Burkhart

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Marty Malsch — is this the ELD memo which gave your concern?

October 10, 1984

I. Davis
L. Mrazshardt
CC: FC

MEMORANDUM FOR: Frank P. Gillespie, Director
Division of Risk Analysis and Operations
Office of Nuclear Regulatory Research

FROM: William J. Olmstead
Director and Chief Counsel, Regulations Division
Office of the Executive Legal Director

Fuhrel 3/18 11:00

SUBJECT: CHEMICAL TOXICITY OF UF_6 AND EMERGENCY PREPAREDNESS

In your memorandum of August 23, 1984 you requested our opinion on whether NRC has the legal authority to base emergency preparedness regulations for a uranium hexaflouride (UF_6) release on the chemical toxicity of the compound. It is our conclusion that the chemical toxicity of uranium compounds may be taken into consideration in developing regulations to protect the public health and safety from the radiological effects of UF_6.

Although the predominant regulatory concern of the NRC for protection of public health and safety has been the radiological hazards associated with source, byproduct, and special nuclear material, under the Atomic Energy Act of 1954, as amended, Commission regulatory authority can be more extensive. The Atomic Energy Act confers broad authority to regulate the use and possession of the defined classes of nuclear materials, i.e., source, byproduct, and special nuclear, in order to protect public health, minimize danger to life or property from the hazards associated with these materials, and to prevent possession and use inimical to the common defense and security. Section 161.(3) permits the Commission, by rule or order, to regulate any activity authorized by the Act including standards and restrictions governing the operation of facilities used in the activity. Section 161b authorizes the Commission to establish whatever regulations it deems necessary or desirable to protect health and to minimize danger to life or property with respect to the possession and use of source, byproduct, and special nuclear material. In the case of source material Section 63b(1) states that the physical characteristics of source material are to be considered in writing rules for its possession and use. The physical characteristics of source material would include both its chemical and radiological characteristics. Section 53b(1) states the same for special nuclear material. UF_6 can be either source material or special nuclear material depending on whether or not the uranium has been enriched. Under this broad authority the Commission has exercised regulatory authority over all integral parts of an activity for which an NRC license is required by the Atomic Energy Act. See legal opinions printed in the hearing, "Uranium Mill Tailings Control Act of 1978," before the Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce, 95th Cong. 2d Sess., June 19, 20, and August 2, 1978, at pp. 202-207.

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PDR FOIA
HIGUCHI86-61 PDR

Enclosure 4

A-5

The chemical toxicity of uranium has already been considered in the Commission's regulations. It is our understanding that the values for soluble uranium in air in 10 CFR Part 20, Appendix B are based upon the chemical toxicity of uranium in the human kidney rather than its radiological hazard, even though the concentration limits are expressed in terms of radioactivity.[1] See fn. 4 to Appendix B, 10 CFR Part 20, 39 F.R. 23990 (June 28, 1974). These values would apply to a release of UF_6 that on contact with air hydrolyzes to UO_2F_2, a compound very soluble in body fluids which would be absorbed into the blood via the lungs.[2]

As a supplement to the Atomic Energy Act, the National Environmental Policy Act of 1969 (NEPA) also supports the establishment of regulations for protection of public health, safety and the environment from other hazardous materials produced in the course of using source, byproduct, or special nuclear material. Calvert Cliff's Coordinating Committee v. AEC, 449 F.2d 1109 (D.C. Cir 1971) imposed upon the Commission an obligation not only to consider environmental concerns, radiological and nonradiological, but also to take action to mitigate adverse impacts. Ibid p. 1128. See also, Public Service Co v. NRC, 582 F.2d 77 (1st Cir. 1978) (Commission has jurisdiction under Atomic Energy Act to order rerouting of transmission lines to minimize adverse environmental impacts). To implement NEPA objectives in individual licensing actions involving possession and use of UF_6 (both natural and enriched), NRC licenses are already routinely conditioned under Atomic Energy Act authority to require monitoring of emissions of other fluoride compounds such as HF, and the keeping of monitoring records. However, to avoid dual regulation of such other fluoride compounds, enforcement of violations of Clean Air Act health standards revealed by such monitoring is left to the States, or EPA, as appropriate.[3]

1/ Personal communication from Ralph G. Page, Chief, Uranium Fuel Licensing Branch, Division of Fuel Cycle and Material Safety, ONMSS

2/ Chemical damage to the kidney sets the basis for bioassay (urinalysis) in uranium mills. See Regulatory Guide 8.22. It is also a factor in the general bioassay program in Regulatory Guide 8.11, in the health physics survey described in Regulatory Guide 8.24, and in the ALARA program for uranium mills in Regulatory Guide 8.31.

3/ 40 CFR 190, which was promulgated by EPA under Atomic Energy Act authority, sets the standard for environmental releases of uranium only with respect to radiological consequences. EPA authority under the Atomic Energy Act to establish generally applicable environmental protection standards for uranium does not limit the authority of the NRC to establish specific regulations for emergency preparedness by persons possessing and using UF_6. The latter is a matter of regulating directly the licensed activities of persons under the Atomic Energy Act.

It is clear from the preceding discussion that licenses are not infrequently conditioned under Atomic Energy Act authority to regulate non-radiological concerns related to the use of source, byproduct, and special nuclear materials. Because the Atomic Energy Act allows regulation by rule on an equal basis to regulation by license condition, it is our opinion that a rule under Atomic Energy Act authority for emergency preparedness for licensees possessing and using UF_6 may be based upon its chemical toxicity as well as its radiological characteristics.

William J. Olmstead
Director and Chief Counsel
Regulations Division
Office of the Executive
Legal Director

cc: O.G. Page, ONMSS

6 January 1986

MEMORANDUM

SUBJECT: ARAC ASSUMPTIONS ASSOCIATED WITH GORE DI INCIDENT CALCULATIONS.

RELEASE START: 1100CST (1730GMT)
DURATION: 15 MINUTES

CENTROID OF RELEASE CLOUD AT HGT OF 5 METRES AGL

RELEASE AMOUNT = 25,800 LBS (11756 KG of UF_6
YIELDING 11,700 KG OF UO_2F_2 (URANYL FLORIDE) AND 3040 KG HF. THIS IS BASED ON THE FOLLOWING:

$UF_6 + 2(H_2O) \rightarrow (UO_2F_2) + 4(HF) + heat$

THE RELEASE RATE WAS ASSUMED TO BE CONSTANT OVER THE DURATION OF THE RELEASE.

THE HF WAS MODELED AS VAPOR WITH A 1 cm/s DEPOSITION VELOCITY.

THE UO_2F_2 WAS MODELED AS PARTICLES WITH A MEDIAN DIAMETER OF ONE MICRON, A STANDARD GEOMETRIC DEVIATION OF 1.5 MICRONS, A MAXIMUM DIAMETER OF 3.0 MICRONS AND A MINIMUM DIAMETER OF 0.01 MICRONS AND A DEPOSITION VELOCITY OF 1 cm/s.

PLEASE NOTE THAT FIGS 3 AND 4 ARE EXPANDED VIEWS OF FIGS 1 AND 2. THE COMPUTATIONAL GRID WAS THE SAME, I.E. 40KM X 40KM WITH A DELTA X AND DELTA Y OF 1KM, AND DELTA Z OF 50 M.

