

C-8 ENVIRONMENTAL STATUS

History

Industrial Hygiene

- Engineering Changes
- Protective Equipment
- Air Monitoring
- Blood Sampling
 - Long-Term and Short-Term Employees
 - New Hires

C-8 Material Balance

- Off-Plant Disposal
- In Product
- To River
- To Atmosphere
 - Ground Level Modeling Results

ENVIRONMENTAL ALTERNATIVES

FEP

- Replace C-8 - $C_7F_{15}CO_2NH_4$
With TBSA - $R_fCH_2CH_2SO_3H$

Fine Powder

EID091341

- No Known Substitute
 - Two Expensive Alternatives
 - Scrubbing of Vents
 - Conversion to Presumed Innocuous Compound
- $$C_7F_{15}CO_2NH_4 \xrightarrow[\text{Heat}]{400^\circ C} C_7F_{15}H + CO_2 + NH_3$$

RJZ026744

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C-8 REVIEW

HISTORY

8/51 BEGAN USE OF C-8 IN DISPERSION POLYMERIZATION. FEW PRECAUTIONS IN HANDLING.

6/27/78 ADVISED EMPLOYEES THAT 3M FOUND ELEVATED ORGANIC FLUORINE LEVELS IN BLOOD OF WORKERS EXPOSED TO FLUORINATED SURFACTANTS. WE WOULD REVIEW OUR SITUATION.

6/12/79 ADVISED EMPLOYEES THAT THE REVIEW WAS COMPLETE WITH NO PROBLEMS FOUND. AS AN ADDITIONAL STEP FLUORINE LEVELS IN SOME EMPLOYEES WOULD BE CHECKED.

8/13/79 COMMUNICATION ADVISED EMPLOYEES THAT SOME OF 8 OPERATORS AND LABORATORIANS SAMPLED IN JUNE HAD ELEVATED ORGANIC FLUORINE LEVELS SIMILAR TO 3M WORKERS. MORE SAMPLES WOULD BE TAKEN.

9/79 PROVISIONAL AEL ESTABLISHED.

11/12/79 COMMUNICATION ADVISED RESULTS OF 78 BLOOD SAMPLES. SAMPLES FROM MONOMER OPERATORS AND FLUOROPOLYMERS RESEARCH PERSONNEL WERE LOWER THAN FOR PERSONNEL IN POLYMERIZATION OPERATIONS. REVIEW OF MEDICAL RECORDS SHOWED "NO CONCLUSIVE EVIDENCE OF HEALTH PROBLEMS ASSOCIATED WITH EXPOSURE TO C-8".

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8/01/80

Communication Summarized Program:

- Define areas where engineering changes will reduce C-8 exposure. Authorize COD's.
- Define areas where protective equipment will be needed.
- Continue blood sampling program.
- Continue to evaluate liver tests of employees with potential exposure.

3/20/81

3M advised Du Pont that C-8 caused birth defects in the unborn when fed by stomach tube to female rats in a laboratory experiment. As a result all female employees with potential C-8 exposure were promptly transferred to other areas.

4/01/81

Communication about birth defects concern.

4/10/81

Communication about use of C-8 specific blood analysis. Results increased 28% average.

7/31/81

Communication concerning expansion of blood sampling and air sampling programs.

12/15/81

Communication about new data which puts original 3M analysis in doubt.

3/01/82

Communication that studies are complete which find C-8 not to be a teratogen and no evidence of adverse health effects. Female and blood donation exclusion recommendations recinded.

5/17/82

Final AEL established.

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7/06/82

Communication that based on C-8 findings the blood sampling program would be reduced to only those directly exposed.

JWR:ldr
10/19/83

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ENGINEERING CHANGES

- Equipment Seals and Gaskets
- Better Leak Maintenance
- Overall Building Ventilation Study
- Building Exhaust Fans
- Building Pressure Balance
- Ventilated Hoods Over Dryer Doors
- Increased Vent Stack Height
- Eliminated Dusty Jobs
- Major Cleanup of Area
- New Torus Disc Dryer

Protective Equipment

Comfo Half Mask Respirators
Breathing Air Respirators
Latex Rubber Gloves

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10/19/83

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TRENDS IN C-8 IN AIR LEVELS

	<u>C-8 In Air (mpb)</u>			
	AEL = 0.56			
	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
FEP Area (Composite Avg.)	1.87	0.32	Not Calculated	0.15
FEP Wet Finishing Operator	0.95	0.30	0.09	0.11
FEP - No. 1 Clean Room	6.80	3.11	3.54	--
No. 2 Clean Room				0.19
Fine Powder Dryer Operator	1.40	0.56	0.15	0.06
Fine Powder Dryer Room (Composite Avg.)	3.00	2.47	0.37	0.23

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TEFLON® FINE POWDER/DISPERSION OPERATORS

