2 Pg.#: 3-54 Line#: 21 Code: C
Original Comment #: 75

Comment: This sentence does not make sense.

Response: Agree.

Action: The text will be changed to read: The thickness of the gray clay in Zone III actually increases to the east to approximately 25 feet. The zone includes a few small areas where the gray clay is thinner than 10 feet, but overall 10 feet is a good representative minimum thickness.

390. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.1.2 Pg.#: 3-55 Line#: 27-28 Code: C
Original Comment #: 76

Comment: Effective porosity values, especially for the clayey units, may be much smaller than the total porosities used to calculate horizontal and vertical seepage velocities. The calculated vertical seepage velocities would be higher using effective porosity values.

Response: Agree. An effective porosity lower than the 26 percent reported, would result in a greater calculated seepage velocity. There is a practical limit under which this relationship is true. At some point the grain size and capillary pressure become the controlling factor and restrict the movement of fluids through the porous material. Porosites generally range from 33 to 60 percent for clay and 35 to 50 percent for silt (Fetter 1980) therefore 26 percent is already a conservatively low number for the clay and silt in the glacial overburden. Section 5.0 presents modeling where a 20 percent effective porosity is used which is a further 23 percent decrease in porosity from the 26 percent.

Action: Delete the sentence on lines 29 and 30 and replace with: Seepage velocities calculated using total porosity are lower than seepage velocities calculated using effective porosities. Modeling of contaminant fate and transport (Section 5.0) assumes an effective porosity of 20 percent which provides a faster seepage velocity.

391. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.6.2.2 Pg.#: 3-59 Line#: Code:
Original Comment #: 77
Comment: Change "captured "to "influenced".
Response: Disagree. The cone of depression extends from the bedrock wall between the FEMP and Ross to the bedrock wall on the east side of the valley. More than 70 percent of the water pumped from the collector wells is due to recharge from the river because the aquifer cannot supply all the water even though each well has lateral collectors to improve the efficiency of the well. To say this pumping only influences groundwater flow is far too weak a statement.
Action: The word "captured" will be replaced with "influenced".

392. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.2.2 Pg.#: 3.62 Line#: 9-10 Code: C
Original Comment #: 79
Comment: The groundwater divide at FEMP is a linear (ridge) feature, not a point; and groundwater flows downgradient away from the divide.
Response: Agree
Action: The word "point" will be replaced with "ridge."

393. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.2.2 Pg.#: 3-64 Line#: 13 Code: C
Original Comment #: 81
Comment: Are vertical hydraulic gradients within the Great Miami Aquifer locally significant to uranium migration (e.g., in the south plume)?
Response: The gradients shown in Figure 3-58 are not significant to the movement of groundwater in the FEMP. It is assumed that they are not significant to the migration of uranium either.
Action: None

394. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.2.2 Pg.#: 3-69 Line#: 39-40 Code: C
Original Comment #: 85
Comment: This discussion contradicts what is stated on page 3-60 and 3-61, lines 19-32 and 1-11. Winter and spring are the recharge months. Groundwater elevations are generally declining by the onset of Summer.
Response: Disagree. The peak groundwater levels as shown in the hydrographs in Appendix L indicate that peak water levels occur from April to July depending on the year and the distance the well is from Paddys Run.
Action: The reference to May will be changed to June.

395. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.3 Pg.#: 3-73 Line#: Code: C
Original Comment #: 88
Comment: Seepage velocities should be identified as either "calculated velocities" or "estimated velocities". They have not been measured directly. Travel times should also be so described.
Response: Agree. As written, a reader must read Section 3.6.1.2 to know that these are calculated values.
Action: All references to "horizonal seepage velocities," "horizontal advective time of travel," "vertical seepage velocities" and "vertical advective time of travel" in Section 3.6.3, on page 3-73, will be revised to read: calculated horizontal seepage velocities, calculated horizontal advective time of travel, calculated vertical seepage velocities, and calculated vertical advective time of travel.

396. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.3 Pg.#: 3-72 to 3-74 Line#: Code: C
Original Comment #: 89
Comment: The hydraulic conductivity values noted should be identified as the geometric mean of measurements.
Response: Agree.
Action: Begin line 31 on page 3-72 and lines 1 and 2 of page 3-73 with: The geometric mean of...

397. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 3.6.3 Pg.#: 3-73 Line#: 22-25 Code:
Original Comment #: 90
Comment: The horizontal to vertical ration of hydraulic conductivity has been determined to be 1:100 in the South Plume ground water interception project. Why is the range reported here as 5 to 15?
Response: The sentence on line 22-25 is not correct. The vertical to horizontal ratio determined from the South Plume Removal Action pumping test ranges from 0.05 to 0.19. This is reported on page 7-3 of the South Plume Pump Test Report.
Action: The sentence will be changed to read: The vertical to horizontal ratio determined from the South Plume Removal Action Pumping Test ranges from 0.05 to 0.19 (DOE 1993i).

398. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 3.6.3 Pg.#: 3-74 Line#: 7-9 Code: C
Original Comment #: 92
Comment: The sponge analogy neglects the concept of preferential leakage through depositional (textural) heterogeneities and deep secondary permeability features (e.g., fractures). Unfortunately, as noted in the text, the significance of such features at the site cannot be determined with unreasonable excavation.
Response: While these other features may be present, like tears and holes in a sponge, their impact seems to be minimal. The fact remains that all the data to date indicated that the sponge analogy is accurate for the overall conditions at the FEMP.
Action: None required.

399. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 3.7.1 Pg.#: 3-75 Line#: 25-34 Code: C
Original Comment #: 93
Comment: This paragraph states that the Paddy's Run Road site is classified as a CERCLA site and is listed on the CERCLIS database. Please delete "classified as a CERCLA site."
Response: Agree.
Action: Delete "classified as a CERCLA site." Replace with: Known as the Paddys Run Road Site, these facilities are undergoing a state-led RI/FS and are listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS).

400. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 3.8 Pg.#: 3-79 Line#: Code: C
Original Comment #: 94
Comment: This section does not include results and findings of RI biological studies described in section 2.9.1. The section should be revised to include these results and findings or reference the section where these results may be found.
Response: Agree. Section 3.8 is a physical description of the ecology of the FEMP site. Results of sampling programs applicable to this discussion are included in Section 3.8. However, most of the sampling programs described in Section 2.9.1 addressed the nature and extent of

contamination. Results of these programs are presented in Section 4.9. A reference to the location of results will be added to Section 2.9.

Action: In Section 2.9, page 2-59, line 21 the following bullet text will be inserted:

- Section 3.8 presents a description of the terrestrial and aquatic ecology, agricultural land use, wetlands and floodplains of the FEMP, as well as the findings of studies concerning threatened and endangered species, avian populations and population genetics.
- Section 4.9 contains sample results related to the nature and extent of contamination of FEMP biota.

Add the second bullet to Section 3.8, page 3-79 as a sentence in line 31.

401. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.0 Pg.#: 4-2 Line#: 10 Code: C
Original Comment #: 95
Comment: Hydrodynamic dispersion does not act to attenuate the movement of contaminants; as noted, it causes the spread of contaminants. Dispersion can be said to reduce (or attenuate) the peak contaminant concentration in a plume of contaminated groundwater.
Response: Agree. Text will be modified as follows.
Action: "Hydrodynamic dispersion, which results in spreading of a contaminant plume, acts to reduce (or attenuate) the peak contaminant concentration in a plume of contaminated groundwater."

402. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.1.5 Pg.#: 4-10 Line#: 6 Code: C
Original Comment #: 96
Comment: Line 24 on page 4-1 indicates that cesium (Cs)-127 is anticipated at low levels. Line 27 of page 4-9 states that cesium-137 is a result of trace amounts of fission products in the recycled uranium processed at the FEMP and is anticipated at low levels. However, line 6 of page 4-10 states that samples have been analyzed for cesium-147. The isotope(s) expected and the isotope(s) analyzed should be clarified.
Response: Agree. All references to cesium will be modified to cesium-137. Text will be modified as follows.
Action: Line 24 on page 4-1. "...strontium (Sr)-90, cesium (Cs)-137, and plutonium (Pu)-238, -239,..."
Line 6 on page 4-10. "samples have been analyzed for cesium-137, strontium-90,..."

403. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.2 Pg.#: 4-14 Line#: 26 Code: C
Original Comment #: 97
Comment: Section 2.5.5.2 indicates that samples were collected from three different depth intervals, whereas this section states that samples from two depth intervals were used. The rationale for selecting the two depth intervals to derive background surface and subsurface soil values should be included here.
Response: Agree. The text will be modified as follows.
Action: "Although samples were collected in two intervals from subsurface soil, (36 to 42 inch and 48 to 54 inch) these samples were combined to determine a representative background concentration. They were combined after it was determined that there was no statistical difference between the results for the two intervals."

404. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.2 Pg.#: 4-15 Line#: 13-14 Code: C
Original Comment #: 98

Comment: Why assume the presence of any organics in the GM River derive from FEMP? What is the basis for this assumption?
Response: This sentence is a misstatement. The sentence will be deleted.
Action: Delete the sentence on Lines 13 and 14.

405. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.3.2 Pg.#: 4-17 Line#: 26 Code: C
Original Comment #: 99
Comment: This section should include radium-224 to be consistent with Section 4.0, page 4-1, line 22.
Response: Agree. The text will be modified as follows.
Action: "...this radionuclide and its more stable progeny (radium-228, thorium-228, and radium-224) are also expected."

406. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.4.1 Pg.#: 4-19 Line#: 7 Code: C
Original Comment #: 100
Comment: Please explain the rise in radon levels in 1993. With the addition of the bentonite cap, it stands to reason that levels would remain steady after 1991.
Response: It is expected that radon levels did drop as a result of the K-65 bentonite capping. However, such a drop may not necessarily be expressed in averages of all radon data collected at the fenceline. The increase in average radon observed in 1993 (vs. 1992) is possibly due to random variation of site emissions. The 1993 increase is consistent with variations observed in the previous 4 years.
Action: No action required.

407. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.5.2.3 Pg.#: 4-28 Line#: 14 Code: C
Original Comment #: 102
Comment: Based on examination of Plates 3-7 and E-3, and Figure 4-11, it appears that uranium may also be migrating to the SSOD from the north and west. Might there be some contribution from runoff of perched groundwater flow into the SSOD from the northwest?
Response: Comment noted.
Action: Add text to line 14 following ....south of the SSOD. Although it is possible that perched groundwater west and north of the SSOD could be migrating to the ditch, the amount of flow from the seeps would be much less than what is contributed by surface water runoff. As shown in Figure 4-8, surface water runoff from areas 580, 581, and 582 flow into the SSOD and contribute significantly more flow than the seeps. Moreover, the uranium concentrations in the perched groundwater are much lower (about 8 μg/L) compared to what is often present in the surface water runoff.

408. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.5.2.5 Pg.#: 4-29 Line#: 27 Code: C
Original Comment #: 103
Comment: Section 4.2 does not present the total uranium background value of 1.1 μg/L for surface water in Paddys Run as stated in Section 4.5.2.5.
Response: Agree with commentor. Section 4.2 does discuss how background values were determined, although the specific background value for total uranium in Paddys Run is not presented in Section 4.2. This is not clearly stated in the text.
Action: The phrase "As presented in Section 4.2" will be deleted.

409. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.5.3.3 Pg.#: 4-35 Line#:34 Code: C

Original Comment #: 105

Comment: Section 4.2 does not present the total uranium background value of 1.4 μg/L for surface water in the Great Miami River as stated in Section 4.5.3.3.

Response: Agree with commentor. Section 4.2 does discuss how background values were determined, although the specific background value for total uranium in the Great Miami River is not presented in Section 4.2. This is not clearly stated in the text.

Action: The phrase "As presented in Section 4.2" will be deleted.

410. Commenting Organization: Ohio EPA Commentor: GeoTrans

Section#: 4.6.1.1 Pg.#: 4-48 Line#: 15-17 Code: C

Original Comment #: 106

Comment: The "conceptual model of adsorption in areas of aqueous spills/leaks versus desorption in areas that received only uranium particles from air emissions" needs further clarification at this point in the text.

Response: Agree

Action: The following text will be inserted. "The leachable forms of uranium will dissolve upon contact with rainwater and aqueous uranium species will migrate through the soil column. As the aqueous uranium species traverse the soil column, adsorption and/or precipitation reactions may remove uranium from solution. Historical information on uranium concentrations in spilled and/or leaking solutions indicates adsorption and/or precipitation of uranium probably occurred in areas proximal to the aqueous spills or leaks. In these areas, the precipitated uranium may still act as a moderately soluble source of uranium and continued leaching of this source will produce additional aqueous uranium that is available for adsorption.