A-6

Rec 1/7/86
0845

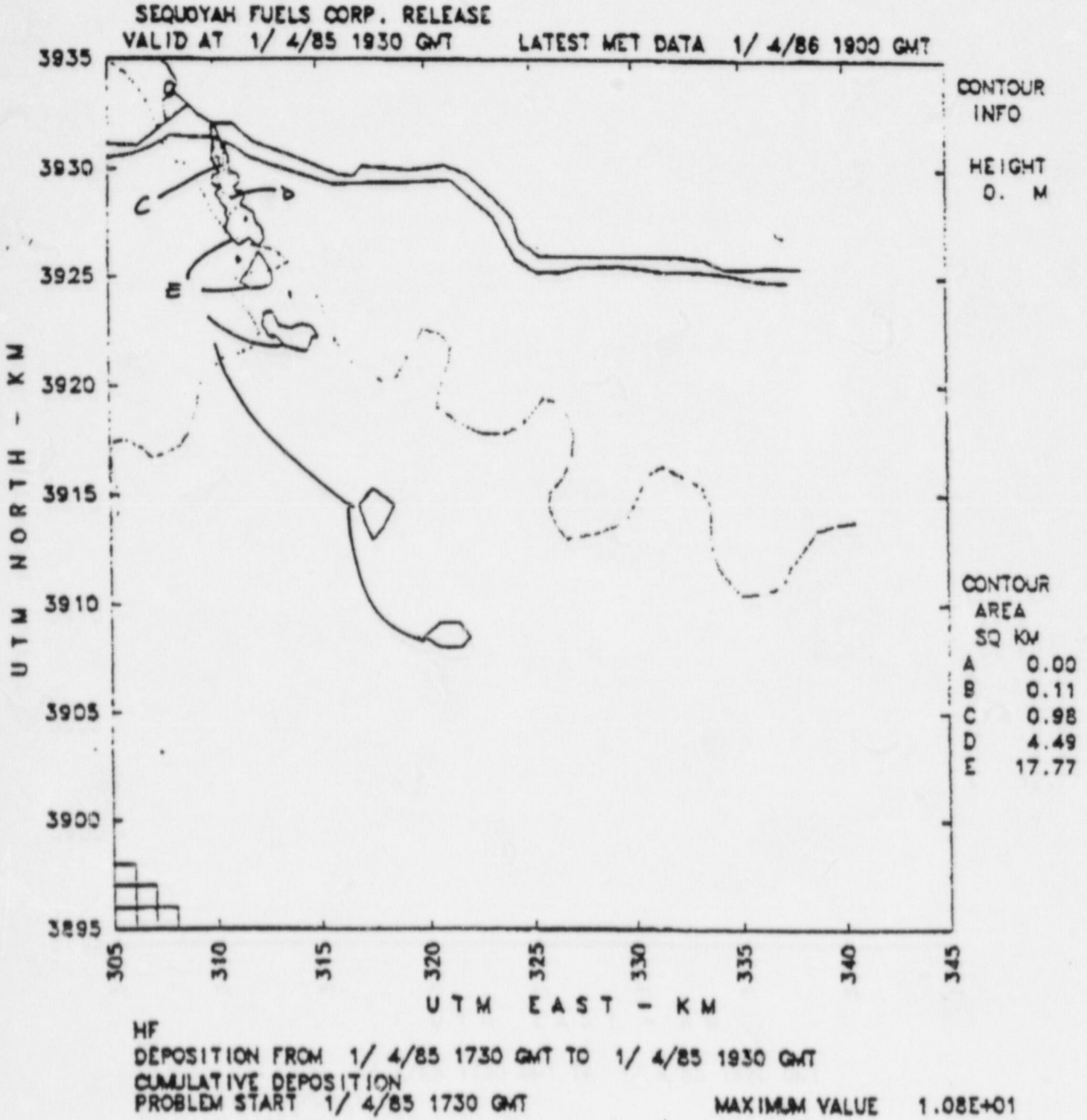


Fig. 1

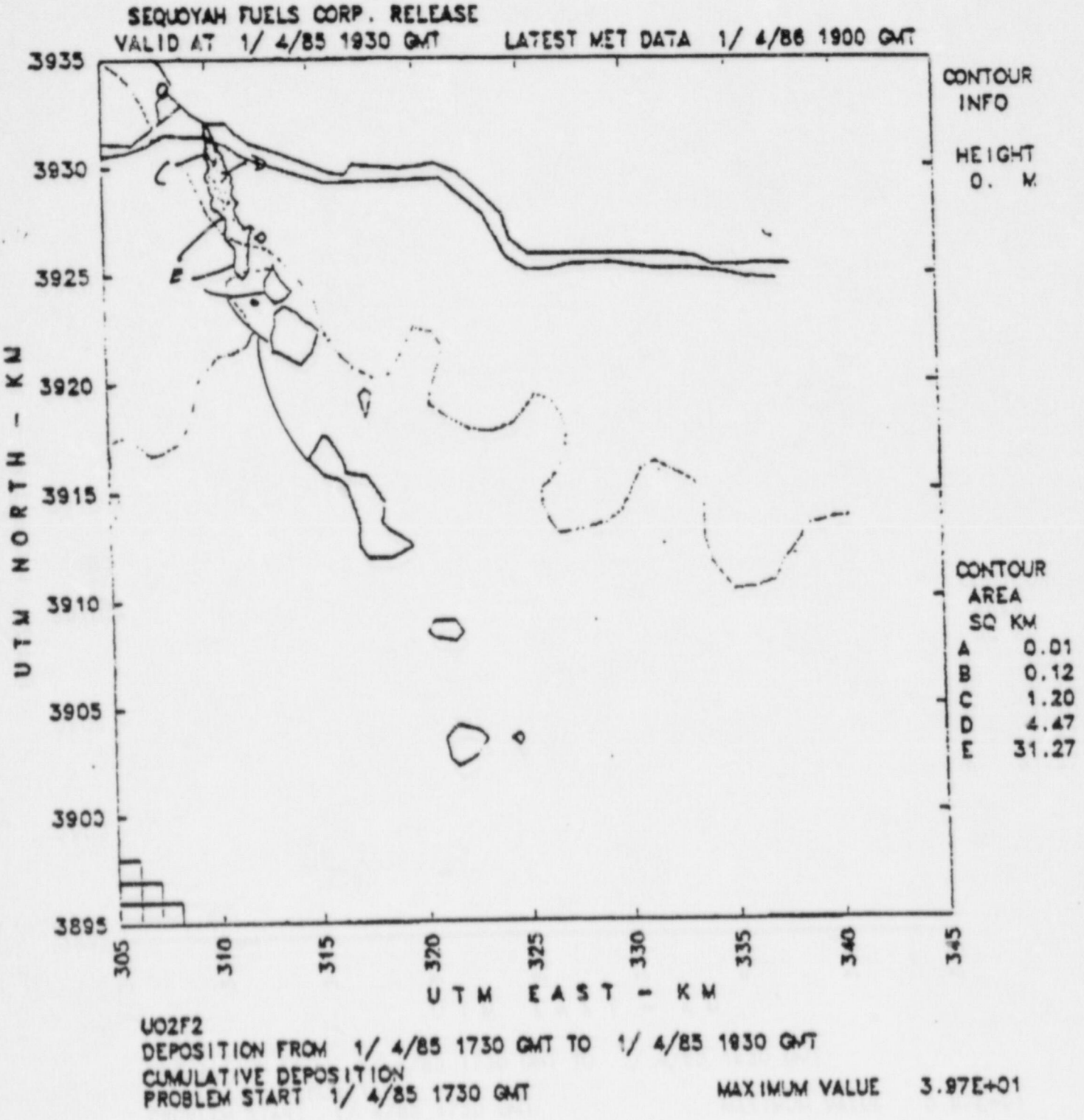

SEQUOYAH FUELS CORP. RELEASE
VALID AT 1/ 4/85 1930 GMT
LATEST MET DATA 1/ 4/86 1900 GMT
CONTOUR INFO
HEIGHT
0. M
CONTOUR AREA SQ KM
A 0.01
B 0.12
C 1.20
D 4.47
E 31.27
UTM NORTH - KM
3935
3930
3925
3920
3915
3910
3905
3900
3895
305
310
315
320
325
330
335
340
345
UTM EAST - KM
U02F2
DEPOSITION FROM 1/ 4/85 1730 GMT TO 1/ 4/85 1930 GMT
CUMULATIVE DEPOSITION
PROBLEM START 1/ 4/85 1730 GMT
MAXIMUM VALUE 3.97E+01

Fig. 2

Loc 1/7/86
1200

7 January 1985

SUBJECT: ARAC NORMALIZED CALCULATION INPUT PARAMETERS

The parameters which are different from the previous ARAC calculations (those which used 29,500 pounds of UF6 as the source) are as follows:

1) Initial cloud size determined from building dimensions (250' by 78').

2) Used 1 gram of HF and 1 gram of UO2F2 each released over the 15 minute plume duration.

3) Calculational grid is now 10 by 10 kilometers with 50 meter delta Z. (Delta X and Delta Y equal 250 meters.)

4) Source location shifted to the East closer to Highway 10.

All other assumptions listed in yesterday's memo were used for this run.

7 January 1986
22:00 GMT

Subject: Additional ARAC Plots

Four additional ARAC plots are being sent:

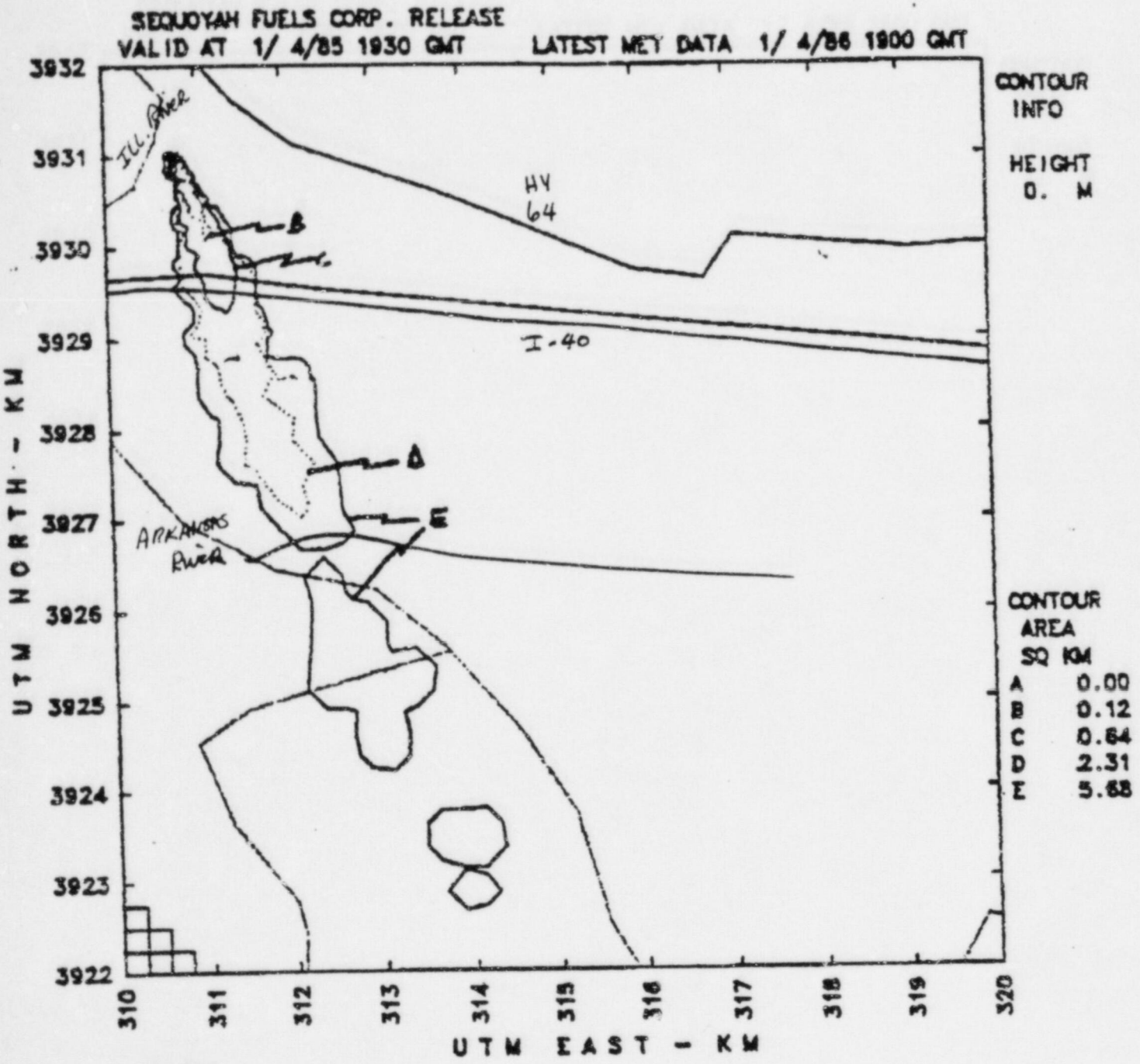
1) Cumulative Deposition contours of UO2F2 assuming maximum source amount (11,788 Kg of UO2F2) on a 10 Kilometer by 10 Kilometer map.

2) Cumulative Deposition contours of HF assuming maximum source amount (3,848 Kg of HF) on a 10 Kilometer by 10 Kilometer map.

3) Integrated Normalized Air Concentration contours of UO2F2 on a 40 Kilometer by 40 Kilometer map.

