

***WORKING DRAFT FOR WORK GROUP DISCUSSION***

(January 15, 2007)

**REVIEW OF EXTERNAL DOSE FOR 32 CASES OF RANDOMLY  
SAMPLED WORKERS  
(This section contains 3 Tabs)**

**Tab 1: Data Compilation**

**Tab 2: First Period Data**

**Tab 3 Cumulative Analysis**

*Disclaimer*

*This document is made available in accordance with the unanimous desire of the Advisory Board on Radiation and Worker Health (ABRWH) to maintain all possible openness in its deliberations. However, the ABRWH and its contractor, SC&A, caution the reader that at the time of its release, this report is pre-decisional and has not been reviewed by the Board for factual accuracy or applicability within the requirements of 42 CFR 82. This implies that once reviewed by the ABRWH, the Board's position may differ from the report's conclusions. Thus, the reader should be cautioned that this report is for information only and that premature interpretations regarding its conclusions are unwarranted.*

**TAB 1: DATA COMPILATION FOR A RANDOM SAMPLE OF 32 RFP WORKER CASES**

**32 cases random sample of RFP workers' DOE files reviewed for % of badging**

ID #	During 1952-1963							During 1964-1992						Notes
	Emp.	Emp.	emp. #	years	# of	# of	% of	emp. #	years	# of	# of	% of		
	Start	End	years	badged	years	not badged	badged	years	badged	years	not badged	badged		
1	80s	90s						10	83-89, 91, 92	9	1	90%	Gap: 1990	
2	50s	60s	4.5	59-62	3.5	1.0	78%	2	64-66	2	0	100%	Gap: 1963	
3	50s	50s	2	53-54	1.5	0.5	75%						Gap: 1952	
4	80s	90s						8.5	84-92	8.5	0	100%		
5	70s	90s						15.5	77-90, 91	15	1	94%	Gap: 1992. (See note #1 for 1991.)	
6	80s	90s						6	85-91	6	0	100%		
7	50s	90s	7.5	56-63	7.5	0.0	100%	28	64-80, 83-91	26	2	93%	Gap: 1981 and 1982	
8	60s	70s	1	63	1.0	0.0	100%	8	64-72	8	0	100%		
9	60s	80s						18	66-68, 70-83	17	1	94%	Gap: 1969 (see note #2 & #3 for 1965.)	
10	50s	60s	7	56-63	7.0	0.0	100%	6	64-68,	5	?	83%	Gap: part of 1969 (see note #2).	
11	70s	90s						22	71-92	22	0	100%	Gap: Nov & Dec of starting year, 1970 Gap: 1969-72 & 75-83. Dose 1969-73 - 1973.	
12	60s	90s						22	73, 74, 84-91	9.5	12.5	43%		
13	80s	90s						8.5	84-92	8.5	0	100%		
14	90s	90s						2	91, 92	2	0	100%	See note #4 below.	
15	50s	70s	12	52-63	12.0	0.0	100%	10.5	64-68, 70-74	10	?	95%	Gap: part of 1969 (see note #2).	
16	80s	90s						10.5	82-91	9.5	1	90%	Gap: 1992	
17	60s	80s	2.5	61-63	2.5	0.0	100%	18	64-68, 70-81	17	?	94%	Gap: 1969 (see note #2).	
18	50s	70s	7.5	56-63	7.5	0.0	100%	7.5	64-71	7.5	0	100%		

19	50s	60s		7.5	57-63	7.0	0.5	93%		4.5	64-68	4.5	0	100%	Gap: 1956
20	60s	80s		4	60-63	4.0	0.0	100%		24.5	64-88	25	0	100%	
21	70s	70s								4	74-78	4	0	100%	
22	60s	70s								10	74-76, 78	3.5	6.5	35%	Gap: 1968-73, 77
23	60s	90s		0.5	63	0.0	0.5	0%		27	74-90	17	10	63%	Gap: 1963, 64-73
24	80s	90s								5.5	87-91	4.5	1	82%	Gap: 1992
25	60s	70s								6	69-75	6	0	100%	
26	80s	80s								3	84-86	3	0	100%	
27	50s	70s		5	62	1.0	4.0	20%		9.5	64-68, 70-73	8.5	?	89%	Gap: 1958-61, 63, 69 (see note #2).
28	60s	90s								22	69-90	22	0	100%	
29	80s	90s								11	82-92	11	0	100%	1991 badge read '92 & incl. w/ 1992 (22 mrem).
30	80s	90s								11	82-91	10	1	91%	Gap: 1992
31	50s	50s		5	55	1.0	4.0	20%							Gap: 1956-59
32	50s	90s		10.5	58, 59, 61-63	5.0	5.5	48%		27	64-90	27	0	100%	Gap: 1953-56, 57, 60 (see note #5).
<b>Total</b>				<b>76.5</b>		<b>60.5</b>	<b>16.0</b>			<b>368</b>		<b>328</b>	<b>37</b>		