C-8 BLOOD SAMPLE RESULTS

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<u>C-8 in Blood (ppm)</u>			<u>Days Between Samples</u>	<u>% Per Year Change</u>
<u>First Sample</u>	<u>Second Sample</u>	<u>Change</u>		
26.0	20.0	-6.0	363	-23
24.0	25.0	+1.0	364	+4
11.0	8.2	-2.8	391	-24
9.4	7.9	-1.5	364	-16
8.2	6.5	-1.7	363	-21
7.0	7.7	+0.7	364	+10
6.9	5.9	-1.0	337	-16
5.6	4.2	-1.4	334	-27
4.4	4.9	+0.5	365	+13
4.3	5.6	+1.3	401	+27
3.9	3.6	-0.3	364	-8
3.6	2.7	-0.9	362	-25
3.5	2.1	-1.4	363	-40
2.9	2.8	-0.1	357	-3
2.8	2.8	0.0	365	0
2.6	2.4	-0.2	391	-7
2.5	1.8	-0.7	336	-28
2.5	2.5	0.0	349	0
2.1	1.6	-0.5	288	-30
1.6	1.5	-0.1	384	-6
1.5	1.2	-0.3	366	-20
1.3	1.1	-0.2	362	-15

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TEFLON® FEP OPERATORS
C-8 BLOOD SAMPLE RESULTS

<u>C-8 in Blood (ppm)</u>			<u>Days Between Samples</u>	<u>% Per Year Change</u>
<u>First Sample</u>	<u>Second Sample</u>	<u>Change</u>		
7.5	6.6	-.9	362	-12
4.5	3.7	-.8	380	-17
3.1	2.8	-.3	384	-9
2.1	1.5	-.6	364	-29
1.8	1.1	-.7	364	-39
1.8	1.6	-.2	392	-10
1.6	1.4	-.2	393	-12
1.25	1.20	-.05	171	-9
1.20	1.00	-.2	333	-18
0.95	0.79	-.16	391	-7
0.86	0.75	-.11	565	-8
0.75	0.72	-.03	364	-4
0.52	0.44	-.08	365	-15
0.51	0.48	-.03	337	-6
0.42	0.39	-.03	445	-6
0.41	0.46	+.05	363	+12
0.38	0.36	-.02	363	-5

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SHORT SERVICE OPERATORS
C-8 BLOOD SAMPLE RESULTS

Fine Powder

<u>Last Sample PPM</u>	<u>Days in Job</u>	<u>PPM Per Year Change</u>
.02	61	+.09
.19	212	+.24
.93	375	+.03
4.00	603	-.18

FEP

.05	95	+.15
.05	124	+.10
.15	135	+.38
.05	165	+.09
.23	492	+.24
.66	266	-.24

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NEW HIRES - TEFLON®

<u>Date of First Sample</u>	<u>Date Hired</u>	<u>C-8 Blood Level (ppm)</u>	<u>Months on Plant Before First C-8 Blood Test</u>
07/28/81	07/27/81	<0.007	0
10/01/81	08/03/81	0.009	2
10/07/81	04/20/81	0.007	5 1/2
10/13/81	04/20/81	0.015	5 3/4

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C-8 BALANCE

1983 NO. 1 FINANCIAL FORECAST BASIS

<u>FEP</u>	<u>FINE POWDER</u>	<u>M LBS. DISPERSION</u>	<u>GRANULAR</u>		<u>LBS. TOTAL</u>	<u>% OF TOTAL</u>
20.5	1.2	---	.1	RIVER	21.8	50
1.8*	10.4	---	.2	ATMOSPHERE	12.4*	28
.2	---	4.5	---	PRODUCT	4.7	11
<u>.3</u>	<u>---</u>	<u>4.2</u>	<u>---</u>	OFF-PLANT DISPOSAL	<u>4.5</u>	<u>11</u>
22.8*	11.6	8.7	.3		43.4*	100

* INCLUDED IN THESE NUMBERS IS APPROXIMATELY 1.5M LBS OF C-8 ENTERING THE HUMID HEAT TREATING OVENS WHERE IT IS THERMALLY CONVERTED TO C₇F₁₅H.

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C-8 IN RIVER

1983 Forecast to River	-	21,800 lbs.
Average Ohio River Flow	-	13.88 Billion lbs./Hour
Concentration	-	.00018 ppm
C-8 Ingested with 1 Liter/Day	-	.00000018 gm.
8 Hour AEL Via Inhalation	-	.0001 gm.