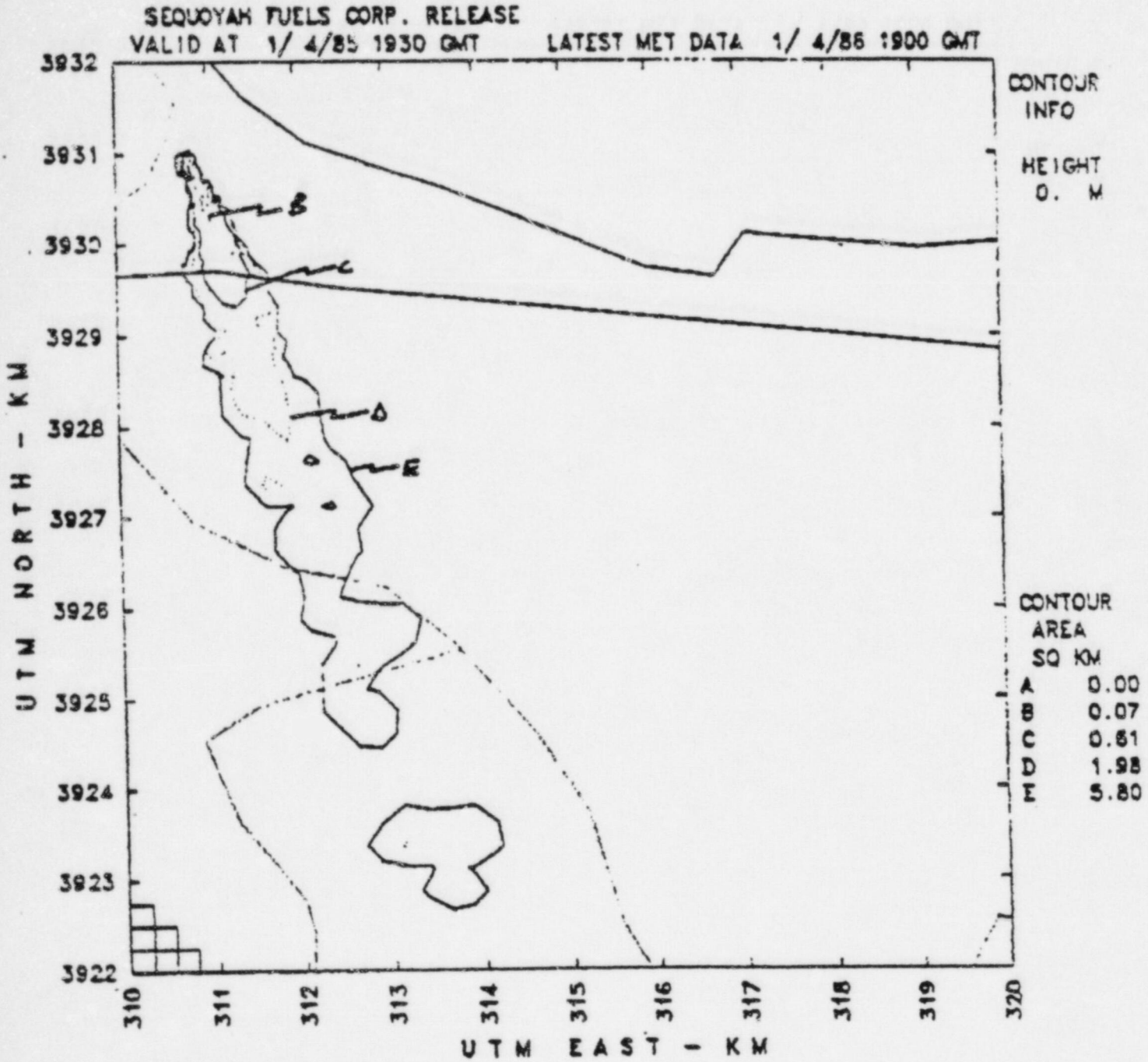
4) Integrated Normalized Air Concentration contours of HF on a 40 Kilometer by 40 Kilometer map.

To convert normalized contour values of plots 3 and 4 to actual values, multiply the values by the total mass released over the assumed 15 minute release period.



U02F2
DEPOSITION FROM 1/ 4/85 1730 GMT TO 1/ 4/85 1930 GMT
MAX SOURCE CUMULATIVE DEPOSITION
PROBLEM START 1/ 4/85 1730 GMT

MAXIMUM VALUE 3.76E+01



HF
DEPOSITION FROM 1/ 4/85 1730 GMT TO 1/ 4/85 1930 GMT
MAX SOURCE CUMULATIVE DEPOSITION
PROBLEM START 1/ 4/85 1730 GMT

MAXIMUM VALUE 1.18E+01

Plant Air Samples

1/4/86

0001 1/4/86 0800 / 1600 /
0800 1/4/86 1600 / 2400 /

Reported values are the fraction of the restricted MPC (1×10^{-10} uCi/ml)

1	SAMPLING	South Wall, 1st	0.09			
2		Splitter, 2nd	0.11			
3		Splitter, 3rd	0.11			
4		Drum Dumper, 4th	0.12			
5		Sample Prep Room	0.10			
6	DIGEST	Center, 1st	0.12			
7		East Walkway, 2nd	0.10			
8		#3 Digestor, 2nd	0.13			
10	DENTRATION	N. End #1, 1st	0.08			
38		Between #3 & #4, 1st	0.11			
39		W. #3 Boildown Tank, 1st	0.06			
11		W. Side #2, 2nd	0.10			
12		E. Side #2, 2nd	0.14			
40		Between #3 & #4, 2nd	0.13			
13	REDUCTION-HYDROFLUORINATION	A-Reactor Blower, 1st	0.09			
41		B-Reduction Reactor, 1st	0.11			
14		A Backup Filters, 2nd	0.15			
42		B-Line, 2nd	0.12			
15		A-Line HF CLR, W., 4th	0.12			
16		UO2 Seal Bin, E., 4th	0.15			
43		B-Line, 3rd	0.17			
17		2nd Stage HFR, 3rd	0.15			
18		N. of UO3 Pulverizer, 3rd	0.11			
44		B-Line HFR CLR, S., 4th	0.17			
19		AHF Furnace, 1st	0.11			
20	FLUORINATION	511 Conveyor, S., 4th	0.15			
21		511 Conveyor, NE., 4th	0.12			
22		#5 Tower, 1st	0.10			
23		#3 Tower, 1st	0.13			
24		F2 Heater #1, W., 2nd	0.37			
25		F2 Heater #3, NW., 2nd	0.12			
26		#5 Tower, S., 2nd	0.10			
27		Cold Trap #2, E., 3rd	0.08			
28		Cold Trap #2, W., 3rd	0.11			
29		Feed Bin #3, 3rd	0.12			
30		Feed Bin Center, 3rd	0.11			
36	MISCELLANEOUS	UF6 Scale Room	0.22			
37s		Decon Room, South	0.57			
37w		Decon Room, West	0.40			
32		Maint. Shop, SE.	0.15			
45		Maint. Shop, West	0.11			
34		#1 F2 Plant	0.07			
35		Cell Reword Area	0.08			
46		#2 F2 Plant	0.09			
47	MISC DIGEST	N. Side Dumping Station, 3rd				
48		S. Side Dumping Station, 3rd				
49		Drum Filling Station, 1st				
50	ASH REC	Ash Receiver DeSmoke House	0.50			

Contamination Incident Report required for restricted area concentrations > 3×10^{-10} uCi/ml

JCS

Plant air samples

1/4/86

0800 1/4/86 1600 1/4/86 2000 1/4/86
1600 1/4/86 2000 1/4/86 2400 1/4/86

Reported values are the fractions of the restricted MPC (1×10^{-10} uCi/ml)

				0800	1600	2000	2400
1	SAMPLING	South Wall, 1st		0.25	0.10		
2		Splitter, 2nd		0.20	0.13		
3		Splitter, 3rd		0.21	0.14		
4		Drum Dumper, 4th		0.25	0.15		
5		Sample Prep Room		0.20	0.21		
6	DIGEST	Center, 1st		0.12	0.17		
7		East Walkway, 2nd		0.11	0.17		
8		#3 Digestor, -2nd		0.14	0.20		
10	DENTRATION	N. End #1, -1st		0.07	0.10		
38		Between #3 & #4, 1st		0.09	0.11		
39		W. #3 Boildown Tank, 1st		0.08	0.16		
11		W. Side #2, 2nd		0.09	0.17		
12		E. Side #2, 2nd		0.12	0.12		
40		Between #3 & #4, 2nd		0.17	0.10		
13	REDUCTION-HYFROFLUORINATION	A-Reactor Blower, 1st		0.10	0.18		
41		B-Reduction Reactor, 1st		0.14	0.14		
14		A Backup Filters, 2nd		0.19	0.11		
42		B-Line, 2nd		0.08	0.15		
15		A-Line HF CLR, W., 4th		0.12	0.06		
16		UO2 Seal Bin, E., 4th		0.19	0.17		
43		B-Line, 3rd		0.22	0.23		
17		2nd Stage HFR, 3rd		0.11	0.08		
18		N. of UO3 Pulverizer, 3rd		0.11	0.08		
44		B-Line HFR CLR, S., 4th		0.14	0.14		
19		AHF Furnace, 1st		0.18	0.12		
20	FLUORINATION	511 Conveyor, S., 4th		2.30	1.60		
21		511 Conveyor, NE., 4th		0.86	0.89		
22		#5 Tower, 1st		0.17	0.25		
23		#3 Tower, 1st		0.41	0.52		
24		F2 Heater #1, W., 2nd		0.21	0.13		
25		F2 Heater #3, NW., 2nd		0.10	0.11		
26		#5 Tower, S., 2nd		0.30	0.48		
27		Cold Trap #2, E., 3rd		0.24	0.14		
28		Cold Trap #2, W., 3rd		0.19	0.16		
29		Feed Bin #3, 3rd		1.20	1.80		
30		Feed Bin Center, 3rd		0.68	1.18		
36	MISCELLANEOUS	UF6 Scale Room		0.13	0.29		
37s		Decon Room, South		0.10	0.10		
37w		Decon Room, West		0.10	0.08		
32		Maint. Shop, SE.		0.22	0.20		
45		Maint. Shop, West		0.19	0.16		
34		#1 F2 Plant		0.11	0.10		
35		Cell Reword Area		0.13	0.19		
46		#2 F2 Plant		0.06	0.12		
47	MISC DIGEST	N. Side Dumping Station, 3rd					
48		S. Side Dumping Station, 3rd					
49		Drum Filling Station, 1st					
50	ASH REC	Ash Receiver DeSmoke House		0.30	0.34		