- #1 The Occup. Dose Reports show blanks for 1991; however, there are detail sheets for 1991 that show zero.
- #2 The Occup. Dose Reports show blanks for 1969; however, there are detail sheets for 1969, some show blanks and some zeros.
- #3 Pages 14, 15, & 22 show 50 mrem for 1965, which is before start of employment.
- #4 P.1 of DOE file does not show employment for '76, '83, or '84; but there are external dose data sheets for those years (0, 0, & 8 mrem respectively).
- #5 Doses for 1957 & 1958 switched on some data sheets in DOE file.

**TAB 2: FIRST PERIOD DATA FOR RANDOM SAMPLE OF EXTERNAL DOSE FOR 32 RFP WORKERS**

**1952 to 1963 data**

During 1952-1963									
	Case	Emp.	Emp.	emp. #	years	# of	# of	% of	
ID #	#	Start	End	years	with at least one badge	years	not badged	badged	Notes
2		50s	60s	4.5	59-62	3.5	1.0	78%	Gap: 1963
3		50s	50s	2	53-54	1.5	0.5	75%	Gap: 1952
7		50s	90s	7.5	56-63	7.5	0.0	100%	
8		60	70s	1	63	1.0	0.0	100%	
10		50	60s	7	56-63	7.0	0.0	100%	
15		50	70s	12	52-63	12.0	0.0	100%	
17		60s	80s	2.5	61-63	2.5	0.0	100%	
18		50s	70s	7.5	56-63	7.5	0.0	100%	
19		50s	60s	7.5	57-63	7.0	0.5	93%	Gap: 1956
20		60s	80s	4	60-63	4.0	0.0	100%	
23		60s	90s	0.5	63	0.0	0.5	0%	Gap: 1963
27		50s	70s	5	62	1.0	4.0	20%	Gap: 1958-61, 63
31		50s	50s	5	55	1.0	4.0	20%	Gap: 1956-59
32		50s	90s	10.5	58, 59, 61-63	5.0	5.5	48%	Gap: 1953-56, 57, 60 (see note #1).

**Total**  
**= 76.5                      60.5                      16.0**  
**Average = 79%**

Notes

#1 Doses for 1957 & 1958 switched on some data sheets in DOE file.

## Analysis for 1952-1959

### External Dose

During 1952-1959									
				1st period		# of	# of	% of	
	Case	Emp.	Emp.	emp. #	years	years	years	years	
ID #	#	Start	End	years	badged	badged	not badged	badged	Notes
2		50s	60s	0.5	59-62	0.5	0.0	100%	
3		50s	50s	2	53-54	1.5	0.5	75%	Gap: 1952
7		50s	90s	3.5	56-63	3.5	0.0	100%	
10		50s	60s	3	56-63	3.0	0.0	100%	
15		50s	70s	8	52-63	8.0	0.0	100%	
18		50s	70s	3.5	56-63	3.5	0.0	100%	
19		50s	60s	3.5	57-63	3.0	0.5	86%	Gap: 1956
27		50s	70s	2	62	0.0	2.0	0%	Gap: 1958-59
31		50s	50s	3.5	55	1.0	2.5	29%	Gap: 1956-59
32		50s	90s	6.5	58, 59, 61-63	2.0	4.5	31%	Gap: 1953-56, 57
Total				<b>36</b>		<b>26</b>	<b>10</b>	<b>28%</b>	

**TAB 3: CUMULATIVE ANALYSIS OF AN EXTERNAL DOSE RANDOM SAMPLE FOR 32 RFP WORKERS**

**Random sample of Rocky Flats Workers, Cumulative Analysis  
External  
Dose**

		Number w/ 1 yr or	% workers with	Cumulative yrs	Cumulative Yrs	% yrs
Period	#of workers	more missing	missing data	employed	missing data	missing
1951- 1963	14	4	29%	76.5	16.0	21%
1964- 1992	30	10	33%	368	37	10%

- Note 1: First or last partial year of missing data not counted as a missing year. Partial years counted in cumulative data
- Note 2: Of the 10 employees with missing data in 1964-1992, four had missing data only in 1992  
1969 missing data were part of the year; part year missing data not counted as missing data or in cumulative
- Note 3: missing

# REVIEW OF EXTERNAL DOSE FOR 32 RFP HIGHLY EXPOSED WORKERS

(This Section contains two tabs)