Or .18% of AEL Dose

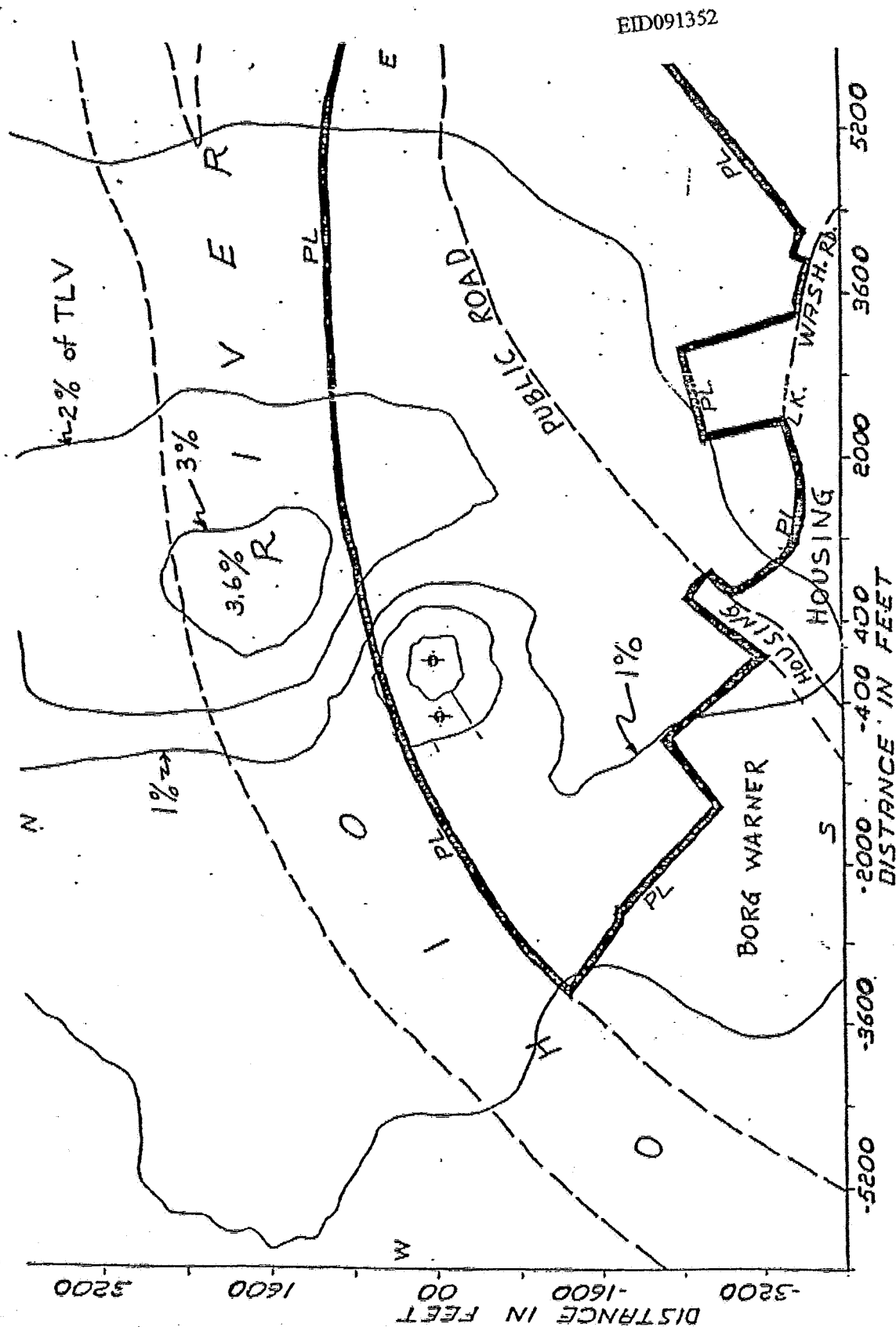
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WASHINGTON WORKS C-B ANNUAL MEAN CONCENTRATION CASE 1



ENVIRONMENTAL ALTERNATIVES

FEP

- Replace C-8 - $C_7F_{15}CO_2NH_4$
With TBSA - $R_fCH_2CH_2SO_3H$
- Toxicity - Appears To Be Less Toxic Than C-8
- Blood Accumulation
Similar to C-8 - Not Present as C-8
Developing a Specific Test For Material in Blood
- Fate In Process
Converted to R_fH - Presumed to be Nontoxic
- Process Development Status
Plant Test in November
- Substitution Timing
First or Second Quarter 1984

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ENVIRONMENTAL ALTERNATIVES (cont'd)

Fine Powder

- No Known Substitute
- Scrubbing of Vent Not Economically Feasible
 - Dryer Pressure Balance is Critical
 - Low Concentration in Vent (60,000 pph of air)
 - Foaming Limits Water Concentration
 - Don't Want to Send Scrubber Effluent to River
- Less Expensive Alternative Conversion to Presumed Innocuous Compound
 - $C_7F_{15}CO_2NH_4 \xrightarrow[\text{Heat}]{400^\circ C} C_7F_{15}H + CO_2 + NH_3$
 - Natural Gas Heated Furnace
 - Investment \$1.2MM
 - Annual Operating Cost \$.3MM
 - Toxicity Tests and Blood Data Needed

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