Contamination Incident Report required for restricted area concentrations > 3×10^{-10} uCi/ml

JCS 1/6/86

Plant Air Samples

1/5/86

0001 1/5/86 0800 1/5/86 1600 1/
0800 1/5/86 1600 1/5/86 2400 1/

Reported values are the fractions of the restricted MPC (1×10^{-10} μCi/ml)

1	SAMPLING	South Wall, 1st	0.07	0.05		
2		Splitter, 2nd	0.09	0.08		
3		Splitter, 3rd	0.09	0.08		
4		Drum Dumper, 4th	0.08	0.13		
5		Sample Prep Room	0.08	0.11		
6	DIGEST	Center, 1st	0.16	0.12		
7		East Walkway, 2nd	0.07	0.06		
8		#3 Digestor, 2nd	0.10	0.08		
10	DENTRATION	N. End #1, 1st	0.05	0.04		
38		Between #3 & #4, 1st	0.07	0.03		
39		W. #3 Boildown Tank, 1st	0.09	0.04		
11		W. Side #2, 2nd	0.08	0.06		
12		E. Side #2, 2nd	0.10	0.06		
40		Between #3 & #4, 2nd	0.10	0.04		
13	REDUCTION-HYFROFLUORINATION	A-Reactor Blower, 1st	0.08	0.03		
41		B-Reduction Reactor, 1st	0.13	0.05		
14		A Backup Filters, 2nd	0.09	0.04		
42		B-Line, 2nd	0.10	0.05		
15		A-Line HF CUR, W., 4th	0.06	0.04		
16		UO2 Seal Bin, E., 4th	0.18	0.08		
43		B-Line, 3rd	0.18	0.13		
17		2nd Stage HFR, 3rd	0.10	0.07		
18		N. of UO3 Pulverizer, 3rd	0.04	0.04		
44		B-Line HFR CUR, S., 4th	0.08	0.05		
19		AHF Furnace, 1st	0.09	0.05		
20	FLUORINATION	511 Conveyor, S., 4th	0.69	0.37		
21		511 Conveyor, NE., 4th	0.13	0.24		
22		#5 Tower, 1st	0.09	0.26		
23		#3 Tower, 1st	0.31	0.12		
24		F2 Heater #1, W., 2nd	0.11	0.06		
25		F2 Heater #3, NW., 2nd	0.12	0.15		
26		#5 Tower, S., 2nd	0.09	0.41		
27		Cold Trap #2, E., 3rd	0.12	0.09		
28		Cold Trap #2, W., 3rd	0.09	0.24		
29		Feed Bin #3, 3rd	0.30	0.40		
30		Feed Bin Center, 3rd	0.24	0.20		
36	MISCELLANEOUS	UF6 Scale Room	0.09	0.09		
37s		Decon Room, South	0.06	0.03		
37w		Decon Room, West	0.08	0.04		
32		Maint. Shop, SE.	0.11	0.10		
45		Maint. Shop, West	0.11	0.02		
34		#1 F2 Plant	0.10	0.08		
35		Cell Reword Area	0.08	0.03		
46		#2 F2 Plant	0.06	0.09		
47	MISC DIGEST	N. Side Dumping Station, 3rd				
48		S. Side Dumping Station, 3rd				
49		Drum Filling Station, 1st				
50	ASH REC	Ash Receiver DeSmoke House	0.15	0.22		

Contamination Incident Report was [illegible] for contained area

NRC

Daily Air Monitoring Report

0001 1/16 0800 1/16 1600 1/16-86
0800 1/16 1600 1/16 2400 1/16-86

NRC

1	SAMPLING	South Wall, 1st	06	.07	.06	
2		Splitter, 2nd	08	.08	.05	
3		Splitter, 3rd	08	.12	.07	
4		Drum Dumper, 4th	07	.07	.09	
5		Sample Prep Room	09	.09	.03	
6	DIGEST	Center, 1st	12	.12	.12	
7		East Walkway, 2nd	06	.04	.03	
8		#3 Digestor, 2nd	10	.09	.07	
10	DENTRATION	N. End #1, 1st	04	.03	.05	
38		Between #3 & #4, 1st	06	.03	.05	
39		W. #3 Boildown Tank, 1st	04	.09	.05	
11		W. Side #2, 2nd	03	.05	.04	
12		E. Side #2, 2nd	08	.07	.05	
40		Between #3 & #4, 2nd	05	.05	.03	
13	REDUCTION-HYFROFLUORINATION	A-Reactor Blower, 1st	07	.04	.03	
41		B-Reduction Reactor, 1st	08	.04	.06	
14		A Backup Filters, 2nd	05	.06	.03	
42		B-Line, 2nd	08	.06	.05	
15		A-Line HF CUR, W., 4th	04	.02	.02	
16		UO2 Seal Bin, E., 4th	10	.07	.09	
43		B-Line, 3rd	15	.13	.11	
17		2nd Stage HFR, 3rd	06	.06	.04	
18		N. of UO3 Pulverizer, 3rd	05	.05	.03	
44		B-Line HFR CUR, S., 4th	05	.04	.03	
19		AHF Furnace, 1st	05	.05	.04	
20	FLUORINATION	511 Conveyor, S., 4th	27	.22	.13	
21		511 Conveyor, NE., 4th	06	.07	.01	
22		#5 Tower, 1st	05	.05	.04	
23		#3 Tower, 1st	(A) 1.10	1.02	.77	
24		F2 Heater #1, W., 2nd	08	.05	.06	
25		F2 Heater #3, NW., 2nd	07	.07	.03	
26		#5 Tower, S., 2nd	06	.05	.02	
27		Cold Trap #2, E., 3rd	06	.04	.05	
28		Cold Trap #2, W., 3rd	06	.07	.04	
29		Feed Bin #3, 3rd	28	.28	.12	
30		Feed Bin Center, 3rd	27	.25	.23	
36	MISCELLANEOUS	UF6 Scale Room	06	.07	.04	
37s		Decon Room, South	03	.04	.02	
37w		Decon Room, West	07	.04	.02	
32		Maint. Shop, SE.	10	.06	.06	
45		Maint. Shop, West	08	.05	.07	
34		#1 F2 Plant	06	.04	.03	
35		Cell Heword Area	07	.05	.04	
46		#2 F2 Plant	10	.18	.01	
47	MISC DIGEST	N. Side Dumping Station, 3rd				
48		S. Side Dumping Station, 3rd				
49		Drum Filling Station, 1st				
50	ASH REC	Ash Receiver DeSmoke House				
			14	.12	.09	

Contamination

Prep'd for Samples 1-7-86

0001 1/7 0800 1/7 1600 1/7
0800 1/7 1600 1/7 2400 1/7

1/8/86 14:30 by [illegible]

1	SAMPLING	South Wall. 1st	.06	.17	.06	
2		Splitter, 2nd	.05	.10	.07	
3		Splitter, 3rd	.08	.15	.08	
4		Drum Dumper, 4th	.08	.14	.06	
5		Sample Prep Room	.05	.05	.09	
6	DIGEST	Center, 1st	.11	.14	.12	
7		East Walkway, 2nd	.06	.07	.05	
8		#3 Digestor, 2nd	.06	.09	.07	
10	DENTRATION	N. End #1, 1st	.03	.04	.04	
38		Between #3 & #4, 1st	.05	.12	.03	
39		W. #3 Boildown Tank, 1st	.04	.07	.05	
11		W. Side #2, 2nd	.03	.04	.04	
12		E. Side #2, 2nd	.04	.07	.06	
40		Between #3 & #4, 2nd	.05	.05	.04	
13	REDUCTION-HYFROFLUORINATION	A-Reactor Blower, 1st	.02	.05	.07	
41		B-Reduction Reactor, 1st	.03	.04	.06	
14		A Backup Filters, 2nd	.05	.05	.05	
42		B-Line. 2nd	.07	.08	.06	
15		A-Line HF CLR, W., 4th	.02	.03	.02	
16		UO2 Seal Bin, E., 4th	.03	.08	.03	
43		B-Line, 3rd	.04	.06	.08	
17		2nd Stage HFR, 3rd	.04	.03	.05	
18		N. of UO3 Pulverizer, 3rd	.04	.03	.03	
44		B-Line HFR CLR, S., 4th	.06	.05	.04	
19		AHF Furnace, 1st	.03	.06	.07	
20	FLUORINATION	511 Conveyor, S., 4th	.05	.06	.08	
21		511 Conveyor, NE., 4th	.03	.02	.07	
22		#5 Tower, 1st	.02	.03	.04	
23		#3 Tower, 1st	.05	.06	.07	
24		F2 Heater #1, W., 2nd	.05	.05	.09	
25		F2 Heater #3, NW., 2nd	.02	.06	.06	
26		#5 Tower, S., 2nd	.05	.08	.07	
27		Cold Trap #2, E., 3rd	.04	.07	.07	
28		Cold Trap #2, W., 3rd	.04	.05	.04	
29		Feed Bin #3, 3rd	.03	.08	.06	
30		Feed Bin Center, 3rd	.03	.06	.06	
36	MISCELLANEOUS	UF6 Scale Room	.04	.07	.07	
37s		Decon Room, South	.02	.05	.04	
37w		Decon Room, West	.03	.06	.04	
32		Maint. Shop, SE.	.07	.09	.19	
45		Maint. Shop, West	.06	.07	.09	
34		#1 F2 Plant	.05	.07	.07	
35		Cell Reword Area	.03	.04	.06	
46		#2 F2 Plant	.05	.06	.08	
47	MISC DIGEST	N. Side Dumping Station, 3rd				
48		S. Side Dumping Station, 3rd				
49		Drum Filling Station, 1st				
50	ASH REC	Ash Receiver DeSmoke House	.14	.17	.14	

Contamination Incident Report required for restricted area concentrations > 3×10^{-10} uCi/ml

1/4/86
1502
by: Greenwood
To: S. Emerson
B. Wrage
J. Straub

CN 196

Survey & Roaster on 1/4/86

1300-1315

Hwy - 10 -

1/4/86 KHL

		Direct α cpm
NORTH of I/40 Bridge	-	<200
1/2 to plant	-	200
(South State) at hyway Islands	-	<200