In contrast to the aqueous spills and/or leaks containing concentrated uranium in an aqueous form, uranium particles deposited from air emissions were a mix of soluble and nearly insoluble solids. The soluble particles were quickly mobilized by the first seasonal rains and transported into the soil, where adsorption removed some of the solubilized uranium. However, after the soluble source of uranium particles was removed, adsorption processes would cease to function as infiltrating rainwater derived very little uranium from the nearly insoluble particles remaining on the surface. As the relatively more dilute rainwater passed through the soil containing adsorbed uranium, desorption processes would begin to operate to satisfy the uranium partition equilibrium between the soil and water. Therefore, uranium desorption is likely to be occurring under areas covered by particle emissions, while adsorption may still be occurring in areas that contain moderately soluble forms of uranium derived from aqueous spills."

411. Commenting Organization: Ohio EPA Commentor: GeoTrans

Section#: 4.6.1.1.1 Pg.#: 4-51 Line#: 11 Code: C

Original Comment#: 107

Comment: This sentence implies that the highest concentration of total uranium detected in the 0 - 0.5 ft interval at the Plant 1 area, Plant 6 area, the laboratory area, the scrap metal pile, decontamination building, and Buildings 64 and 65 area is 12,337 mg/kg. This (as shown on Table 4-18), however, is not the case.

Response: The sentence was intended to show that the incidences of total uranium greater than 10,000 mg/kg are localized and do not encompass large areas of the site. Thus the concentration of 12,337 mg/kg in the Plant 1 area is an example of this. The text will be clarified as follows.

Action: "...at least on order of magnitude. An example of this localized area of high contamination is found in the Plant 1 area. In the immediate vicinity of the sample location where the concentration was 12,337 mg/kg, the two nearest sample concentrations were 112 mg/kg (located 25 feet due west) and 715 mg/kg (located 1000 feet due east)."

412. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.6.1.1.1 Pg.#: 4-54 Line#: 14 Code: C
Original Comment#: 108
Comment: This sentence states that there was one detection of uranium (362 mg/kg) in the surface soil of the northeastern area. Section 3.6.3 "Northeastern Area of the FEMP", page 4-87, line 8 indicates that total uranium in the surface soil was detected as high as 5533.31 mg/kg. Are these two sections referring to the same northeastern area? This contradiction should be clarified.
Response: The two areas are the same northeastern areas. The text states that "There was one detection of uranium in the northeastern area (362 mg/kg) that was not expected. This is not the maximum value of total uranium in the area, but a high value where a source could not readily be identified. Text will be modified for clarification as follows.
Action: There was one detection of uranium in the northeastern area (362 mg/kg) that was not expected. This is not the maximum value of total uranium in the area, but a high value where a source could not readily be identified.

413. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.1.1.3 Pg.#: 4-64 Line#: 31 Code: C
Original Comment#: 110
Comment: Please provide background information regarding the thorium sump and how this may have contributed to elevated thorium levels in the area.
Response: The thorium sump was the primary waste water treatment facility for the pilot plant. Thorium and uranium were removed from the waste water and the effluent was sent to the general sump for final treatment before discharge. Almost all sumps are suspected source areas of surface contamination since they are areas where wastewater is treated.
Action: No action required.

414. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.1.2 Pg.#: 4-67 Line#: 25 Code: C
Original Comment#: 111
Comment: Please insert units after 0.77 to 81.9. There are several places in the remaining text where this needs to be addressed.
Response: Agree.
Action: The text will be modified as follows: "Arsenic concentrations ranged from 0.77 to 81.9 mg/kg."

415. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.1.3 Pg.#: 4-79 Line#: 25 Code: C
Original Comment#: 114
Comment: It is speculated that the detection of bis(2-ethylhexyl)phthalate is due to cross-contamination. How was this theory verified? Was this area re-sampled?
Response: Bis(2-ethylhexyl)phthalate is commonly associated with plastic. It is only mentioned that this may be a possible source of the contaminant. All calculations for both modeling and risk will incorporate this data.
Action: No action required.

416. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.4 Pg.#: 4-90 Line#: 1 Code: C
Original Comment#: 117
Comment: Why was only the 0 to 0.5-foot depth interval analyzed for inorganic constituents?
Response: There was no indication that inorganic contamination exists in the subsurface soil. Additional sampling will be required during the RD and/or RA phases of the cleanup. However, as

indicated in Table 7-12, it is not required during the screening of alternatives for the FS. Estimates of media volumes containing elevated concentrations of CPCs will be based on results of the various investigations and process knowledge. Following remedy selection and identification of cleanup goals, additional sampling will be performed during remedial design to verify the FS estimates of affected media and/or remedial action to certify that final cleanup goals have been attained.

Action: Add the following paragraph: Although there is sufficient data to present the nature and extent of contamination for the feasibility study and risk assessment, it is recognized that in some instances there will be a need for further sampling to support the actual remediation. With the exception of a few specific contaminants discussed in Section 4.6.9, the volume of soil defined by known uranium contamination (uranium envelope) indicates the extent of soil contamination. As part of the remedial design and remedial action, verification and confirmatory sampling, respectively, may be required to accurately determine specific volumes of soil to be removed. Such sampling will provide sufficient characterization to ensure that contaminant concentrations above the final remediation levels, as defined in the Operable Unit 5 Record of Decision, are removed.

417. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.6.6 Pg.#: 4-96 Line#: Code: C
Original Comment#: 119
Comment: This section would benefit from including a Conclusion section as was done for 4.6.4, 4.6.5, 4.6.7 etc.
Response: Section 4.6.9, Summary of FEMP Soil Contamination, was intended to be the conclusion section.
Action: No action required.

418. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.7 Pg.#: 4-97 Line#: 18 Code: C
Original Comment#: 120
Comment: Please describe how many samples were detected containing levels of isotopic uranium. The text currently states that "a few" samples resulted in detections.
Response: Agree.
Action: The text will be modified as follows: "Within the 0- to 0.5- foot depth interval 11 out of 256 samples were detected containing total urainium of..."

419. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 4.6.7 Pg.#: 4-98 Line#: 4 Code: C
Original Comment#: 121
Comment: Why were samples collected at depths of 0 to 1.5 feet but reported as 1.0 to 1.5-foot depth interval samples?
Response: To characterize the soil, depth intervals were established and used throughout the Section 4 nature and extent discussion. To be conservative in the portrayal of the extent of contamination, the bottom depth was used as the guide for placement of the sample result in a depth interval. Because the bottom depth was 1.5 feet it was placed in the 1.0- to 1.5-foot-depth interval.
Action: The above response will be incorporated into Section 4.6.1.

420. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.6.9 Pg.#: 4-105 Line#: 25-26 Code: C
Original Comment#: 124
Comment: This section should note (as is done on pps. 4-68 and 4-71) that beryllium and cadmium are present in flyash and that deposition of airborne flyash may be a source of trace metals (e.g.,

cadmium and beryllium) in surface soil.

Response: Agree. The text will be modified as follows.

Action: "Cadmium and beryllium are trace elements in the earth's crust and both are trace constituents in coal and the resulting flyash when burned. The only known source..."

421. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.7.1 Pg.#: 4-107 Line#: 27 Code: C
Original Comment#: 125

Comment: This sentence states that the isoconcentration maps are based on the 1993 data set. Are there instances where the 1988-1992 data significantly contradict the 1993 data set such that the representation of the nature and extent of contamination would change?

Response: There are instances where the 1993 data set map values are contradicted by earlier results in the data base. The contradictions in data represent variations of concentrations in wells. However, the contradictions do not change the basic conclusions drawn for the nature and extent of contamination. For instance, the portrayal of uranium contamination differs when the 1993 data set is used relative to the maximum-observed-value in the data base. A map constructed with the maximum-observed-values shows higher uranium concentrations in some wells (and lower concentrations in other wells), but the basic concentration trends are identical and the major sources of contamination can be discussed by referring to either map. Comparisons of Plates E-1 to E-3 and E-2 to E-4 illustrate this point.

Action: The following paragraph will be added so that it follows the subject text: "There are instances where the 1993 data set values are exceeded by earlier results in the database, due to variations in concentrations in wells. However, the earlier data do not change the basic conclusions drawn for the nature and extent of contamination. Groundwater moves slowly within the glacial overburden, so plumes have not expanded or contracted appreciably within the period of monitoring. For instance, the portrayal of uranium contamination differs when the 1993 data set is used relative to the maximum observed values in the database. A map constructed with the maximum observed values shows higher uranium concentrations in some wells (and lower concentrations in other wells), but the basic concentration trends are very similar and the major sources of contamination can be discussed by referring to either map. Visual comparisons of Plates E-1 to E-3 and E-2 to E-4 illustrate this point. Most importantly, reliance on the 1993 data set to characterize nature and extent does not minimize or mask visual representations of groundwater contamination at the FEMP."

422. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.7.1.1.1 Pg.#: 4-119 Line#: 16-26 Code: C
Original Comment#: 126

Comment: If uranium has migrated through the gray glacial overburden at all three lysimeter locations, why is there no indication of migration to the base of this unit illustrated for present time in Figures 4-82 and 4-83?

Response: The commentor is correct that the portrayal of uranium in the figure should extend downward so that it matches the description stated in the text.

Action: Figure 4-82b will be revised so that the dotted-cross pattern extends to the base of the glacial overburden. Figure 4-83b will be revised so that a finger of the cross-hatch pattern extends to the base of the glacial overburden.

423. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.7.1.1.1 Pg.#: 4-120 Line#: 4-7 Code: M
Original Comment#: 127

Comment: If vertical seepage velocities are 0.85 to 1.42 ft/yr and the relative velocity of uranium is 1/20th to 1/80th of that of groundwater, then the maximum downward seepage velocity of uranium would be only 0.071 ft/yr. If this were the case, then uranium could only migrate

2.84 ft downward over a 40-year period. Yet, on p.4-119, the report acknowledges that uranium has migrated to the below the glacial overburden at all three lysimeter locations. What gives? Are the reported retardation values too high (relative velocities too low) and/or are the estimated seepage velocities too low? Further clarification at this point in the text would be helpful.

Response: See response to comment number 25.

Action: See action for comment number 25.

424. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.7.2 Pg.#: 4-130 Line#: 15-17 Code: C
Original Comment#: 128
Comment: Figure 4-92 does not indicate the general directions of groundwater flow as noted in the text.
Response: Agree
Action: Figure 4-92 will be modified to indicate general groundwater flow directions.

425. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.8.1 Pg.#: 4-141 Line#: 29 Code: C
Original Comment#: 129
Comment: This sentence states that the isoconcentration maps are based on the 1993 data set. Are there instances where the 1988-1992 data significantly contradict the 1993 data set such that the representation of the nature and extent of contamination would change?
Response: See response for comment number 421.
Action: No action required.

426. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.8.1.1.1 Pg.#: Figure 4-95 Line#: Code: C
Original Comment#: 130
Comment: The legend does not clearly identify "sections of Paddys Run where little or no infiltration occurs".
Response: Agree.
Action: The legend and map patterns will be revised. One pattern will be used to show "areas where infiltration occurs via glacial overburden that is thin or absent due to mans activities," and a second pattern will be used to portray "areas where Paddys Run flows directly upon sand and gravel of the Great Miami Aquifer and infiltration occurs through the bed of Paddys Run (little or no infiltration occurs along other sections of Paddys Run)."

427. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.8.1.1.1 Pg.#: 4-146 Line#: 15-17 Code: C
Original Comment#: 132
Comment: Replace "not underlain by glacial overburden" with "with little or no glacial overburden separating their lines from the Great Miami Aquifer."
Response: Agree.
Action: Will replace "not underlain by glacial overburden" with "with little or no glacial overburden separating their liners from the Great Miami Aquifer." (lines 16-17 of page 4-146 in Section 4.8.1.1.1.)

428. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 4.8.1.1.1 Pg.#: 4-151 Line#: 1-6 Code:
Original Comment#: 135
Comment: It is also possible that this uranium plume is the result of uranium infiltration from the Paddy's Run.

Response: Agree. The text does not dispute the fact that the uranium beneath and downgradient of the PRRS may be attributable to the FEMP; and if attributable to the FEMP, the source is likely infiltration along Paddys Run.

Action: Line 13 of page 4-151 will be modified so that it reads "... originated entirely from the FEMP and entered the aquifer via infiltration along Paddys Run, (2) the uranium contamination..."

429. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 4.8.1.1.1 Pg.#: 4-151 Line#: 14-16 Code:
Original Comment#: 136
Comment: Does DOE intend to further investigate the source of uranium in the area south of the Paddy's Run Road Site?
Response: For purposes of the RI/FS for Operable Units, DOE has drawn an administrative line coincident with the South Plume removal wells. DOE does not intend to further investigate the subject contamination for purposes of completing the RI and FS for OU5. Future investigation of the subject contamination may be completed jointly by the DOE and the PRRS PRPs.
Action: No action required.

430. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.8.1.1.1 Pg.#: 4-151 Line#: 27 Code: C
Original Comment#: 137
Comment: The subsection "Other Uranium Plumes and Sources" does not discuss the two isolated detections of uranium above background shown in Figure 4-97.
Response: Agree. The southernmost isolated detection of uranium in a Type 4 well (Figure 4-97) is part of South Plume B, and is located very close to the South Plume Removal Action pumping wells. The eastern isolated detection is a total uranium value of 2.3 μg/L, which is only slightly above the Great Miami Aquifer background value of 1.2. The isolation of the eastern location from other known plumes or sources is evidence that the above-background detection is most likely attributable to natural variation in the Great Miami Aquifer.
Action: The following text will be added to line 23 of page 4-148 in Section 4.8.1.1.1: "The eastern isolated detection shown Figure 4-97 corresponds to a total uranium value of 2.3 μg/L, which is only slightly above the Great Miami Aquifer background value of 1.2. The isolation of the location from other known plumes or sources is evidence that the above-background detection is most likely attributable to natural variation in the Great Miami Aquifer."

431. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 4.8.1.1.1 Pg.#: 4-152 Line#: 16 Code: C
Original Comment#: 138
Comment: Replace "east" with "west".
Response: Agree.
Action: Replace "east" with "west," line 16 on page 4-152 in Section 4.8.1.1.1.

432. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 4.8.1.1.3 Pg.#: 4-154 Line#: 21 Code:
Original Comment#: 140
Comment: Change "were" to "where".
Response: Agree.
Action: Replace "were" with "where," line 21 on page 4-152.

433. Commenting Organization: Ohio EPA Commentor: DDAGW
Section#: 4.8.1.2 Pg.#: 4-157 Line#: 11-13 Code:

Original Comment#: 141

Comment: This statement is very broad. More information and discussion is warranted. Specifically, what are the additional contaminants identified by FEMP? What rational was used for each determination?

Response: The OU5 RI presents interpretations and conclusions on nature and extent only for DOE-collected data. DOE does not have sufficient access to PRRS data and PRRS documents to compare or evaluate the Draft PRRS RI (ERM 1992) against the Operable Unit 5 RI. However, based on the Draft PRRS RI (ERM 1992), DOE believes that differences between conclusions of the Draft PRRS RI and the Operable Unit 5 RI are due to: 1) DOE sampled a different set of wells in the vicinity of PRRS, and 2) to determine COCs, DOE compared DOE data to the DOE-determined background values for the Great Miami Aquifer, while PRRS compared PRRS data to PRRS-determined background values for the Great Miami Aquifer.

Action: No action required.

434. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.1.1.3 Pg.#: 5-5 Line#: 6-9 Code: C
Original Comment#: 142

Comment: What is the basis for stating that "Seventy years is also a reasonable time frame for continual government control" of the FEMP environment?

Response: Based on preliminary estimations, completion of a minimum Great Miami Aquifer groundwater remedial action (i.e., continuous operation of the South Plume recovery well system as a containment or a passive cleanup system) may take about 70 years; therefore, some forms of continual government control of the FEMP need to be maintained for the duration. Any assumption of longer periods of government control can lead to predictions of lower future impacts to off-site receptors (especially from the surface water pathway) and are not as conservative for Operable Unit 5 RI. A formal estimation of the required period of continual government control will be determined in the Operable Unit 5 FS based on the preferred remedial alternative and future land use objective selected.

Action: No action in the RI Report.

435. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.1.2.3 Pg.#: 5-8 Line#: 20 Code: C
Original Comment#: 143

Comment: Remove "through the vadose zone" or clarify. The perched groundwater migrates downward to the Great Miami Aquifer through the saturated zone of the glacial overburden and through the vadose zone of the underlying Great Miami Aquifer.

Response: The entire glacial overburden and the unsaturated zone of the Great Miami Aquifer are called the "vadose zone" in the Operable Unit 5 fate and transport modeling. However, to avoid possible misinterpretations the text will be revised to remove "through the vadose zone" as recommended.

Action: The text will be revised to remove "through the vadose zone."

436. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.1.2.3 Pg.#: 5-8 Line#: 15-29 Code: C
Original Comment#: 144

Comment: *Groundwater Migration pathways*
Generally the pathways identified are accurate and complete. These should also include the lateral migration pathway from the perched groundwater directly to Paddy's Creek (line 20).

Response: Agree. The text will be revised to include the lateral migration pathway from perched groundwater to surface water bodies (i.e., drainage ditch and Paddys Run) which was modeled in the Operable Unit 5 RI as described in Section 5.3.3.2.

Action: The text will be revised to include lateral migration pathway from the perched groundwater to surface water bodies. The following bullet will be added under the Groundwater transport heading on page 5-8:

- Lateral flow of perched groundwater to surface water bodies (i.e., drainage ditches and Paddys Run

437. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table 5-9 Line#: Code: C
Original Comment#: 146
Comment: What is the basis for assigning an F_{oc} value of 0.01 for each source area?
Response: The F_{oc} values presented in table 5-9 were based on information given in the soil surveys of Hamilton and Butler counties in Ohio (USDA 1982, 1980). The soil surveys report the percent organic matter in the soils that covers the site. The percent organic matter was then converted to F_{oc} based on the relationship that the percent of organic matter is approximately 1.9 times the F_{oc} value (Maidment 1993). The F_{oc} values for the surface soil in each of the source areas were all calculated to be approximately one percent so this value was assumed for all of the source areas. The determination of the F_{oc} values is discussed in section F.2.3.2, page F.2-27 in Appendix F.
Actions: The F_{oc} column in Table 5-9 will be referenced to the discussion in Section F.2.3.2 in Appendix F.

438. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5 Pg.#: Table 5-12 Line#: Code: C
Original Comment#: 147
Comment: It would be helpful to report half-lives for organics in days, rather than a decay constant in 1/day.
Response: Agree. Half-lives in days for organics will be added to Table 5-12.
Action: Half-lives in days for organics will be added to Table 5-12.

439. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Fig 5-11 Line#: Code: C
Original Comment#: 149
Comment: Which of the leachate source concentrations (Table 5-10 and 5-11) were calculated using the 70-year rule?
Response: According to Figure 5-11, the 70-year rule is to be used only when no other information is available for estimating leachate concentrations. All the contaminants listed in Tables 5-10 and 5-11 have literature values for K_l or K_d available. Therefore, none of the leachate source concentrations for these contaminants were estimated by using the 70-year rule.
Action: No action.

440. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 5.2.1.4 Pg.#: 5-20 Line#: 28 Code: C
Original Comment#: 150
Comment: Define what is meant by +2D and+8D.
Response: The symbols +2D and +8D indicate that two or eight daughter products in a radioactive decay chain are included as a group in the discussion and are represented by the parent radionuclide of each decay chain.
Action: No action.

441. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.2.3.1 Pg.#: 5-26 Line#: 7 Code: C

Original Comment#: 151

Comment: *Application of K_l*: The discussion and justification for the use of K_l is not clearly presented. While the use of field measurements support the quantification of K_l which is less than the best estimate of K_d, this does not necessarily ensure that the approach is "very conservative" (line 11).

Response: The K_l is higher than K_d by definition (as explained in Attachment F.3.I) and also supported by field and laboratory measurements. When K_l is not available, use of the lower K_d values in determining contaminant source leachate concentrations lead to higher, and therefore conservative concentrations.

Action: Additional clarification will be given on the difference between K_l and K_d, and discussion will focus on the K_l range being derived from differences in the solubility of uranium solids while K_d range is a function of adsorption versus desorption. The following text will be inserted in Line 12 on Page 5-26:

The solid phase concentrations used in the definition and calculation of K_l include both particulate and adsorbed forms of contaminants while only the adsorbed forms of contaminants are considered in the K_d definition and calculation.

442. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.2.3.3 Pg.#: 5-29 Line#: Code: C
Original Comment#: 153

Comment: The discussion presented here is nearly identical to OU2 RI. In fact many of the numbers from Table 5-2 in OU2 match with OU5, but not all (see the screening levels for vanadium 2.0 vs 2.6). It is good to see consistency between the various OU's, but subtle differences are observable. The unintentioned representation of K_l/K_d ratios on Table 5-12 and Figure 5-20 should be revised and clarified.

Response: The screening levels will be checked for correctness and consistency. The symbol "K_l/K_d" stands for K_l or K_d and not the ratio between K_l and K_d. To avoid misinterpretation "K_l/K_d" will be revised to "K_l or K_d".

Action: The screening levels will be checked for correctness and consistency. To avoid misinterpretation "K_l/K_d" in Table 5-12 and Figure 5-20 will be revised to "K_l or K_d".

443. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.4.2.4 Pg.#: 5-66 Line#: 7-8 Code: C
Original Comment#: 156

Comment: Please clarify whether or not the "estimated mass of uranium within the plume of significant concentration in the Great Miami Aquifer" includes adsorbed mass?

Response: The estimate of mass within the plume of significant concentrations of uranium includes both dissolved and adsorbed phases.

Action: The text will be changed to clarify this that the estimated included both adsorbed and dissolved phases of the uranium.
The first sentence of the first full paragraph on page 5-66 will be revised to state: Based on sampling results, the estimated mass of uranium within the plume of significant concentration (in both adsorbed and dissolved phases) in the Great Miami Aquifer was estimated to be 5100 kg (Table 5-20).

444. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.4.2.5 Pg.#: 5-69 Line#: 24 Code: C
Original Comment#: 157

Comment: Suggest replacing "Under the possible range of values" with "Under the input range of values" because the possible range is much larger. The sensitivity analysis was limited.

Response: Agree. The range of input values do not encompass all possible values; however they do

encompass the range of likely input parameters.

Action: The text will be revised to clarify this point. Under the possible range of values, will be replaced with Under the range of likely input values....

445. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.4.3.2 Pg.#: 5-71 Line#: 17 Code: C
Original Comment#: 158
Comment: It should be noted in the text that the plume is predicted to migrate beyond the extent of the transport model. This results in numerical model boundary errors on the transport calculations. In this model application, the flow boundary conditions are prescribed heads. The numerical model allows the concentration boundary conditions to become passive sink terms as a reasonable approximation in modeling a truncated system.
Response: Agree. The recommended text will be included in Section 5.4.3.2.
Action: The following text will be added to the end of Section 5.4.3.2: The contaminant plume is predicted to migrate beyond the extent of the transport model. This results in numerical model boundary errors on the transport calculations. In this model application, the flow boundary conditions are prescribed heads. The numerical model allows the concentration boundary conditions to become passive sink terms as a reasonable approximation in modeling a truncated system.

446. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.4.3.6 Pg.#: 5-76 to 5-77 Line#: Code: C
Original Comment#: 159
Comment: The retardation assumed for the Great Miami Aquifer should be noted in the text as R=12. This would help facilitate review of this report relative to previous reports and provide a better physical understanding of the retardation effects.
Response: Agree. The geochemical parameters (e.g., retardation factor) for uranium in the Great Miami Aquifer model will be noted in the beginning of the discussion of uncertainty/sensitivity analysis for the uranium K_l and K_d values in the contaminant sources and glacial overburden.
Action: The geochemical parameters (e.g., retardation factor) for uranium in the Great Miami Aquifer model will be noted in the beginning of the discussion of uncertainty/sensitivity analysis for the uranium K_l and K_d values in the contaminant sources and glacial overburden. The following text will inserted in line 16 on page 5-76:

.. term. During this analysis the retardation factor for uranium in the Great Miami Aquifer was fixed at 12. As discussed ..

447. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 5.5.3 Pg.#: 5-81 Line#: 40 Code: C
Original Comment#: 160
Comment: Replace "which vary with the thickness" with: which vary with the assumed K_d value and thickness."
Response: Agree.
Action: Replace "which vary with the thickness" to "which vary with the assumed K_d value and thickness".

448. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Fig 5-28-32 Line#: Code: C
Original Comment#: 161
Comment: Only the upper model layer results are presented for a few selected cases. There is no graphical representation of the lower horizons or vertical sections. This can potentially lead

one to incorrectly believe that the contaminants are uniformly mixed throughout the aquifer. At a minimum, the figures should be more clearly labeled to indicate that these predictions represent only the topmost model layer and that there is significantly less contaminant concentration in the lower zones.

Response: Agree. Figures 5-28 to 5-32 will be labeled to indicate that the figures represent only the topmost model layer. It will be stated in Section 5.5.3 that in general there is significantly less contaminant concentration in the lower zones.

Action: Figures 5-28 to 5-32 will be labeled to indicate that the figures represent only the topmost model layer. In addition the following text will be added in Section 5.5.3 after the first sentence of line 7 on page 5-81:

Figures F-28 through F-32 present the modeled total uranium plume in the Great Miami Aquifer at various time points. The figures and text below refer to the total uranium concentrations in the top layer of the SWIFT model and the upper portion of the aquifer. Generally, the concentration of contaminants in the lower model zones and the lower portion of the aquifer is significantly less than the top layer.

449. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Line#: Code: M
Original Comment#: 162

Comment: The Operable Unit 5 Baseline Risk Assessment was reviewed and certain calculations were done to attempt to replicate risk estimates presented in the document. From this review, several exposure calculations could not be replicated as noted in the following comments. In addition, several errors were found regarding the toxicity criteria used in the report. These toxicity errors will have a significant impact on the results of the risk assessment for certain exposure pathways. Also, several questionable exposure parameters (e.g., certain fraction ingested [FI] assumptions) were used to estimate exposure. More appropriate exposure parameters for certain pathways may result in risk estimates 2 to 8 times higher than those presented in the report.

Response: This is a summary of major comments provided by the reviewer for Appendix A. Please see all the responses prepared for Appendix A comments. In summary, the QA check of the risk estimates conducted to date indicates that intake calculations were performed correctly. (We will advise if any errors are identified in the QA check.) All toxicity criteria will be checked and updated, as necessary, based on information available September 15, 1994. The exposure dose assumptions are reasonable for Operable Unit 5 and generally in line with exposure assumptions used by other operable units. Risk estimates for predominant COCs (risk drivers) have not been underestimated.

Action: See responses to Appendix A comments.

450. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Line#: Code: M
Original Comment#: 163

Comment: As described above, several errors regarding exposure calculations and toxicity criteria were found in the detailed baseline risk assessment report (Volume 2) which directly impact the results and conclusions presented in Chapters 6 and 7 of the RI. Thus, substantive comments presented for Volume 2 also apply to Chapters 6 and 7 (Volume 1) and will not be repeated below. Only editorial and minor comments unique to Chapters 6 and 7 are presented below.

Response: See response to preceding comment, No. 449.

Action: None.

451. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 6 Pg.#: 6-18 Line#: 25 Code: C

Original Comment#: 169

Comment: Provide justification in the text as to why the carcinogenic risk to the agricultural user of the Great Miami River is lower than to both the recreational and household users. This doesn't seem possible.

Response: The risk results are a function of the pathways considered for each receptor. The agricultural user is exposed by the typical food uptake pathways only.

Action: The text will be modified to clearly identify pathways contributing to risk. Specifically, the food uptake pathways are the only pathways considered for the agricultural user (i.e., ingestion of meat, ingestion of milk, ingestion of vegetables and fruits -- it was assumed that fruits, vegetables, and forage/grains were irrigated using surface waters of the Great Miami River). The household user is exposed assuming he/she is using the Great Miami River as a domestic water supply (i.e., exposure occurs via the ingestion of water, inhalation of VOCs, and dermal contact while bathing pathways). The recreational user is exposed via the incidental ingestion while swimming, dermal contact while swimming, and ingestion of fish pathways.

452. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 6 Pg.#: 6-21 Line#: 30 Code: C
Original Comment#: 170

Comment: What exactly is "institutional and community memory"?

Response: The author is referring to the fact that the local government and community are well aware of the Fernald facility and associated environmental problems. While this fact is not a consideration in the determination of the need for clean-up, it is significant because informed officials and an informed public are less likely to support (referring to a government official) or pursue (referring to the public) activities that would result in exposure to the environmental contamination associated with the FEMP.

Action: The information and narrative presented in the response will be incorporated into the text.

453. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Table 6-3 Line#: Code: C
Original Comment#: 171

Comment: The Total Risks and Total HIs for Off-Property Child for both the eastern and western fencelines are reported incorrectly in this table. They should appear as follows:

Eastern Fenceline: Total Risk = 4E-04;
Total HI = 8.3E+02
Western Fenceline: Total Risk = 7E-05;
Total HI = 4.3E+01

Response: Agree that the subject numbers are reported incorrectly in Table 6-3.

Action: The table will be revised to reflect the correct numbers.

454. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Table 6-4 Line#: Code: C
Original Comment#: 172

Comment: See above comment. Totals should be as follows:

Eastern Fenceline: Total Risk = 1E-03;
Total HI = 9.7E+02
Western Fenceline: Total Risk = 7E-05;
Total HI = 4.5E+01

Response: Agree that the subject numbers are reported incorrectly in Table 6-4.

Action: The table will be revised to reflect the correct numbers.

455. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 7.3.2 Pg.#: 7-12 Line#: 19 Code: C
Original Comment#: 176
Comment: Note that, during summer months, perched groundwater also flows laterally toward the drainages, but will discharge to the Great Miami Aquifer below the creek (or ditch) base level.
Response: Agree that the sentence is misleading.
Action: Delete the last sentence of the paragraph (lines 19-20, page 7-12, Section 7.3.2), and replace with: "During periods of high evapotranspiration, significant soil moisture is lost to the atmosphere and lateral and vertical hydraulic gradients are affected. The summer drop in water levels reduces the vertical hydraulic gradient and results in reduced discharge of groundwater along stream banks and incised channel."

456. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 7.3.3 Pg.#: 7-14 Line#: 22 Code: C
Original Comment#: 177
Comment: Six inches per year of recharge under the FEMP should not be characterized as minor. This sentence should be edited.
Response: Disagree. A recharge value of six inches per year corresponds to only 14.7 percent of the annual rainfall (6 in/yr vs 40.86 in/year, see Section 7.3.2).
Action: No action required.

457. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 7.3.6 Pg.#: 7-20 Line#: 1 Code: C
Original Comment#: 178
Comment: Identify the assumptions inherent in calculated vertical seepage velocities.
Response: The intent of Section 7 is to present a summary and conclusion of the RI report. The goal of Section 7 is to repeat the salient material from earlier sections. To repeat all assumptions used to calculate the vertical seepage velocities would be inappropriate, because it would mean providing a greater level of detail for one subject than is provided for other summary material in Section 7.
Action: No action required.

458. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 7.5.2 Pg.#: 7-43 Line#: 4 Code: C
Original Comment#: 179
Comment: Regarding "No credit was taken"; suggest alternative wording to provide more specific meaning and explanation of rationale.
Response: Agree.
Action: Revise the sentence to read "It is assumed that there is no contaminant attenuation in this weathered zone."

459. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 7 Pg.#: Table 7-10 Line#: Code: C
Original Comment#: 181
Comment: In the section "Surface Soil - Lateral Extent of Contamination", why does DOE draw the conclusion that the "data limitation presents a potential for overestimating risk"?
Response: The calculation of the representative concentration for purposes of risk assessment err on the side of safety. This is particularly true when the data distribution is undefined or undetermined as often occurs when there is an anomalously high detection. In this case, the representative concentration is the 95 percentile value or the maximum value. Thus the risk assessment will err on the high side or "overestimate" the risk as is stated in the text.

Action: No action required.

460. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 7 Pg.#: Table 7-10 Line#: Code: C
Original Comment#: 182
Comment: In the section, "Perched Groundwater - Vertical Extent of Contamination" differentiate between the two sets of perched groundwater data.
Response: Agree.
Action: Add the following text after the first paragraph of the data limitations: "The site investigations operated in most cases with a rule to stop drilling at the bottom of the first encountered water-bearing zone or 20 feet, whichever came first. As a consequence, most data at the FEMP was collected between 0 and 20 feet, and little data was collected between 20 feet and the base of the glacial overburden.

461. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: 7 Pg.#: Table 7-11 Line#: Code: C
Original Comment#: 183
Comment: There are numerous COC's in this table that are listed twice and there is no differentiation between the two forms. These constituents include 1,1-dichloroethene, 1,2-dichloroethene, 4-methylphenol, arsenic, beryllium, chloroform, chromium, methylene chloride, pentachlorophenol and tetrachloroethene. There needs to be some explaination of the two different forms or justification for a double listing.
Response: Agree.
Action: Text and tables will be reviewed to correct typographical errors.

462. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Pg.#: A.1-10 Line#: 9 Code: C
Original Comment#: 185
Comment: Change "was **issued for review** by" to "was **prepared** by".
Response: Agree.
Action: The text will be modified as suggested.

463. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Pg.#: A.1-10 Line#: 15-25 Code: C
Original Comment#: 186
Comment: Include the numbers obtained by both FEMP and RAC for total releases and, if practical, specific contaminants. This will help to put the said percentages into perspective.
Response: Compare 1-12 to A.1-10
Action: None required except reference to page 1-12, lines 20-29 in Section 1. Add text to line 25, page A.1-10 as follows: "Numbers obtained by FEMP and RAC for airborne releases of uranium and thorium are presented in Section 1.0 of the RI Report. As the risk assessment is concerned with deposition and contaminant concentration in the media, estimated emissions data are not considered for Appendix A calculations."

464. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Pg.#: A.1-11 Line#: 30 Code: C
Original Comment#: 187
Comment: Include the 1993 NPDES status if this information is available.
Response: Table 15 of the 1993 FEMP Site Environmental Report indicates that compliance was attained for 99.79 percent of NPDES test requirements at Manhole 175. Two parameters were above requirements: pH and suspended solids. In addition, NPDES permit modifications occurred effective 20 May 1993. The significant changes include reduced pH monitoring and

suspension of cyanide, silver, and lead sampling at Manhole 175.

Action: Add the following to line 30 of page A.1-11: "However, during 1993 there were two violations of NPDES limits at Manhole 175. Two parameters were above requirements: pH and suspended solids. In addition, NPDES permit modifications occurred effective 20 May 1993. The significant changes for Manhole 175 include reduced pH monitoring and suspension of cyanide, silver, and lead sampling at Manhole 175."

465. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.2-6 Line#: 13 Code: M
Original Comment#: 188
Comment: The equation listed for calculating the 95th UCL for the normal distribution should take the square root of the quantity "n-1" not just "n". This error, if present in the formulas actually used, would have resulted in incorrect values for the EPCs and consequently the CDIs and risks may be incorrect.
Response: Disagree. The 95th UCL for the normal distribution was calculated correctly and in accordance with guidance presented in the USEPA document entitled "Supplemental Guidance to RAGS: Calculating the Concentration Term" (Publication 9285.7-081). Please see Attachment A.II.2.2. The formula presented in the EPA guidance and on page 2-6 for the UCL (normal) differs from that suggested by the reviewer.
Action: None.

466. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#:A.2-7 Line#: 15 Code: C
Original Comment#: 191
Comment: Table A.2-14 and Table A.2-15 are missing. There is no mention of a Table A.2-13 in the text.
Response: Tables A.2-14 and A.2-15 were inadvertently not included in the original submittal of the Operable Unit 5 Remedial Investigation report to OEPA. They were forwarded to all reviewers on August 3,1994. Table A.2-13 is referenced on page A.2-7, line #14.
Action: None.

467. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.2-9 Line#: 14 Code: C
Original Comment#: 192
Comment: Reference should be made in Section A.2.3 to where tabulated values for calculated relative risk factors can be found.
Response: Agree. The text will be modified as suggested by the reviewer.
Action: The text of Section 2.3 will state that: Calculated relative risk factors are found in Attachment A.III.

468. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.2-11 Line#: Table Code: C
Original Comment#: 194
Comment: The list of constituents identified as CPCs is inconsistent with the set of constituents identified in Tables A.2-1 and A.2-2 by a "X" in the last column. This discrepancy should be resolved.
Response: Agree.
Action: Tables A.2-1 and A.2-2 will be modified to include all CPCs identified in Section A.2.4.1. The following sentences have been added to Section A.2.4.1: Polychlorinated biphenyl compounds and dioxins were also selected as CPCs for human health risk assessment. PCBs (class B2 carcinogens) were detected more frequently than pesticides. These compounds are often found in industrial area soil as a result of accidents or spills involving transformers or

waste oils. Dioxins were selected as CPCs because the calculated toxicity benchmarks are extremely low.

469. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.2-16 Line#: 36 Code: C
Original Comment#: 195
Comment: The report indicated here that two constituents were retained because they were Class B2 carcinogens. This text is inconsistent with text on page A.2-8 (line 4) that indicated that chemicals were retained if they were Class B1 carcinogens. Which is correct?
Response: Both statements are correct. However, the reviewer is correct in that the text should be clarified. **ALL** class B1 carcinogens were selected as CPCs regardless of the frequency of detection or the results of the toxicity screens. Selected B2 carcinogens were selected as CPCs for groundwater and soil taking into consideration the frequency of detection and the results of the toxicity screens. A large number of organic carcinogens were detected in soil and groundwater. However, many of these organics were detected very infrequently or at low concentrations. Relative to groundwater and soil, few organic carcinogens were detected in the sediment samples collected at the FEMP. Thus, conservatively, all class B2 carcinogens were selected as CPCs for sediment.
Action: The text in Section A.2.4.4 will be modified to state that: Few organic carcinogens were detected in the sediment samples collected during remedial investigation. Thus, conservatively, all class B2 carcinogens were selected as CPCs for sediment.

470. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.2.-17 Line#: 2 Code: C
Original Comment#: 197
Comment: Here and at least two other places in Section A.2 reference is made to a toxicity-concentration ranking screen in Attachment III. Attachment III, however, omits the said ranking screen.
Response: The results of the toxicity-concentration ranking screen were inadvertently not included in the original submittal of the Operable Unit 5 Remedial Investigation report to OEPA. They were forwarded to all reviewers on August 3, 1994.
Action: None.

471. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: A Pg.#: Table A.2-1and A.2-2 Line#: Code: C
Original Comment#: 198
Comment: Throughout these tables, many of the eligible radionuclides have failed to be marked as COC's. There are many such eligible rads that have Maximum Detected Concentrations that are well above both the background and screening level values. Please modify the last column of the table to indicate the appropriate COC's.
Response: The tables do need to be edited. Metals and radiologicals were selected as CPCs based on a comparison to background as detailed in the tables presented in Attachment A.IV.
Action: The tables will be corrected and a footnote will be added to these tables indicating that metals and radiologicals were selected for each area of concern based on a comparison to background. Clarifying text will also be added to Section A.2.0. The following sentence will be added to Section A.2.4: (The results of the comparison to background [referring to naturally occurring radiologicals and metals] are presented in Attachment A.IV tables.)

472. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.3-35 Line#: 22-26 Code: C
Original Comment#: 203
Comment: It is not clear from the text how the area weighting was calculated. The area weighted EPC should be an area weighting of the 95th UCL on the arithmetic mean derived for each study

area, rather than an area weighting of the average concentration.

Response: Agree. The area weighting was calculated as suggested by the reviewer.

Action: The sentence beginning on line #22 will read: The future on-property receptors are evaluated using an area-weighted average concentration (i.e., an area weighting of the 95th UCL on the arithmetic mean for each study area) to represent exposure....."

473. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.3-63 Line#: 28-29 Code: M
Original Comment#: 210

Comment: The certain exposure parameters selected for the swimming scenario do not reflect RME assumptions, but rather central tendency parameters. 2.6 hr/day is the average time spent swimming in a given swimming day, while 7 days/year is the average number of days spent swimming. Therefore, higher exposure parameter values should be selected in order to be consistent with the RME scenario.

Response: Disagree. The EPA Dermal Exposure Assessment: Principles and Applications guidance (EPA/600/8-91-011B, page 8-7 and 8-8) reads as follows: "....Based on judgement, a reasonable average value for a recreational swimmer may be 5 days/year for 0.5 hours/event, 1 event/day and a reasonable upper value for a person who swims regularly for exercise or competition may be 150 days/year for 1 hour/event, 1 event/day". RAGS Part B suggests 7 days per year as a national average for swimming. Although the term average is used for these exposure parameters, neither guidance labels these values as central tendency values. In fact, central tendency values are not suggested or labeled as such by either guidance. Instead both guidance documents suggest that exposure values should be selected based on site-specific conditions. Given that the Great Miami River in the vicinity of the FEMP cannot be described as attractive for swimmers (including competitive swimmers), the exposure values selected for the Operable Unit 5 baseline are considered reasonably conservative and represent RME values (that is, it is very unlikely that risk would be underestimated using the suggested values).

Action: None.

474. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.3-20 Line#: Code: M
Original Comment#: 211

Comment: The FI value justification discussed in Footnote "g" is not consistent with the FI values presented in Table A.3-20. Thus, the FI values used to calculate exposure and risk may not be correct.

Response: Disagree. The FI justification discussed in Footnote "g" is not inconsistent with the FI values presented in Table A.3-20. However, the footnote should be clarified and the superscript to the FI in the table needs to be corrected. Footnote "g" states that it is assumed that the receptor is on property 4 of 16 waking hours. It is further assumed that the receptor will be exposed to surface soil and sediment for 3 and 1 hours, respectively. Thus, the FI for sediment should be: 1/16 or 0.06. The FI for soil should be: 3/16 or 0.19.

Action: Footnote "g" will be appended to state: It is assumed that the receptor is exposed to soil and sediment 3 hours and 1 hour, respectively.
The FI superscripts in Table A.3-20 will be corrected to note 0.19 for soil and 0.06 for sediment.

475. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.3-20, 3-21b Line#: Code: M
Original Comment#: 212

Comment: The soil FI values of 0.06 and 0.019 in these tables are based on the erroneous assumption that an individual would ingest on average the same quantity of soil during "exploring activities" than during other activities throughout the day while awake. Intuitively it is clear

that a child would ingest more soil while playing and exploring outdoors than while watching TV, sitting in a classroom, reading, eating, etc. Although, a child would likely ingest soil and/or dust in areas other than the site, it is not logical to apply a 16-hour time weighting factor to the exposure time. In addition, the logic put forth for the soil ingestion scenarios is inconsistent with the FI values of 1.0 used for other pathways. A more reasonable assumption for the soil scenarios may be to use an FI value of 0.5.

Response: Disagree. The hours of exposure and the FI values for the Operable Unit 5 trespass scenario are those used in risk assessments submitted for preceding FEMP operable units. These exposure assumptions are the product of numerous discussions (between DOE and the regulators [numerous discussions and meetings have occurred with Ms. Pat Van Leeuwen regarding the exposure parameters]) and comment response documents generated for FEMP risk assessments. For purposes of consistency, if nothing else, the exposure assumptions for this scenario should not change for Operable Unit 5. Also, given that the scenario is a trespass scenario, exposure, in reality, will be very limited. Finally, and most importantly, the trespassing/exploring scenarios assume that the receptor is exposed to on-property contamination 52 days per year. (This assumption is in line with Region V guidance.) While one may argue with how conservative the ET and the FI should be, the EF assumption (52 days/year) is very conservative and ensures that risks estimates will not be underestimated.

Action: None.

476. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-5 Line#: 26 Code: C
Original Comment # 214
Comment: "g/pCi$_{-y}$" should be "g/yr-pCi".
Response: Agree.
Action: Modify text as suggested.

477. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-8 Line#: 3-4 Code: C
Original Comment #
Comment: Change "using the inhalation RfD" to "using the inhalation rate."
Response: Agree.
Action: Modify text as suggested.

478. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-14 Line#: Table A.4-3 Code: M
Original Comment # 216
Comment: RfDi for 1,2-dichloroethane reported as "NA" should be 2.9E-03. (Source: EPA-ECAO)
Response: The RfD and CSF information found in Table A.4-3 was based on IRIS, HEAST, and ECAO databases available to EPA contractors working on the FEMP project in late April/early May 1994. (The values in the current version of Table A.4-3 will be checked.) Given that toxicity values are subject to change, these data sources will be consulted again on September 15, 1994 and Table A.4-3 updated accordingly. Please note that this chemical is not a predominant contaminant at the FEMP.
Action: Toxicity values will be checked and updated based on information available as of September 15, 1994. The draft final version of the Operable Unit 5 baseline risk assessment will reflect toxicity criteria available as of September 15, 1994.

479. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-15 Line#: Table A.4-3 Code: M
Original Comment # 217

Comment: RfDo and RfDi reported as "NA" for *cis*-1,3-dichloropropene should be 3.0E-04 and 5.7E-03, respectively according to IRIS.
Response: See response to preceding comment (RfDi comment for 1,2-dichloroethane.
Action: See action for preceding comment (478).

480. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-15 Line#: Table A.4-3 Code: M
Original Comment # 218
Comment: RfDo for 2-chloro-1,3-butadiene is reported as "NA" should be 2.0E-02. (Source: HEAST 1994)
Response: See response to comment 478.
Action: See action for comment 478.

481. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-15 Line#: Table A.4-3 Code: M
Original Comment # 219
Comment: RfDo for acrolein is reported as "NA" should be 2.0E-02. (Source: HEAST 1994)
Response: See response to comment 478.
Action: See action for comment 478.

482. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-16 Line#: Table A.4-3 Code: M
Original Comment # 220
Comment: RfDi for benzene is reported as "NA" should be 1.4E-04. (Source: EPA-ECAO)
Response: See response to comment 478.
Action: See action for comment 478.

483. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-16 Line#: Table A.4-3 Code: M
Original Comment # 221
Comment: RfDi for carbon tetrachloride is reported as "NA" should be 5.7E-04. (Source: EPA-ECAO)
Response: See response to comment 478.
Action: See action for comment 478.

484. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-16 Line#: Table A.4-3 Code: M
Original Comment # 222
Comment: RfDo for chloroethane is reported as "NA" should be 2.0E-02. (Source: EPA-ECAO)
Response: See response to comment 478.
Action: Please action for comment 478.

485. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-17 Line#: Table A.4-3 Code: M
Original Comment # 223
Comment: RfDo for methacrylonitrile is reported as "NA" should be 1.0E-04. (Source: IRIS)
Response: See response to comment 478.
Action: See action for comment 478.

486. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-17 Line#: Table A.4-3 Code: M
Original Comment # 224
Comment: CPSo for styrene is reported as "3.0E-02" should be NA.

Response: See response to comment 478.
Action: See action for comment 478.

487. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-17 Line#: Table A.4-3 Code: M
Original Comment # 225
Comment: CPSi for tetrachloroethene is reported as "NA" should be 2.03E-03. (Source: EPA-ECAO)
Response: See response to comment 478.
Action: See action for comment 478.

488. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-20 Line#: Table A.4-3 Code: M
Original Comment # 226
Comment: RfD_i for 2-nitroaniline is reported as "6.0E-05" should be 5.7E-05. (Source: HEAST 1994)
Response: See response to comment 478.
Action: See action for comment 478.

489. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-20 Line#: Table A.4-3 Code: M
Original Comment # 227
Comment: RfDo for 4-methylphenol is reported as "5.0E-02" which is the value for subchronic. It should be 5.0E-03, the value listed in HEAST for chronic exposure (under p-Cresol).
Response: See response to comment 478.
Action: See action for comment 478.

490. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-21 Line#: Table A.4-3 Code: M
Original Comment # 228
Comment: CPSi for aramite is reported as "2.5E-01" should be 2.5E-02 (Source: HEAST, IRIS).
Response: See response to comment 478.
Action: See action for comment 478.

491. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-22 Line#: Table A.4-3 Code: M
Original Comment # 229
Comment: CPSo and CPSi for chlorobenzilate are reported as "NA" should both be 2.7E-01. (Source: HEAST)
Response: See response to comment 478.
Action: See action for comment 478.

492. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-23 Line#: Table A.4-3 Code: M
Original Comment # 230
Comment: RfDo for hexachlorobutadiene is reported as "NA" should be 2.0E-04. (Source: HEAST 1994)
Response: See response to comment 478.
Action: See action for comment 478.

493. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-23 Line#: Table A.4-3 Code: M
Original Comment # 231
Comment: CPSo for Kepone is reported as "NA" should be 1.8E+01. (Source: EPA-ECAO)

Response: See response to comment 478.
Action: See action for comment 478.

494. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-25 Line#: Table A.4-3 Code: M
Original Comment # 232
Comment: CPSo reported for bis(2-chloroethyl)ether as "NA" should be 1.1E+00. (Source: IRIS).
Response: See response to comment 478.
Action: See action for comment 478.

495. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-25 Line#: Table A.4-3 Code: M
Original Comment # 233
Comment: RfDo for bis(2-chloroisopropyl)ether is reported as "NA" should be 4.0E-02. (Source: IRIS)
Response: See response to comment 478.
Action: See action for comment 478.

496. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-28 Line#: Table A.4-3 Code: M
Original Comment # 234
Comment: CPSo for gamma-BHC (hexachlorocyclohexane, gamma- [lindane]) is reported as "NA" should be 1.3E+00. (Source: HEAST 1994)
Response: See response to comment 478.
Action: See action for comment 478.

497. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A-V-95 Line#: 17 Code: C
Original Comment # 235
Comment: The toxicity profile for uranium states that "EPA presented a verified RfD of 0.003 mg/kg/day for chronic oral exposure to uranium.", however, there is no entry in Table A.4-3 for uranium. This discrepancy should be addressed.
Response: Agree.
Action: An entry for uranium will be added to Table A.4-3.

498. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-29 Line#: Table A.4-3 Code: C
Original Comment # 236
Comment: Entry in Table for hexavalent chromium neglects to mention that the kidney is the target organ (page A-V-22).
Response: Agree.
Action: The text will be modified as suggested.

499. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.4-29 Line#: Table A.4-3 Code: C
Original Comment # 237
Comment: This table does not list an RfD for $Uranium_{total}$, although the correct RfD appears to have been used for the calculations. Please include it in this table.
Response: Agree.
Action: An entry for uranium will be added to Table A.4-3.

500. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A-V-23 Line#: 7 Code: C

Original Comment # 238
Comment: Regarding the inhalation risk of chromium, the value of RfDi reported as **41** per mg/kg/day should be **42** per mg/kg/day based on the calculation and the value reported in Table A.4-3.
Response: Agree.
Action: The text on line 7 will note a cancer slope factor of 42 per mg/kg/day.

501. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.40 Line#: Code: C
Original Comment # 239
Comment: The toxicity assessment section did not contain a discussion for bis(2-Chloroisopropyl)ether and several other constituents of potential concern for Operable Unit 5. A discussion should be prepared for these compounds.
Response: Attachment A.V will be reviewed and missing toxicity profiles will be added for any parameter selected as a COC. However, toxicity profiles will not be added for parameters not selected as COCs.
Action: Add any missing toxicity profiles.

502. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.5-9 Line#: 11 Code: C
Original Comment # 242
Comment: Insert the following phrase before the sentence beginning on this line: **Although the total HIs for all areas exceed unity for this receptor,** [then continue with the sentence] the HIs developed for these metals,...
Response: Agree. Good comment.
Action: The text will be modified as suggested.

503. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.5-19 Line#: 7 Code: MA
Original Comment # 244
Comment: 4-Methylphenol, based on the toxicity information presented in Section A.4 and current IRIS and HEAST values, is classified as a weight-of-evidence class C carcinogen. However, EPA has not assigned this compound a slope factor. In several cases throughout the risk calculations and in the text of this report, a very high slope factor was used for this compound. This will be highlighted in further comments, but a systematic check of the text and calculations is necessary to insure that risk is not being overestimated by quantitatively evaluating risk for this chemical.
Response: Agree.
Action: Risk estimates for 4-methylphenol will be corrected.

504. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.5-25 Line#: 25 Code: M
Original Comment # 245
Comment: See previous comment on 4-methylphenol.
Response: See response to comment 503.
Action: See action for comment 503.

505. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.5-5 Line#: Code: C
Original Comment # 246
Comment: The risks presented in this table for the "with access controls" scenario do not appear to be presented in Attachments VI or VII. The calculation results presented in the attachments only correspond to those listed in this table for the "without access controls" scenario. The

groundwater exposure routes need to have both scenarios presented.

Response: Disagree. The risks for the "with-access-controls" scenario do appear in Attachments VI and VII. See the footnote at the bottom of Table A.5-5: "With access controls assumes off-property use of bottled water for ingestion only. Without access controls assumes full unrestricted use of groundwater." Thus, the risks presented for the "without-access-controls scenario" minus the ingestion of groundwater pathway become the risks for the "with-access controls scenario."

Action: None.

506. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.5-6 Line#: Code: C
Original Comment # 247
Comment: The comment directly above applies to this receptor as well.
Response: See response to preceding comment.
Action: None.

507. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Line#: Code: C
Original Comment # 248
Comment: Tables 6-1 through 6-7 are not referenced in the text. A discussion should be added regarding the uncertainties associated with the estimation of cancer risks and hazard indices reported in these tables.
Response: Tables 6-1 through 6-7 were misplaced in the original submittal of the report to the OEPA. They belong in Section 6 of the RI. Thus, no reference is needed in Section A.6. All of Section A.6 is a discussion of the uncertainties that should be considered when evaluating the cancer risk estimates in the baseline risk assessment. However, the attached master summary tables will be added to the report to summarize risk results and important uncertainties.
Action: Master summary tables will be added to the report to summarize risk results and important uncertainties

508. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.6-1 Line#: 18 Code: C
Original Comment # 249
Comment: The report should indicate that uncertainty is also caused by extrapolation from short-term to chronic exposures.
Response: The text will be modified as suggested.
Action: The following sentence will be added to page A.6-1, line #18: "Uncertainty is also caused, in some cases, by the use of chronic toxicity criteria (cancer slope factors, reference doses) which may be based on short-term animal exposure studies."

509. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: A.7-1 Line#: 8-10 Code: C
Original Comment # 250
Comment: The discussions contained in Sections A.7-3 and A.7-4 are reversed from the way they are presented in this introduction.
Response: Agree.
Action: Lines 8, 9, and 10 will read: Preliminary remediation goals based on risk are presented in A.7.3. Conclusions of the baseline risk assessment for Operable Unit 5 are presented in Section A.7.4.

510. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: 6 Pg.#: Line#: Code: M

Original Comment # 254

Comment: As previously discussed, several errors were made regarding the toxicity criteria used in the report. Updated toxicity criteria need to be incorporated into the risk calculations presented in the attachments. Also, certain slope factors used for radionuclide daughter compounds and certain organic compounds are different from those listed in the Toxicity Assessment section. Correction of the toxicity criteria in the report will have a significant impact on the estimated risks for certain pathways.

Response: See responses prepared for previous comments regarding toxicity criteria (478 ff).

Action: See actions specified for previous comments regarding toxicity criteria.

511. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Tables A.VI-9c & 10c and A.VII-9c & 10c Line#: Code: M
Original Comment # 255

Comment: Off-Property Farmer: Trichloroethene is listed in Section A.4.0 as having an oral RfD and should be evaluated for noncarcinogenic effects. TCE was specifically checked for this receptor and pathway for groundwater ingestion, but should be included for hazard quotient estimation in all pathways for which it is a COC - a systematic check should be performed.

Response: Agree. However, given that the carcinogenic properties of TCE are more significant in human health risk assessment, it is very unlikely that the noncarcinogenic risk analysis of TCE will result in a significant change in any risk assessment conclusion.

Action: The oral RfD for TCE will be used to calculate hazard quotients for TCE in the Operable Unit 5 environmental media.

512. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Tables A.VI-9 & 10 Line#: Code: M
Original Comment # 256

Comment: Off-Property Farmer: According to the exposure parameter tables (i.e., A.3-20 and A.3-21) the IR for this receptor and pathway should be 0.1 g/day for current land use and 0.18 g/day for future land use. Please check the consistency between these two land use scenarios. In the calculations, it appears that the 0.18 g/day value was used for both land use scenarios.

Response: The 0.18 g/day value presented in Table A.3-21 and discussed in Section A.3.4.6.5 is the correct value. It is used to evaluate the off-property farmer for both the current and future land-use scenario. Table A.3-20 will be corrected.

Action: The IR for the off-property farmer in Table A.3-20 will be corrected to read "0.18 g/day".

513. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.VII-23c Line#: Code: M
Original Comment # 257

Comment: Off-Property Farmer: A slope factor of approximately 4 was used to evaluate the risk associated with 4-methylphenol from ingestion of groundwater. As previously noted, a slope factor for 4-methylphenol is not available in IRIS or HEAST. Therefore, carcinogenic risks are overestimated in this case. The evaluation of carcinogenic effects associated with 4-methylphenol needs to be systematically checked throughout the report for all pathways.

Response: This is a repeat of previous comments regarding 4-methylphenol. We agree that there is no slope factor available for 4-methylphenol on IRIS or Heast. A CSF for 4-methylphenol is not listed in Table A.4-3.

Action: The risk results for 4-methylphenol will be corrected.

514. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.VII-12a Line#: Code: M
Original Comment # 258

Comment: Off-Property Child: The food RfD was used to calculate the hazard associated with ingestion

of cadmium in groundwater. The water oral RfD should be used and will approximately double the hazard estimate.

Response: The risk calculation spreadsheets will checked and modified, as necessary.

Action: Check risk calculation spreadsheets.

515. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Tables A.VI-1 & 2 Line#: Code: C
Original Comment # 259

Comment: Groundskeeper: Tabulate and reference the ABS used for all of the CPCs evaluated for this and associated pathways.

Response: Agree.

Action: A table listing ABS (absorption factor) for all exposure pathways will be added to Section A.3 of the RI Report.

516. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table 15 Line#: Code: M
Original Comment # 260

Comment: Groundskeeper: Several of the exposure intakes could not be replicated using the assumptions presented in the report (incidental ingestion of soil appeared to be correct). The calculations should be checked.

Response: This comment appears to refer to Table A.VI-15. The comment is somewhat general in that specific parameters and results are not mentioned. As requested, the calculations were checked for a couple of parameters and additional information has been added to Table A.3-21a specifying ET_{in} and ET_{out} for the direct radiation exposure scenario. Three example calculations were provided earlier. No errors have been identified thus far.

Action: Additional information specifying ET_{in} and ET_{out} for the direct radiation exposure scenario has been added to Table A.3-21a.

517. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Tables A.VI-5 & 6 Line#: Code: C
Original Comment # 261

Comment: Exploring Youth: As previously discussed, the FI used for the soil ingestion pathway for this and similar receptors should be 1 for the reasons previously given. Using the exposure parameters given in Section 3, the reviewer found all of the intakes for the soil ingestion pathway for this receptor to be off by a factor of approximately 3.2. Please double check the exposure calculations in this table.

Response: Regarding the FI values selected, please see response to previous reviewer comments on the FI. The reviewer indicates that ALL intakes in Table A.VI-5 and 6 are off by a factor of 3.2. As a double check, the intake value for U-238 in Table A.VI-5a was double checked as shown in Attachment A.3. The hand calculation confirms the intake value presented in Table A.VI-5a. The reviewer could not confirm this value because of an error in Table A.3-20. The FI for soil for this receptor should be 0.19. The FI for sediment for this receptor should be 0.06. (Note that the FI for soil is exactly 3.2 times the FI for sediment.)

Action: Correct Table A.3-20.

518. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table A.VI-6k Line#: Code: C
Original Comment # 262

Comment: Exploring Youth: Please recheck the K_{ow} for di-n-octylphthalate. The reviewer found the same value based on calculations. However, there may be other values in the literature that may be more appropriate. Because this is the only chemical for which a hazard was estimated for this pathway, it may deserve more attention. If no other value can be found, then the way

this anomaly is caveated in the text is appropriate.

Response: Agree. Good comment.

Action: The K_{ow} for di-n-octylphthalate was rechecked. No additional values were located.

519. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.1.3 Pg.#: B-13 Line#: 17-18 Code: C
Original Comment #: 263

Comment: Have all aspects of this removal action been completed, including remediation activities off-property? If not, the text should be clarified to reflect the current status of the removal action.

Response: Agree with commentor.

Action: The report will be modified to read as follows: "On-property excavations were completed in November 1993. A localized area of contamination was detected off-property adjacent to the incinerator. Excavation of the localized off-property contaminated soil was completed in January 1994. All excavated soil was containerized and transferred to the controlled area at the FEMP site for storage. Verification sampling, however, indicated the presence of additional off-property contamination. Excavation of this additional material was scheduled for July 1994."

520. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-6 Line#: 20-29 Code: C
Original Comment # 264

Comment: The theoretical basis for the conclusion that dividing the LC50 by 100 will result in a conservative estimate for the CAWQC is tenuous. There are currently no broadly mechanistic models available for extrapolation from acute to chronic exposures. A caveat should be added to the last sentence of this paragraph. This also affects page B-6 line 11.

Response: Comment noted. This section of the document discusses the derivation of chronic toxicity values from acute toxicity data. However, the document incorrectly suggests that chronic ambient water quality criteria (CAWQC) are being derived from acute data. Lines 7-30 will be revised so that it is clear that chronic values, rather than CAWQC are being derived from acute (LC50) data when necessary. The extrapolation from acute to chronic endpoint has been extensively researched in the field of aquatic toxicology and is commonly employed in ecological risk assessments. Kenega (1982) examined the acute/chronic ratios for multiple species exposed to 84 chemicals that included chlorinated hydrocarbons, pesticides, and miscellaneous inorganic and organic chemicals. Compilation of these data indicated that 86 percent of the chemicals have acute/chronic ratios of ≤ 100, regardless of which species was used to derive the ratio. Calabrese and Baldwin (1993) recommend that the LC50/50 be used if the intent is protection at the 95 percent level. Therefore, the use of LC50/100 represents an appropriate, conservative estimate of *chronic* toxicity (NOEC). No caveat need be added to this section.

Action: This portion of the document will be revised to indicate that LC50/100 was used, when necessary, to derive chronic toxicity endpoints.

521. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-6 Line#: 31 Code: C
Original Comment # 265

Comment: The report indicates that dividing the LOEC by 10 should give a conservative estimate of concentrations protective of sensitive aquatic species. The authors should note that there is considerable uncertainty associated with this method for approximating the NOEC. This uncertainty is compounded when the NOEC is then used to approximate the CAWQC because of an acute to chronic extrapolation. Such an extrapolation is only valid for contaminants having the same toxic endpoint at acute and chronic exposures.

Response: It is agreed that derivation of an NOEC from LOEC data generated as a result of a chronic toxicity test is associated with uncertainty; this uncertainty is in part a function of the relatively small chronic effect database. Although based on a smaller database than that used to establish acute/chronic ratios, the use of LOEC/10 to derive the NOEC is recommended by Calabrese and Baldwin (1993). Because the Site-wide Ecological Risk Assessment based all extrapolation of NOECs from LOECs obtained from chronic toxicity tests, the uncertainty associated with possible mechanistic differences between acute and chronic responses is minimized. LOEC/10 was intended to provide an estimate of the NOEC, not an estimate of the CAWQC.