**Tab 1 Group 3 and Group 4**

**Tab 2: 1950's Data**

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**TAB 1: GROUP 3 AND 4 OF THE 32 CASES OF HIGHLY EXPOSED RFP WORKERS**

Review of 20 RFP highly exposed workers' DOE files for % of badging

ID #	During 1952-1992					During 1952-1963					During 1964-1992					Notes
	Exp. cat.	Emp. Start	Emp. End	emp. # years	years badges	# of badged years	# of not badged years	% of time	% not badged	emp. # years	years badges	# of years	% of time			
1	3	50s	90s	6	1960-63	4	2.0	67%	33%	29	1964-92	29	100%			
2	3	50s	80s	9.5	1957-63	7	2.5	74%	26%	20	1964-83 (1986)	20	100%	1986=10 mrem?		
3	3	50s	70s	9	1960-63	4	5.0	44%	56%	14.5	1964-78	14.5	100%			
4	3	60s	80s	2.5	1961-63	2.5	0.0	100%	0%	19	1964-1982	19	100%			
5	3	50s	80s	8	1956-63	8	0.0	100%	0%	24	1964-87 (89 & 90)	24	100%	1989 & '90 =0 mrem?		
6	3	50s	90s	5	1960-63	4	1.0	80%	20%	30	1964-93	30	100%			
7	3	50s	90s	6	1958-63	6	0.0	100%	0%	34.5	1964-98	34.5	100%			
8	3	50s	80s	9	1956-57 & 1960-63	6	3.0	67%	33%	21	1964-84	21	100%			
9	3	50s	80s	8.5	1960-63	4	4.5	47%	53%	24	1964-87	24	100%			
10	3	50s	60s	11	1957 & 1959-63	6	5.0	55%	45%	5.5	1964-69	5.5	100%			
11	4	50s	80s	7.5	1956-63	7.5	0.0	100%	0%	21	1964-84	21	100%			
12	4	50s	80s	7.5	1956-63	7.5	0.0	100%	0%	25	1964-68 & 1970-87	23	92%			
13	4	50s	90s	7.5	1956-58 1960-63	6.5	1.0	87%	13%	29	1964-92	29	100%			
14	4	50s	70s	9.5	1954-63	9.5	0.0	100%	0%	11.5	1964-75	11.5	100%			
15	4	50s	80s	6	1958 1960-63	5	1.0	83%	17%	19	1964-82	19	100%			



16	4	50s	80s	10.5	1956-63	8	2.5	76%	24%	22	1964-85 (88, 89, & 90)	22	100%	'88=0, '89=9 mrem, '90=0?
17	4	50s	70s	5.5	1958-63	5.5	0.0	100%	0%	8	1964-71	8	100%	
18	4	50s	50s	0.33	PPG no badging	0	0.3		100%					This period non-Rocky Flats work.
														Not included in analysis
18		50s	80s	8	1957-63	7	1.0	88%	13%	22	1964-85	22	100%	
19	4	50s	60s	8	Paducah 1955-62	7.5	0.5	94%	6%					This period non-Rocky Flats work
														Not included in analysis
19		60s	80s	2	RFP 1962 & 1963	1.5	0.5	75%	25%	24.5	1964-88	24.5	100%	
20	4	60s	70s	4	1960-63	4	0.0	100%	0%	14.5	1964-78	14.5	100%	
	# of years rounded													
	to the nearest 0.5 years													

**TAB 2: 1950 DATA FOR THE 32 CASES OF HIGHLY EXPOSED RFP WORKERS**

	Exp.	Emp.	Emp.	emp.	years	# of	# of		
ID #	cat.	Start	End	# years	badged	badged	years not badged	Comments	Notes on Job Type
1	3	50s	90s	1.5	1960-63	0.0	1.5	all initial	gaps in data: Production B
2	3	50s	80s	5.5	1957-63	3.0	2.5	all initial	gaps in data: Production B to 4-23-56. No gaps in Production C
3	3	50s	70s	4.5	1960-63	0.0	4.5	all initial	gaps in data in 81 and QC lab. Lab specialist
5	3	50s	80s	4.5	1956-63	4.5	0.0		service and Plant D and starting in 57 Depart 83
6	3	50s	90s	1.0	1960-63	0.0	1.0	all initial	gaps in data in Production B
7	3	50s	90s	1.5	1958-63	1.5	0.0		Production B
8	3	50s	80s	5.0	1956-57	2.0	3.0	initial	gaps in data in Production B. Production B 55, C in 56, back to B in 2-57,
									plus 58, 59
					& 1960-63				
9	3	50s	80s	4.5	1960-63	0.0	4.5	all initial	gaps in data in Production B
10	3	50s	60s	6.5	1957	2.0	4.5	initial plus 58	Laborer operator janitor to 5-55, Produc C from 4-56, 57 to 8-59 military leave
					& 1959-63				
11	4	50s	80s	3.5	1956-63	3.5	0.0		Production D-77
12	4	50s	80s	3.5	1956-63	3.5	0.0		Health Physics
13	4	50s	90s	3.5	1956-58	2.5	1.0	1959	gaps in data, 1959, in Production B, other times in the 1950s, A and C
					1960-63				
14	4	50s	70s	5.0	1954-63	5.0	0.0		Production A until 4 1957, then C
15	4	50s	80s	1.5	1958	0.5	1.0	1959	Production C initially and in 1959 Production B. Missing data in production B