H-4

1-H-86
KBL 1300-1330

I/40 South - EAST BOUND Direct & cpm - ∠200 On Ramp to I/40 (1/2 mile) (Interv)

1/2 - ∠200

1 mile - ∠200

1 1/2 mile - ∠200

2 mile - ∠200

2 1/2 mile - ∠200

WEST BOUND (ON RAMP - WEST)

I-40 North — ∠200

OFF RAMP - ∠200

1 - ∠200

1 1/2 - ∠200

2 - ∠200

2 1/2 mile - ∠200

I-40/North - WEST of (40) - 1/2 mile ∠200

I-40/South - WEST of (40)

1/2 mile - ∠200

Admin. Area Chemistry

Sequoyah Facility Direct and Smear Survey

Date 1-4-85

KOS-002

	Direct-dpm 59 cm²	Smear-dpm 100 cm²
LOBBY CARPET	400	
DESK AT DOOR		1200
MODEL DESK		700
COMPUTER ROOM WINDOW		200
TELEPHONE DESK		300
LUNCH ROOM FLOOR		500
WOMENS CHANGE ROOM ENTRANCE		600
HP OFFICE BACK FLOOR		900
HP OFFICE SINK	600	1100
MENS CHANGE ROOM ENTRANCE		400
MENS CHANGE ROOM - TOP OF LOCKER	SOUTH	500
" " " MIRROR		400
" " " FLOOR AT SINK		600
" " " PAINTING		<300
XEROX ROOM - TOP OF FILE CABINET		1200
FLOOR		1300
TOP OF BULLETIN BOARD		700
FRONT LAB BENCH		300
LAB BILL'S DESK		500
SWANEY'S DESK	1" @ 2500	700
LAB BENCH AT OVEN		700
ASSAY LAB WEST BENCH	2100	1000
WEST LAB NORTH BENCH		1100
COMPUTER ROOM	2900	1300
STAIRWAY - AT SMALL DOOR	2300	700
LUCRETIA'S OFFICE - DESK		600
LUCRETIA OFFICE - FLOOR		600
CONTROL ROOM - WEST CONTROL PANEL		1400
" " FLOOR NORTH		200
" " EAST CONTROL PANEL	1400	400
INSTRUMENT SHOP TABLE		200
" " FLOOR AT DESK		400
ENGINEER OFFICE - CAROLS DESK		800
STAIRWAY TO FILE ROOM	1800	600
FILE ROOM TABLE	1600	700
OUTSIDE FILE ROOM - WEST		600

* These areas require cleaning.
** Indicates general area.

1700

Sequoyah Facility Direct and Smear Survey

Date 1/?/86

[illegible signature]

Process area

	Direct-dpm 59 cm²	Smear-dpm 100 cm²
[illegible] Plant [illegible]	10,000	5000
[illegible]	[illegible]	1000
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	400
2RP	5000	1000
[illegible]	1400	400
Conf	2000	700
[illegible]	4000	1000
	4000	[illegible]
	2600	700
	14000	2000
[illegible]	8000	1800
	[illegible]	100

	Direct-dpm 59 cm²	Smear-dpm 100 cm²
[illegible]	38,000	1000
	3600	1000
	6000	2000
	14000	3000
[illegible]	2000	1000
[illegible]	14000	200
[illegible]	[illegible]	2500
[illegible]	10000	400
[illegible]	[illegible]	800
[illegible]	[illegible]	3000
[illegible]	[illegible]	1200
[illegible]	4000	150

* These areas require cleaning.
** Indicates general area.

LM 1/15/86

~~270-109~~

PROCEDURES RELATIVE IS UF_6 PROCESS

HP-8 = IN-PLANT AIR SAMPLING (INTERNAL EXPOSURE ESTIMATE)

ACCT-1 = PROCEDURE FOR UF_6 INVENTORY DAILY REPORT
ACCT-7 = RECEIVING UF_6 CYLINDERS
ACCT-8 = PREPARING UF_6 CYLINDERS FOR SHIP
ACCT-9 = SHIPPING UF_6

EMERGENCY INSTRUCTIONS

E-008 = EMERGENCY PROCEDURE FOR UF_6 RELEASE PROCESS INSTR.
N-270-3 = SECONDARY COLD TRAP OPERATION
N-270-4 = PRIMARY COLD TRAP OPERATION
N-270-5 = EMERGENCY DUMP TANK
N-270-7 = CLEAN UP REACTOR
N-270-8 = FLUORINATION TOWER OPERATION
N-270-10 = ASH GRINDING
N-270-11 = MOVING UF_6 SCALE CARTS
N-280-1 = UF_6 PRODUCT HANDLING AND SHIPPING
N-280-3 = UF_6 CYLINDER WASHING, INSPECTING + HYDROSTATIC TES

QUALITY ASSURANCE

QA-001 = QUALITY ASSURANCE FOR UF_6 SHIPPING CYLINDERS
QA-002 = INSPECTION - UF_6 CYLINDERS

Data for Cylinder
Filled with UF_6

Fig. 1: UF_6 Solid, $\rho(T)$ from NUREG/CR-4360, VI, 9/85
UF_6 Liquid, $\rho(T)$ from ORO-651, Rev 4
ρ of HF liq., $\rho_L(T)$ generated from:

$$\frac{(\rho_L - \rho_V)_1}{(\rho_L - \rho_V)_2} = \left(\frac{T_c - T_2}{T_c - T_1}\right)^{1/3}$$

Perry & Chilton, Chemical Engineers Handbook, 5th Ed., 3-230

and

T_c = crit. Temp HF = 188°C = 370°F
condition 1 at b.p. HF
$T_{b.p.}$ = 19.54°C = 67.2°F @ s.g. = .99
$\therefore \rho_{b.p.} = 61.7$ lb/ft^3; $\rho_{V,F\,for\,T_c} \overset{assumed}{=} 0$
$\rho_S = 300 - 0.18\,T\,(°F)$

: Data from CRC, Handbook of Chemistry and Physics, 60th Ed.
NUREG/CR-4360, VI § 2.1.3

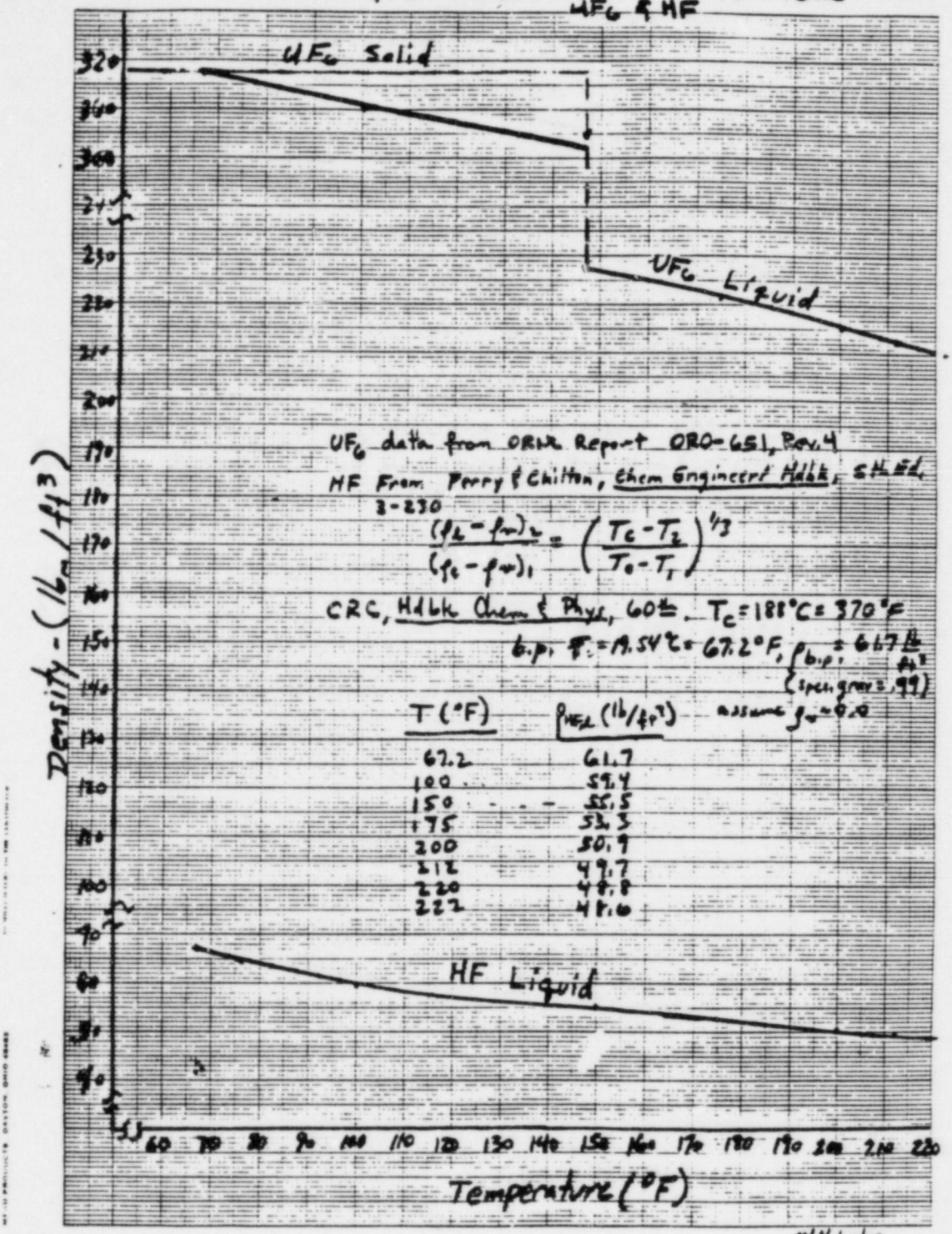
Fig 2. Volume of mix calculated at Temp. by assigning HF wt. Fract, x; therefore UF_6 wt Fract = $1-x$ (2 comp. sys.). Volume of HF then, $\tilde{V}_{HF} = W_T\,x/\rho_{HF}(T)$, $\tilde{V}_{UF_6} = W_T(1-x)/\rho_{UF_6}(T)$, W_T = Total wt. of mix

Fig 3. Solve $[V_T = W_T(1-x)/\rho_{UF_6} + W_T\,x/\rho_{HF}]$ for x setting V_T = Cyl. Vol = 144.12 ft^3, W_T = 29500 lb
$\rho_{UF_6}, \rho_{HF} = f(T)$.