Action: This section of the report will be modified to indicate that uncertainty is associated with deriving NOEC endpoints from LOEC values, that this uncertainty is reduced because the LOEC values were obtained from chronic toxicity tests, and that the use of the LOEC/10 was intended to provide an estimate of the NOEC, not CAWQC.

522. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.2.2.1 Pg.#: B-7 Line#: 16-19 Code: C
Original Comment #: 266

Comment: Some of these contaminants can result in considerable negative impacts on surface water. Such effects as eutrophication and salination should not be overlooked by screening these contaminants. The text should be revised to reflect these potential impacts.

Response: Agree with commentor.

Action: The text will be modified to indicate that while these materials are not generally regarded as toxic, their presence in elevated concentrations can affect water quality and alter the structure of aquatic biotic communities.

523. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-7 Line#: 18 Code: C
Original Comment # 267

Comment: The elements calcium, magnesium, phosphorus, potassium, sodium, and silicon were categorically eliminated from consideration as CPCs based on the fact that they are essential nutrients. While beneficial at low concentrations, these elements may potentially pose risk if present in sufficient concentrations. Magnesium compounds, for example, were used extensively in production activities at the site. Magnesium and the other essential elements were detected at levels significantly above background in soils. The risk assessment should screen these elements as CPCs in surface water. (This comment applies to several portions of the ecological risk assessment)

Response: Comment noted. It is acknowledged that these macronutrients are present in various locations in concentrations that are statistically significantly greater than background concentrations. However, it should be borne in mind that statistical comparisons that were made between background samples collected a 0-6" depth and surface soil samples collected from the various study areas at depths that ranged from 0-30". Examination of data compiled for this study indicates that there are distinct concentration gradients for these macronutrients (e.g., concentrations increase with depth). Therefore, finding statistical differences between samples collected from a depth of 30" is compared to background samples collected between 0-6" is not unexpected. It is also acknowledged that excessive concentrations of macronutrients can result in adverse impacts. For instance, plasmolysis may be observed in sensitive plants cultivated in irrigated areas where top soil concentrations of magnesium, calcium, and potassium concentrate as a result of rapid evaporation and low rain fall. However, in humid regions (> 26 inches of annual precipitation) such as southwestern Ohio, the downward movement of water leaches these soluble materials (Foth 1978). This leaching phenomenon accounts for the concentration gradients observed in the background soil study and limiting the likelihood that the presence of these macronutrients will adversely impact organisms

inhabiting the FEMP.

Action: Text will be added to Seciton B.2.2.1 noting that the presence of essential nutrients can affect water quality and alter the structure of aquatic biotic communities. In addition, text will be added to Section B.2.2.4 noting that a number of chemicals were detected in surface water, sediment, and soil samples in concentrations greater than concentrations reported for background samples but were eliminated from further consideration because they are generally regarded as nontoxic, macronutrients (e.g., calcium, potassium). Because benchmark toxicity values could not be identifed for these macronutrients, elimination of these chemicals present in concentrations greater than background values without considering their possible toxicity adds ucertainty to the ecological risk assessment.

524. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.2.2.1 Pg.#: B-9 Line#: 1-7 Code: C
Original Comment #: 269

Comment: DOE should not only look at Ohio EPA drinking water standards, but also evaluate USEPA's drinking water standards and select the lower of the two. No basis provided for the selection of Ohio standards over those of USEPA. A number of drinking water standards are lower under federal standards.

Response: Comment noted. Table B.III-2 compares a number of potential benchmark values to LOEC data for avian and mammalian drinking water exposures. Human Health Public Water Supply standards established by Ohio EPA are among these potential benchmarks. These criteria were compared to criteria established by the federal government; federal drinking water values established for antimony, beryllium, and cadmium were found to be lower than those established by OEPA. Use of these lower values would have resulted in deriving higher toxicity quotient values for cadmium and beryllium in several instances; toxicity quotient values calculated for antimony were unaffected. However, as indicated in Table B.III-2, the OEPA criterion for cadmium is substantially less than LOEC values identified for the metal. The OEPA criterion therefore already represents conservative criteria for terrestrial ecological receptors. Use of the even more conservative federal criteria for cadmium is unnecessary. No LOEC values could be identified for beryllium to determine if OEPA human health criteria were sufficiently conservative for these types of receptors. Therefore, drinking water tables will be modified to incorporate the more conservative federal criterion for this metal. Use of this criterion will result in the recalculation of the toxicity quotient values determined for beryllium in surface water samples collected from drainageways in the South Field area and the Great Miami River below its confluence with Paddys Run. MCLs will be reviewed and used to screen contaminants, including antimony, beryllium, and cadmium.

Action: The following text will be added to page B.2-9: ...identifying ecological drinking water CPCs, the most conservative human health criterion was selected as a drinking water benchmark (DWB).

525. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-9 Line#: 11-13 Code: C
Original Comment # 270

Comment: Lack of a criterion (i.e., CAWQC) for a constituent is insufficient evidence to conclude that a constituent poses negligible risk. The organic chemicals 2-hexanone and 4-methyl-2-pentanone should be screened as potential constituents of concern.

Response: Comment noted. These two contaminants were not eliminated because of the lack of regulatory criteria but as a result of their low toxicity when ingested and short environmental half-lives.

Action: This portion of the text will be revised so that it is clear that these two toxicants were eliminated as a result of their low toxicity when ingested, not because criteria have yet to be promulgated for these two contaminants.

526. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.2.2.1 Pg.#: B-9 Line#: 17-20 Code: C
Original Comment #: 271
Comment: Have any surface water or sediment samples been analyzed for asbestos? DOE should discuss the any existing data on this contaminant and its potential impacts on ecological receptors.
Response: Surface water and sediment samples collected for environmental sampling programs have not been analyzed for asbestos. However, extensive air monitoring for asbestos is conducted to support employee safety. Samples of FEMP's liquid effluent to the Great Miami River are analyzed on a routine basis to ensure that the effluent (which includes all controlled stormwater runoff from the former production area and the waste pit area) meets Clean Water Act standards for asbestos. These areas include the primary - if not all - sources of asbestos. Asbestos is not expected to be found outside these areas; therefore, it would seem very unlikely that it would have any impact on ecological receptors within the ecological risk study areas.
Action: No action necessary.

527. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-9 Line#: 22-23 Code: C
Original Comment # 272
Comment: The organic chemical 1,2-dichloromethane was indicated as a CPC based on concentrations measured above the benchmark value in the surface water of the pilot plant drainage ditch. 1,2-dichloromethane, however, is not listed here. The chemicals listed on this page do not match with those identified as CPCs in tables B.III-3 through B.III-5.
Response: Comment noted.
Action: Tables B.III-3 through B.III-5 will be reviewed and the text modified so that it is consistent with the information summarized on these tables.

528. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.2.1 Pg.#: B-9 Line#: 17 Code: C
Original Comment # 273
Comment: Table B.III-11 is missing. It is also referred to on page B-31 line 15.
Response: Agree with commentor. Tables B.III-11 should be identified as Table B.III-10.
Action: Table B.III.11 will be renumbered as Table B.III-10. All references in the text to Table B.III-11 will be changed to Table B.III.10.

529. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.2.2.3 Pg.#: B-13 Line#: 14-16 Code: C
Original Comment #: 274
Comment: The last line and previous line do not agree with regard to number of contaminants. Revise last line to state "four contaminants."
Response: Agree with commentor
Action: Revise line 15 to state "four contaminants."

530. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.3 Pg.#: B-14 Line#: 20-21 Code: C
Original Comment # 275
Comment: Cadmium should be listed as a contaminant present in concentrations exceeding the benchmark criterion based on page B-11 line 20.
Response: Agree with commentor.
Action: Cadmium will be added to the list of contaminants present in concentrations exceeding benchmark criteria.

531. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.3 Pg.#: B-14 Line#: 22-25 Code: C
Original Comment # 276
Comment: List of chemicals exceeding the surface water benchmarks is inconsistent with the list of CPCs for aquatic biota on pages B-7 and B-8 and as CPCs for terrestrial receptors on page B-9. For example, iron and silver are mentioned on page B-14 but not previously.
Response: Comment noted. This section of page B-14 will be modified so that the CPCs for both aquatic biota and terrestrial receptors discussed in the text are consistent with bulleted information.
Action: This section of the text will be modified to include the following CPCs for aquatic biota: aluminum, ammonia, barium, cadmium, cyanide, lead, manganese, mercury, bis(2-ethylhexyl) phthalate, di-n-ocytl phthalate, and uranium. The list of CPCs for terrestrial biota will be modified at follows: aluminum, cadmium, lead, mercury, bis(2-ethylhexyl) phthalate, di-n-ocytlphthalate, 1,2-dichloroethane, trichloroethylene, tetrachloroethylene, and uranium.

532. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.3 Pg.#: Line#: Code: C
Original Comment # 277
Comment: Some chemicals that were CPCs are missing discussions of their toxicological properties. These include selenium, chromium, 1,2-dichloroethylene, and tetrachloroethylene. A discussion of toxicological properties should be prepared for these chemicals.
Response: Comment noted. Chromium and selenium should not be included in the list of CPCs and a discussion of the toxicological properties of 1,2-dichlroethylene, trichloroethylene, and, tetrachloroethylene will be added to the text.
Action: The text will be revised to incorporate a discussion of the toxicological properties of 1,2-dichloroethylene, trichloroethylene, and tetrachloroethylene.

533. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.2.4.1 Pg.#: B-27 Line#: 31-33 Code: C
Original Comment #: 280
Comment: DOE should clarify what conclusion is being drawn from this statement. Surface water criterion are not based upon filtered samples thus exceedance of the criterion is no less significant when filtered data are considered. DOE should clarify this statement.
Response: Agree with commentor.
Action: This portion of the text will be modified so that it is clear that ambient water quality criteria are currently not based on filtered contaminant concentrations but are instead based only on total concentrations of the contaminant.

534. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-29 Line#: 2 Code: C
Original Comment # 281
Comment: The report should state the fact that aluminum was significantly above background in the Great Miami River at confluence with Paddys Run.
Response: Agree with commentor.
Action: The text will be modified to indicate that aluminum is significantly above background in the Great Miami River in sections of the river downstream of the FEMP's NPDES outfall line.

535. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-30 Line#: 23 Code: C
Original Comment # 282
Comment: Quotient value for mercury should be 3.0 based on Table B.III-3.
Response: Agree with commentor.

Action: The quotient for mercury will be changed to 3.0.

536. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-30 Line#: 26 Code: C
Original Comment # 283
Comment: Insufficient justification is provided for the decision to exclude uranium and aluminum from the list of chemicals that pose significant risk to homeothermic vertebrates. Concentrations of these constituents were above the benchmark values. Studies referred to in section 2-3 are primarily about exposure to uranium in soils rather than exposure to uranium in surface waters.
Response: Comment noted. Will also "tap" EPA databases again to see if they've recently updated information on uranium.
Action: To eliminate potential misinterpretation of this portion of the document, the text will be revised as follows: "Contaminants detected in surface water samples collected from Study Area A in concentrations exceeding DWB were aluminum, with a quotient of 2.67, mercury (quotient value of 3.0), and uranium with a quotient value of 1.04 (Table B.III-3). As discussed in Section B.2.2.1, drinking water criteria have yet to be developed to protect terrestrial ecological receptors. In a number of instances, criteria benchmark values developed for the protection of aquatic biota were used to preliminarily identify contaminants that may represent a risk to receptors ingesting surface water examined in this study. Such was the case for both aluminum and uranium. The concentrations of both of these metals exceeded the aquatic biota benchmark values. However, information summarized in Sections B.2.3.1 and B.2.3.16 indicate that neither metal is readily absorbed from the gastrointestinal tract and the small quantities absorbed are rapidly excreted. Venugopal and Luckey (1978) indicated that mammals possess a homeostatic mechanism for this metal and that for most terrestrial organisms, aluminum compounds are generally not harmful and are considered toxicologically inert. Studies performed (Mahon 1982) on movement of uranium through terrestrial foodchains reported that this heavy metal exhibited no sign of biomagnification. Venugopal and Luckey (1978) reported LD100s for soluble uranyl nitrate of 100 and 600 mg/kg for cats and dogs, respectively (see Section B.2.3.16). This information, coupled with the representative concentrations of aluminum and uranium reported for Study Area A (232 and 930 μg/L, respectively) indicate that these two heavy metals do not represent a risk to terrestrial ecological receptors."

537. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-31 Line#: 9 Code: C
Original Comment # 284
Comment: Aluminum is excluded as a source of significant risk to terrestrial receptors ingesting waters from the Area F drainage ditch based on the discussion in section B.2.3. The discussion of bioavailability of aluminum in surface waters, however, is qualitative and does not provide sufficient basis for excluding aluminum when it is present at concentrations two orders of magnitude above the benchmark value.
Response: Comment noted. See discussion above.
Action: The text will be modified to clarify the point that, although the concentrations measured in surface water samples collected from this study area exceeded benchmark values protective of aquatic biota, it is unlikely that these two heavy metals represent a risk to terrestrial receptors.

538. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-31 Line#: 29-31 Code: C
Original Comment # 287
Comment: Uranium is indicated to be present at concentrations over twice as high as the DWB in table B.III-7. It should be included in the list here of constituents present at concentrations greater

than the DWB. Uranium should be considered as a potential risk to terrestrial receptors ingesting water from off-site locations on Paddys Run.

Response: Agree with commentor. Uranium will be added to the list of contaminants present in concentrations that exceeded benchmark values. However, although these concentrations exceeded the benchmark values developed to be protective of aquatic biota, information summarized in Section B.2.3.16 suggests that this heavy metal is not biologically available and that exposure via this pathway does not represent a significant risk to terrestrial ecological receptors.

Action: The text will be modified to incorporate uranium in the list of contaminants present in concentrations greater than benchmark values.

539. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.1 Pg.#: B-32 Line#: 6 Code: E
Original Comment # 288
Comment: Change reference to table B.III-7 to table B,III-9.
Response: Agree with commentor.
Action: The reference to Table B.III-7 will be changed to Table B.III-9.

540. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: B-33 Line#: 28-32 Code: C
Original Comment # 291
Comment: List of soil organic contaminants exceeding benchmark criteria in the various study areas is inconsistent with table B.2-6.
Response: Agree with commentor.
Action: The list of soil organic contaminants exceeding benchmark criteria will be corrected so that it is consistent for the various study areas.

541. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.2.4.4. Pg.#: B-35 Line#: Code: C
Original Comment # 292
Comment: The uncertainty regarding the bioavailability of uranium should be explicitly mentioned.
Response: Comment noted.
Action: Text will be modified to indicate that uncertainty associated with the bioavailability of contaminants, including uranium, influences the risk characterization process.

542. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table B.2-1 Line#: general Code: C
Original Comment # 294
Comment: Include assumptions made about bioavailability of contaminants, e.g., that only the fraction of nonpolar organic compounds that is dissolved in sediment pore water is bioavailable.
Response: Agree with commentor
Action: Text will be modified to incorporate discussion of limited bioavailability of nonpolar organic compounds in water.

543. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: Table B.2-2 Line#: general Code: C
Original Comment # 295
Comment: Provide a reference for the document published by Long and Morgan that was used as a source for the ER-Ls.
Response: Agree with commentor.
Action: Text will be modified to indicate that ER-L values used in this assessment were obtained from Long and Morgan (1992).

544. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.3.1.2 Pg.#: B-3 Line#: 32-33 Code: C
Original Comment #: 296
Comment: DOE should provide additional information to support the conclusion that the depth of a pine tree tap root would not penetrate groundwater. Does this assumption exclude perched groundwater? DOE must provide additional information including assumed root penetration depth and groundwater depth.
Response: Comment noted. Pine tree tap roots are generally 6-8 feet deep. The remainder of the root mass is confined to the upper 1-2 feet and is composed of very fine rootlets. The depth of tap root penetration could theoretically place it in direct contact with perched water at the FEMP. However, a pine tree would not seek direct contact with perched water. Roots immersed for long periods of time in water become water logged and eventually die, killing the tree. This route of exposure is extremely unlikely, and was therefore not incorporated into the model.
Action: A brief synopsis regarding tap root penetration, groundwater depth, and the rationale for not incorporating this pathway into the model will be provided in this section of the text.

545. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Pg.#: B.4-9 Line#: 8-10 Code: C
Original Comment # 297
Comment: There is insufficient evidence that it is the land management practices at the FEMP versus the presence of contaminants in soils that is affecting the food availability and quality of diet for the American robins.
Response: Comment noted. The information contained in lines 8-10 represents the conclusions drawn by Osborne et al. (1992).
Action: The text will be modified so that it is clear that, based on the results of their final investigation, Osborne et al. (1992) concluded that current growth suppression in nestling American robins is related to land management practices on the FEMP.

546. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: B.4.2 Pg.#: B.4-10 Line#: 12-14 Code: M
Original Comment # 298
Comment: Added to the list of soil contaminants to which ecological receptors may be at risk should be thorium. No justification was provided in section B.2.4.2. for exclusion of this element.
Response: Disagree with commentor. See discussion in Section B.2.3.15
Action: Text will be modified to refer reader to Section B.2.3.15 for additional information.

547. ERROR

548. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.II-1 Pg.#: Line#: Code: C
Original Comment #: 300
Comment: Due to the limited number of available samples for consideration, DOE should use both filtered and unfiltered data. DOE should include silver as a CPC based upon the filtered sample concentration which exceeds the benchmark value.
Response: Comment noted. Disagree that silver should be included as a CPC based upon filtered sample concentrations. During the laboratory toxicity tests used to develop EPA water quality criteria for aquatic life, a portion of the metal being tested is in the dissolved form, while the rest is bound to particulate matter. Currently, both federal and OEPA ambient water quality criteria are based on the results of these tests and the concentration of metal is expressed as total recoverable metal. While EPA has developed methods of "translating" metals criteria based on total recoverable metal into criteria based on the dissolved form of the metal, these

translators are confined to a small number of metal ions. Comparing dissolved metals concentrations directly to criteria based on total recoverable metals results in an "apples to oranges" comparison; risks associated with the dissolved form of the metal cannot be appropriately interpreted.

Action: Text will be added in several sections of the report noting that due to the limited number of RI surface water samples, representative concentrations present in both filtered and unfiltered water samples were compared to benchmark values. However, as indicated in Section B.2.2.1, these benchmark values are expressed in terms of concentration of contaminant present in unfiltered samples. Comparing contaminant concentrations detected in filtered samples to benchmark values based on analyses of unfiltered water adds uncertainty to the interpretation of these results.

549. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.II-3 Pg.#: Line#: Code: C
Original Comment #: 301
Comment: This table relates to the Great Miami River. DOE should be using hardness data gathered from the GMR not from Paddys Run. DOE should obtain GMR hardness data and recalculate the BTVs.
Response: Comment noted. Hardness value for the Great Miami River were used to calculate these BTVs; no recalculation is necessary.
Action: Table B.II-3 will be modified so that it correctly indicates that hardness values for the Great Miami River were used to calculate BTVs, where appropriate.

550. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.II-4 Pg.#: Line#: Code: C
Original Comment #: 302
Comment: Due to the limited number of available samples for consideration, DOE should use both filtered and unfiltered data. DOE should include cadmium as a CPC based upon the filtered sample concentration which exceeds the benchmark value.
Response: Comment noted. Disagree that cadmium should be included as a CPC based upon filtered sample concentrations. See response to Comment 548.
Action: See action for Comment 548.

551. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.III-2 Pg.#: Line#: Code: C
Original Comment #: 303
Comment: As stated in a previous comment, DOE should incorporate USEPA drinking water standards. The USEPA standards for antimony, beryllium and cadmium are lower than those presented here.
Response: See response to Comment 524.
Action: See action for Comment 524.

552. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.III-3 Pg.#: Line#: Code: C
Original Comment #: 303
Comment: Revise based upon USEPA drinking water standards.
Response: See response to Comment 524.
Action: See action for Comment 524.

553. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Table B.III-4 Pg.#: Line#: Code: C
Original Comment #: 304

Comment: Due to the limited number of available samples for consideration, DOE should use both filtered and unfiltered data. DOE should include aluminum as a CPC based upon the filtered sample concentration which exceeds the benchmark value.

Response: Comment noted. Disagree that aluminum should be included as a CPC based upon filtered sample concentrations. See response to Comment 548.

Action: See action for Comment 548.

554. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: B.III-7 Pg.#: Line#: Code: C
Original Comment #: 305

Comment: Due to the limited number of available samples for consideration, DOE should use both filtered and unfiltered data. DOE should include antimony as a CPC based upon the filtered sample concentration which exceeds the benchmark value.

Response: Comment noted. Disagree that antimony should be included as a CPC based upon filtered sample concentrations. See response to Comment 548.

Action: See action for Comment 548.

555. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: F.3.I.2 Pg.#: 11 Line#: 14 Code: C
Original Comment #: 306

Comment: Please provide additional justification for stating that the likely form of release is U_3O_8. In the absence of more information the presence of some of the lower oxidation state oxides or mixed oxide-fluorides seems possible.

Response: The text below will be added to the original text.

Action: The likely form of airborne discharges from the five nonproduction burners and incinerators is U_3O_8 because these units functioned to oxidize the lower oxidation state uranium compounds. The oil burner and liquid waste incinerator processed hydrocarbons whose residue could have contained phosphorus in a uranium oxide matrix. Likewise, the old solid waste incinerator could have contained phosphorus plus metal oxides in a uranium oxide matrix. The graphite burner operated only on contaminated graphite and only yielded U_3O_8, as the carbon burned off. The new solid waste incinerator operated mostly on miscellaneous contaminated trash (paper, cardboard, wood, etc.,) that yielded only U_3O_8. Any lower oxidation state uranium compound would not remain after processing under incineration conditions of heat and air. It is possible that quantities of phosphorus or fluoride compounds would exist to some extent given that a wide variety of chemical processing took place, but the likely form of release is U_3O_8.

556. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: F.3.I.3 Pg.#: Line#: Code: C
Original Comment #: 307

Comment: Ohio EPA has some outstanding questions regarding the details of the EQ3/6 geochemical model. For this reason a small technical meeting is in the process of being scheduled. Ohio EPA does not anticipate any insurmountable problems , but believes it is necessary to resolve these questions prior to any approval of the RI.

Response: As requested by Ohio EPA in this comment, a technical meeting was held on September 21, 1994 between Ohio EPA and US DOE. Specific questions regarding the details of the EQ3/6 geochemical model were discussed. In general, all the specific questions have been addressed in the meeting. DOE will make referenced documents and reports related to geochemical issues listed in the RI available to Ohio EPA. Additional information regarding the fate and transport modeling approach and assumptions used in the Operable Unit 5 RI/FS were also presented by US DOE.

Action: No additional action.

557. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: F.3.II Pg.#: 9 Line#: 32 Code: C
Original Comment #: 314
Comment: Please provide a short justification for how the retardation factor corresponds to the Kd value.
Response: Retardation factor (R) is usually calculated by using K_d, soil bulk density (d), and soil moisture content (n) (or effective porosity when the soil is saturated) in the following equation: $R = 1 + K_d * d / n$.
Action: The relation between retardation factor and K_d value will be explained in the text. The following sentence will be added after line 33 on page F.3.II-9:

The relationship between R_d and K_d is described in Section F.3.II.1.1.3.

The following will be added to Section F.3.II.1.1.3 under the heading Retardation Factor (R_d):

Retardation factor (R_d) is usually calculated by using K_d, soil bulk density (d), and soil moisture content (n) (or effective porosity when the soil is saturated) in the following equation: $R_d = 1 + K_d (d / n)$.

558. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: F.3.II Pg.#: 10 Line#: 1-17 Code:
Original Comment #: 316
Comment: The relevance of calculating Kl values using TCLP methods is unclear. It doesn't seem that there is a simple correlation between the Kl's determined using TCLP and the Kl's determined using a leaching solution more closely approximating natural groundwater. It is possible that uranium species are more mobile in carbonate-containing groundwater than they are in the TCLP solution.
Response: It is possible that uranium could be more mobile in carbonate-containing groundwater. Predicted uranium solubilities in carbonate groundwater can be compared to TCLP data to qualitatively compare the two different sets of data. However, uranium K_l and K_d values used in Operable Unit 5 modeling were determined by batch tests and model calibrations. The TCLP results were presented as comparisons only and were not used directly to determine K_l and K_d values for modeling. In general, the K_l and K_d values for other contaminants used in the Operable Unit 5 fate and transport modeling are much lower than the values calculated from the TCLP data. This ensures that the Operable Unit 5 modeling results are very conservative.
Action: No action.

559. Commenting Organization: Ohio EPA Commentor: OFFO
Section#: F.3.II Pg.#: 12 Line#: 4,9,14 Code: C
Original Comment #: 317
Comment: These lines contain more uses of the ambiguous term "depleted" .
Response: The term "depleted" source in the text will be further clarified as contaminated soil in which only a low percentage (i.e., K_e less than 10 percent) of remaining uranium contamination concentration is leachable. This term usually refers to contaminated soil outside of the former production area and other operable units. Results of additional field sampling and laboratory measurements conducted to support the Operable Unit 5 FS will provide specific K_e values and their distribution throughout the FEMP.
Action: The term "depleted" source in the text will be further clarified. The following sentence will be added at the beginning of line 25 on page F.3.II-7:

The term "depleted" source is defined as contaminated soil in which only a low percentage (i.e., K_e less than 10 percent) of remaining uranium contamination concentration is leachable.