					1960				
					and 1963				
16	4	50s	80s	6.5	1956-63	4.0	2.5	all initial	Pipe shop during no monitoring
17	4	50s	70s	1.0	1958-63	1.0	0.0		Production C
18	4	50s	80s	4.0	1957-63	3.0	1.0	all initial	Production B and Depart 83 except for a 3 month period in 1959.
<b>Total</b>				<b>63</b>		<b>36</b>	<b>27.0</b>	<b>43%</b>	col. I: percent cumulative gap
<b>Group 3</b>				<b>34.5</b>			<b>21.5</b>	<b>62%</b>	col. I: percent cumulative gap
<b>Group 4</b>				<b>28.5</b>			<b>5.5</b>	<b>19%</b>	col. I: percent cumulative gap

## REVIEW OF INTERNAL DOSE FOR 32 HIGHLY EXPOSED RFP WORKERS

### Review of 20 RFP highly exposed workers' DOE files for Bioassays

ID #	During 1952-1992					During 1952-1963				During 1964-1992					Notes
	Exp. cat.	Emp. Start	Emp. End	emp. #	emp. years	# of years	years w/o bio	% of time	emp. # years	years bioassays	# of years	# of years w/o bio	% of time		
1	3	50s	90s	6	1958-63	6	0.0	100%	29	1964-92	29	0.0	100%		
2	3	50s	80s	9.5	1954-63	9.5	0.0	100%	20	1964-83	20	0.0	100%		
3	3	50s	70s	9	1955-63	9	0.0	100%	14.5	1964-78	14.5	0.0	100%		
4	3	60s	80s	2.5	1961-63	2.5	0.0	100%	19	1964-82	19	0.0	100%		
5	3	50s	80s	8	1955-63	8	0.0	100%	24	1964-86	23	1.0	96%	Could not find 1987	
6	3	50s	90s	5	1959-63	5	0.0	100%	30	1964-93	30	0.0	100%		
7	3	50s	90s	6	1958-63	6	0.0	100%	34.5	1964-97	34.5	0.0	100%		
8	3	50s	80s	9	1954-63	9	0.0	100%	21	1964-85	21	0.0	100%		
9	3	50s	80s	8.5	1955-63	8.5	0.0	100%	24	1964-87	24	0.0	100%		
10	3	50s	60s	11	1954-63	10	1.0	91%	5.5	1964-69	5.5	0.0	100%	Could not find 1953	
11	4	50s	80s	7.5	1957-63	7	0.5	93%	21	1964-84	21	0.0	100%	Could not find 1956	
12	4	50s	80s	7.5	1956-63	7.5	0.0	100%	25	1964-68	25	0.0	100%		
13	4	50s	90s	7.5	1956-63	7.5	0.0	100%	29	1964-92	29	0.0	100%		
14	4	50s	70s	9.5	1954-63	9.5	0.0	100%	11.5	1964-75	11.5	0.0	100%		
15	4	50s	80s	6	1958-63	6	0.0	100%	19	1964-83	19	0.0	100%		
16	4	50s	80s	10.5	1953-63	10.5	0.0	100%	22	1964-85	22	0.0	100%		
17	4	50s	70s	5.5	1958-63	5.5	0.0	100%	8	1964-71	8	0.0	100%		
18		50s	50s	0.33	PPG	0	0.3							Non Rocky Flats	

																employment - not
																included in analysis
18	4	50s	80s		8	1956-63	8	0.0	100%		22	1964-85	22	0.0	100%	
19		50s	60s		8	Paducah	8	0.0								Non Rocky Flats
						1954-62										employment - not
																included in analysis
19	4	60s	80s		2	RFP 1962	2	0.0	100%		24.5	1964-88	24.5	0.0	100%	
						& 1963										
20	4	60s	70s		4	1960-63	4	0.0	100%		14.5	1964-78	14.5	0.0	100%	

(# of years rounded off to nearest 0.5 years)

(The vast majority were urinalysis; a few years were from WBC.)

RJB 5 Dec 2006