Fig. 4 & 5. Fix Volume At 144 ft^3 and Find Weight of mixture of UF_6 + HF at given T that will fill cylinder

Vol based on 4072 kg water at 70°F for full cylinder

FIG 1. DENSITY VS TEMPERATURE
UF_6 & HF



UF_6 data from ORNL Report ORO-651, Rev. 4

HF From Perry & Chilton, Chem Engineers Hdbk, 5th Ed. 3-230

$$\frac{(\rho_L - \rho_w)_2}{(\rho_L - \rho_w)_1} = \left(\frac{T_c - T_2}{T_c - T_1}\right)^{1/3}$$

CRC, Hdbk Chem & Phys, 60th. $T_c = 188°C = 370°F$

b.p. $T_1 = 19.54°C = 67.2°F$, $\rho_{b.p.} = 667 \frac{lb}{ft^3}$ (spec. grav = .99)

assume $\rho_w = 0.0$

T (°F)	ρ_{HF_2} (lb/ft³)
67.2	61.7
100	59.4
150	55.5
175	53.3
200	50.9
212	49.7
220	48.8
222	48.6

WH Lake
1/10/86

Fig. 2 - Volume of 29,500 lb Mixture of UF_6 and HF

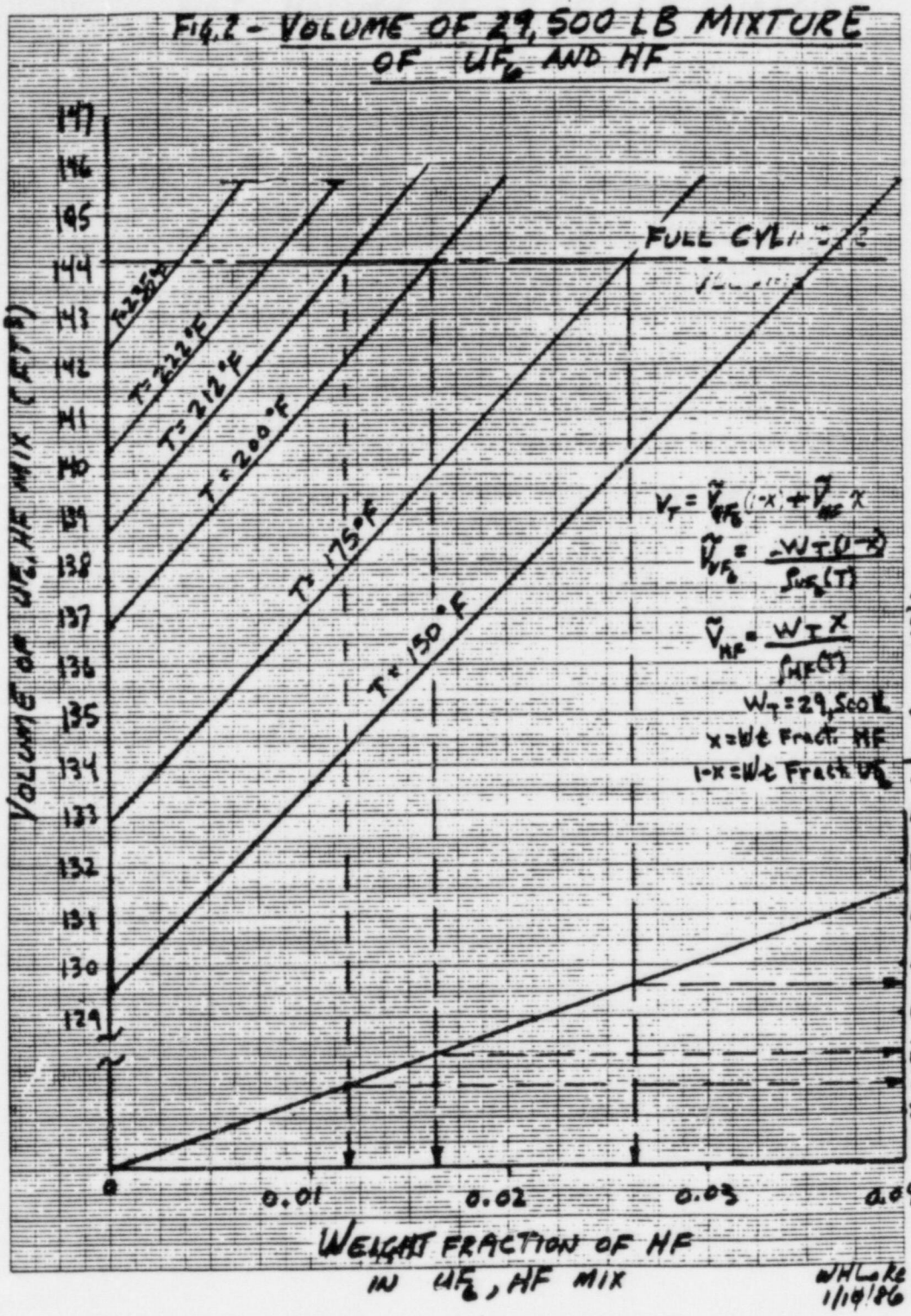
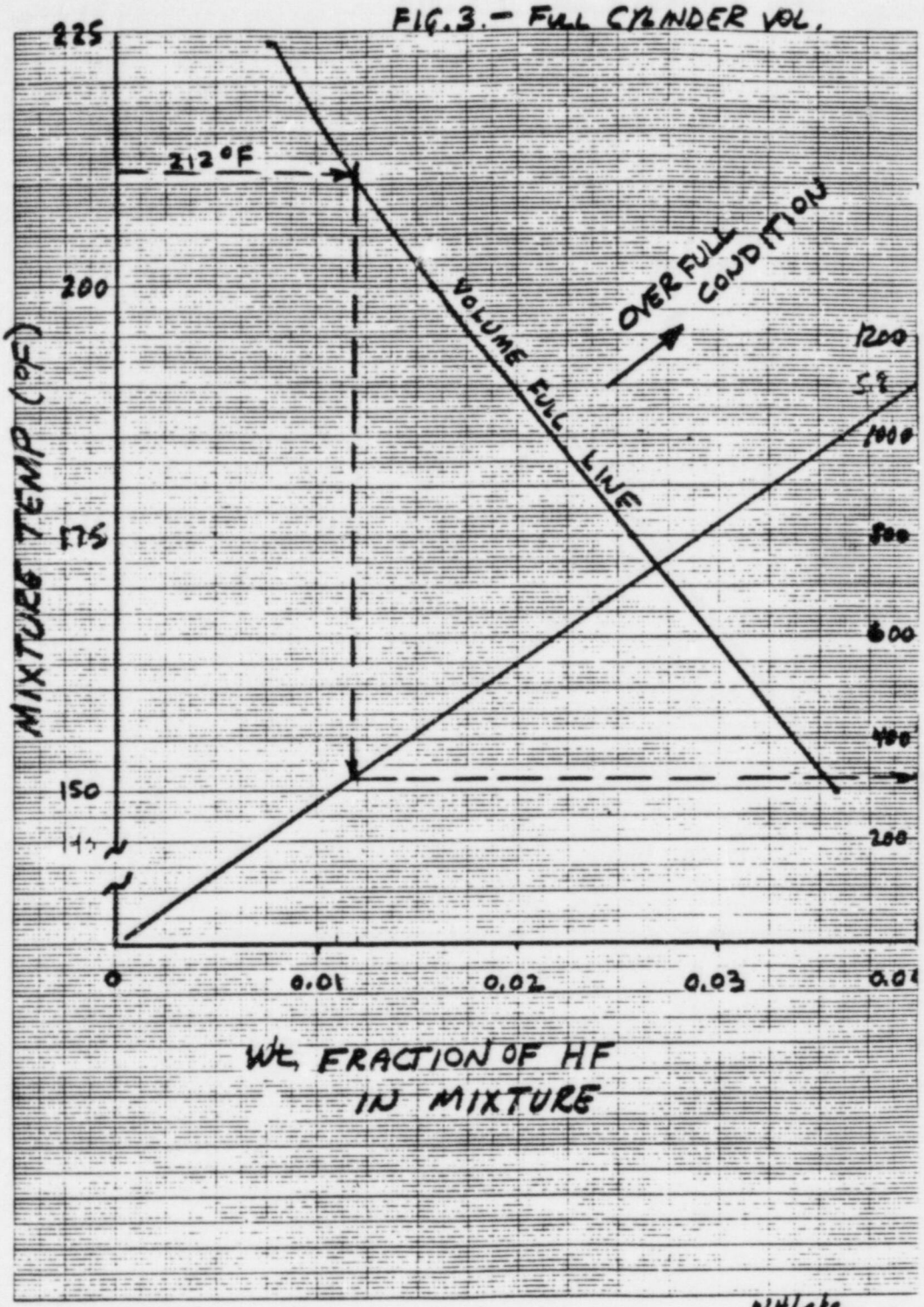
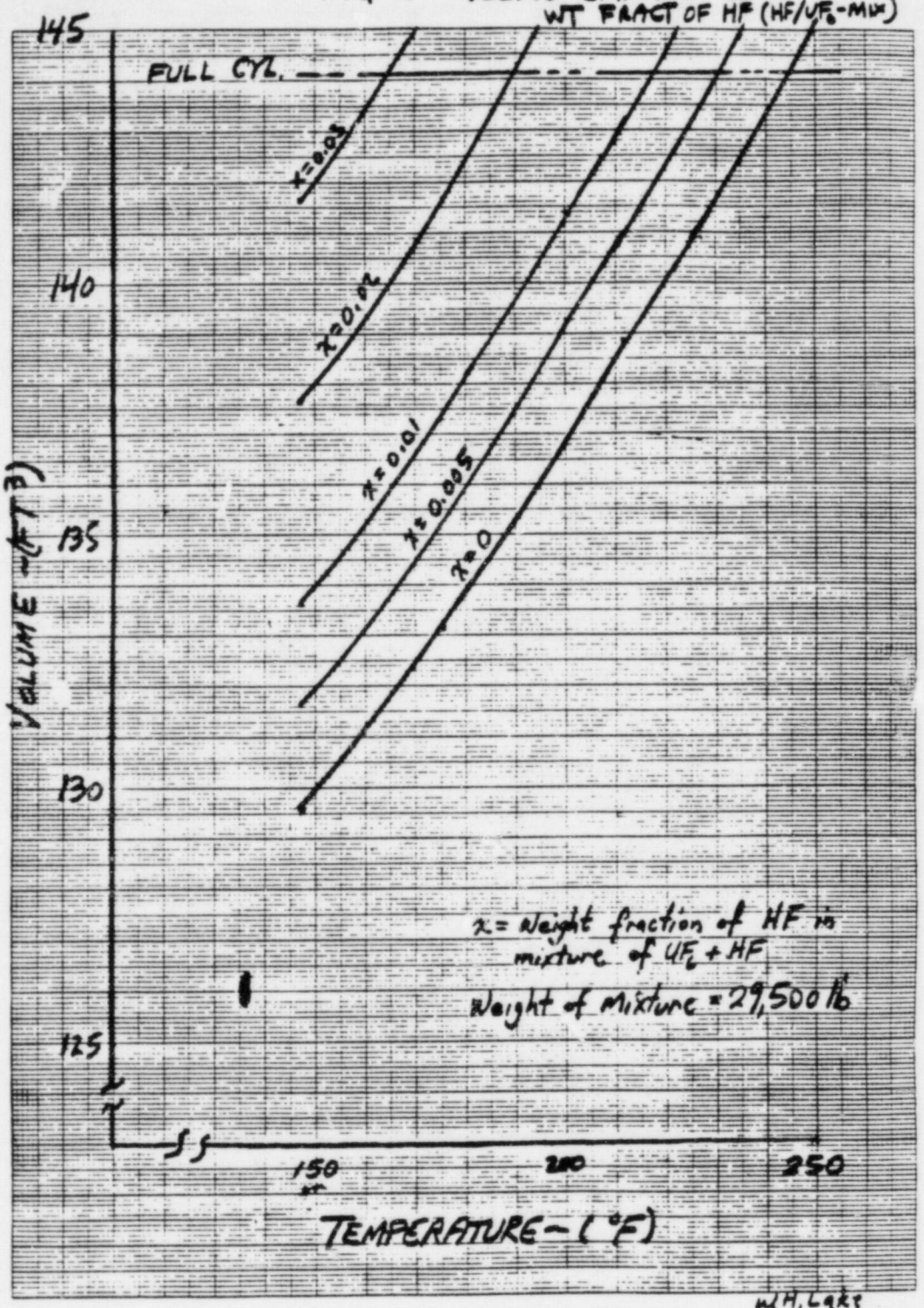


FIG. 3 – FULL CYLINDER VOL.



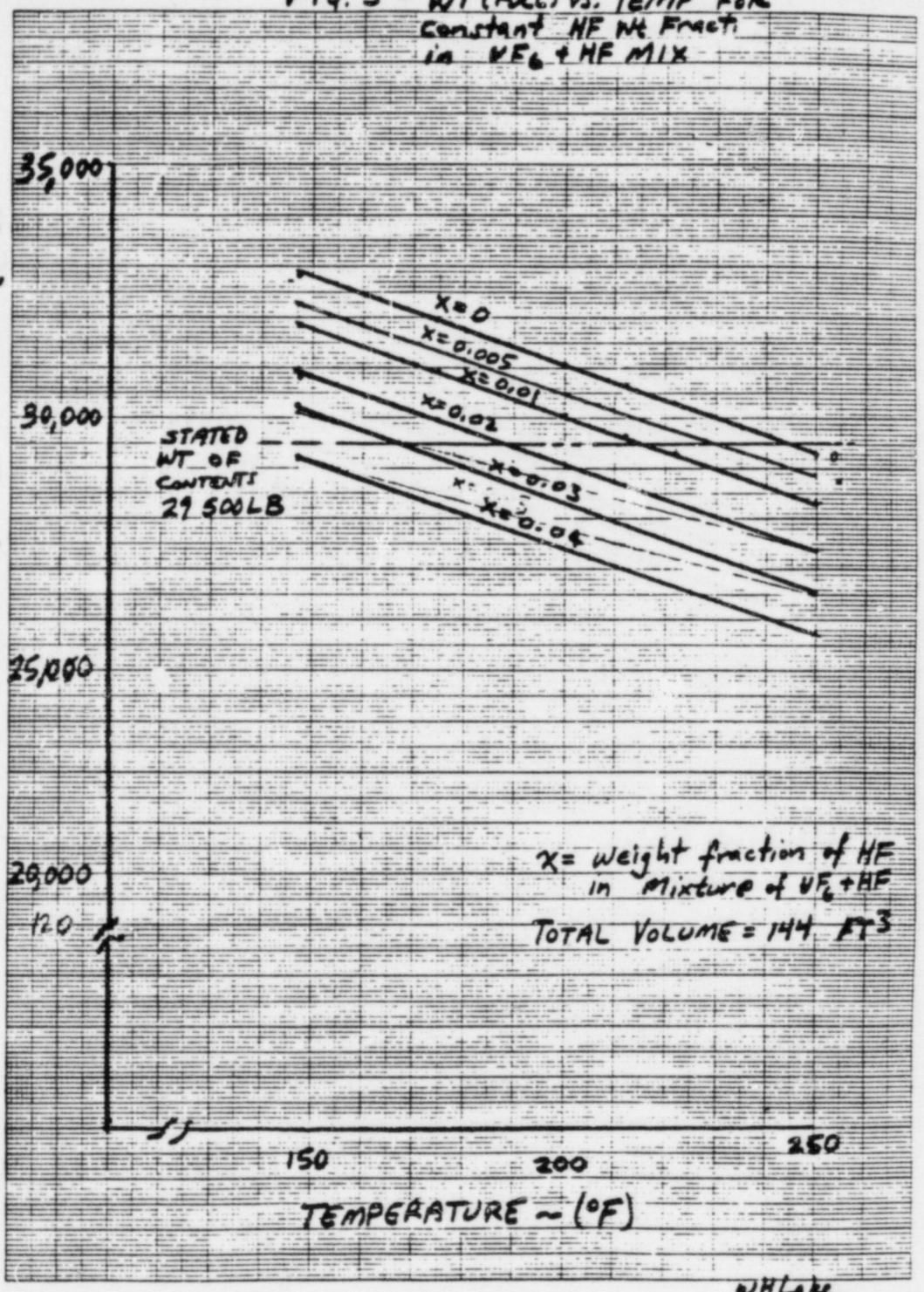
WH Lake
1/19/86

FIG. 4 - VOL. VS TEMP FOR CONSTANT WT FRACT OF HF (HF/UF_6-MIX)



W.H. Lyons
1/15/86

FIG. 5 - WT (FULL) VS. TEMP FOR CONSTANT HF WT. FRACT. IN UF_6 + HF MIX



WH Lake
1/13/86

	62.2	142.3°F	175°F	200°F	212°F	222°F	235°F	250°F	Units
ρ_{air}	1317.8	227.7	221.7	215.6	212.7	210.3	207.1	203.3	lb/ft³
ρ_{WF}	61.7	55.5	53.3	50.9	49.2	48.6	47.1	45.3	lb/ft³
$\vec{V}$=									
$\vec{V}_1$=29500 ρ_{WF}	92.83	129.56	133.06	136.83	138.69	140.28	142.44	145.11	ft³
$\vec{V}_2$=29,500 ρ_{air}	478.12	531.53	552.47	579.57	593.56	607.00	626.33	651.21	ft³

$V_F=\vec{V}_1+\vec{V}_2$	50 lb/ft³	60 lb/ft³ →						Units
x= .000	92.8	129.6	133.1	136.8	138.7	140.3	142.4	145.1	ft
.005	94.8	131.6	135.2	139.1	141.0	142.6	144.9	147.6	
.010	96.7	133.6	137.3	141.4	143.2	144.9	147.3	150.2	
.02	100.5	137.6	141.5	146.0	147.8	149.6	152.1	155.2	
.03	104.4	141.6	145.7	150.7	152.3	154.3	157.0	160.3	
.04	108.2	145.6	149.9	155.3	156.9	158.9	161.8	165.4	

$W_F=V_F\rho_{WF}$ ×29.5M									Units
x= .000	45,799.2	32815.2	31952.1	31071.7	30655.0	30307.5	29847.9	29278.7	lb
.005	44,868.1	32313.9	31455.1	30557.2	30160.4	29811.6	29349.4	28796.6	
.01	43,974.1	31827.7	30973.4	30059.5	29681.5	29331.6	28867.3	28311.3	
.02	42,288.8	30898.0	30053.0	29111.2	28767.9	28416.6	27949.0	27388.3	
.03	40,728.8	30021.0	29185.6	28220.9	27908.9	27557.0	27087.3	26523.6	
.04	39,278.2	29192.4	28367	27383.4	27099.8	26747.9	26277.2	25711.7	

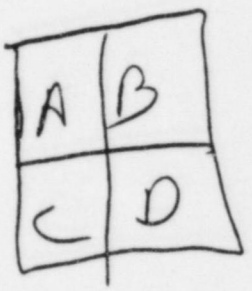
x									
.000	45800	32815	31952	31072	30655	30308	29848	29299	lb
.005	44868	32314	31455	30557	30160	29812	29349	28797	
.01	43974	31828	30973	30060	29682	29332	28867	28311	
.02	42289	30898	30053	29111	28768	28417	27949	27388	
.03	40729	30021	29186	28221	27909	27557	27087	26524	
.04	39278	29192	28367	27383	27100	26748	26277	25712	

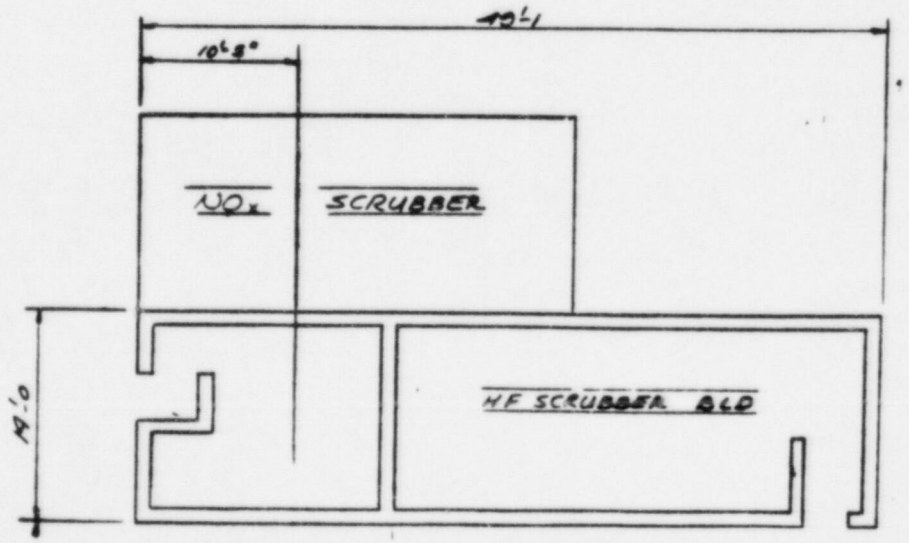
Drawing insert in here

A-2

(F)

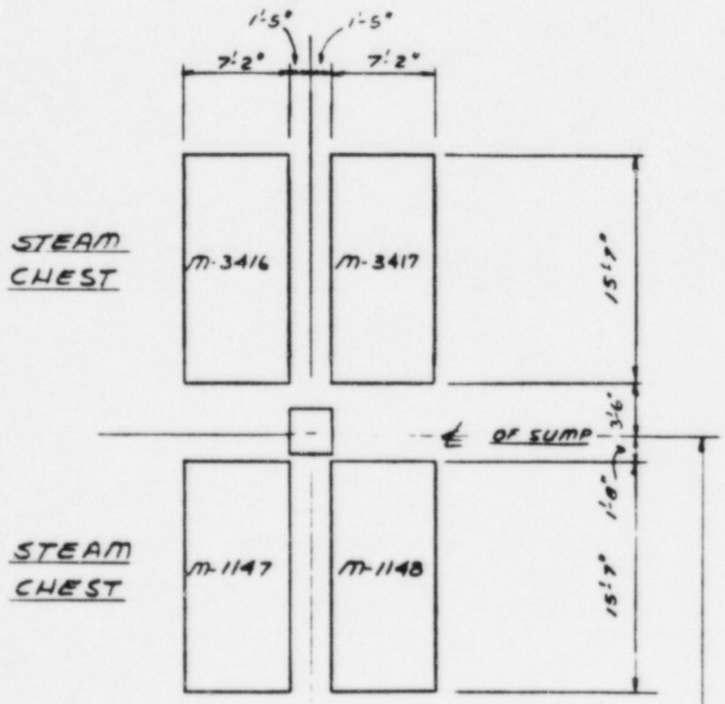
NO 1 TANK FARM





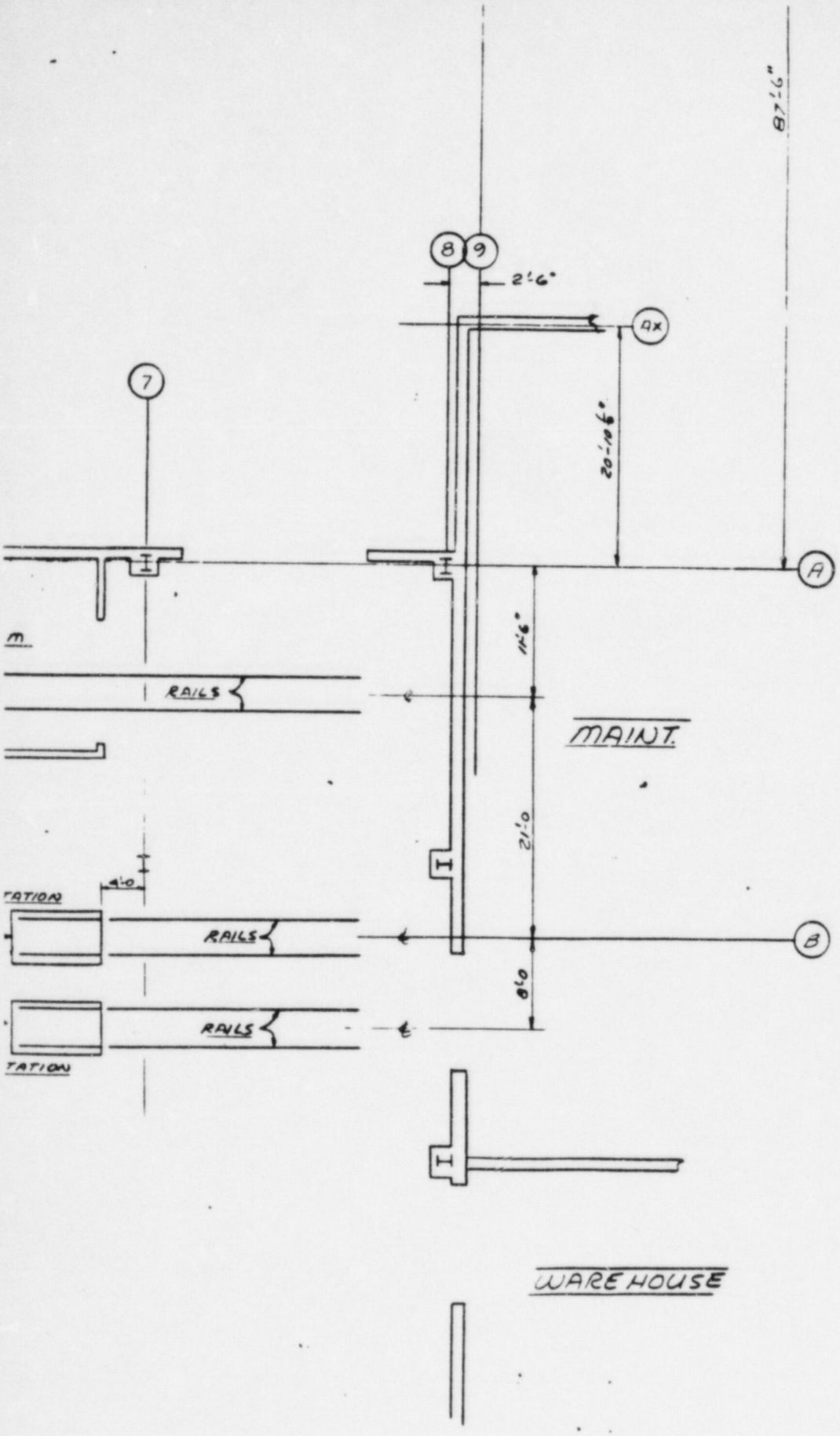
(B)

N

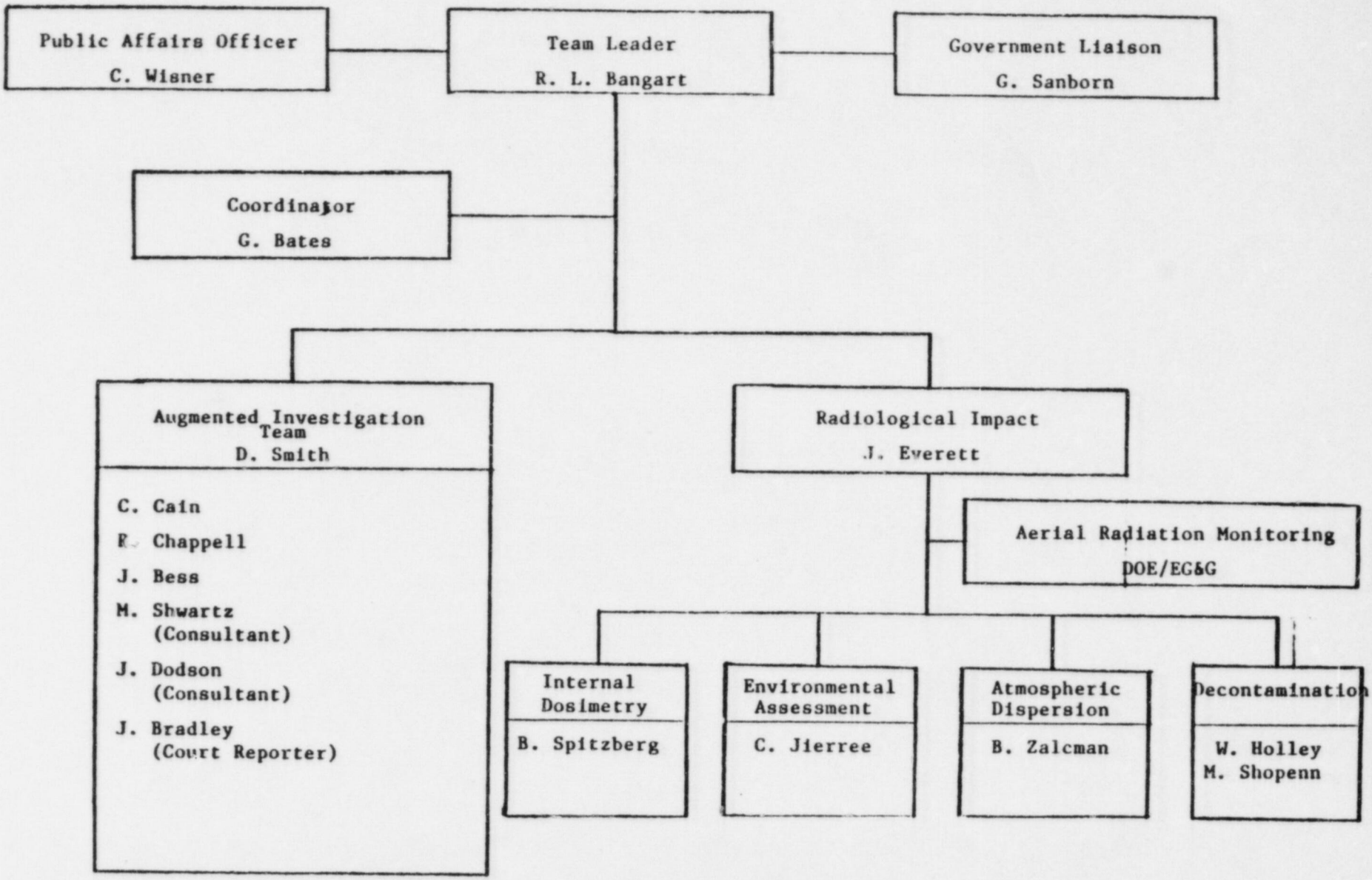

1'-5"
1'-5"
7'-2"
7'-2"
STEAM CHEST
M-3416
M-3417
15'-2"
3'-6"
℄ OF SUMP
1'-8"
STEAM CHEST
M-1147
M-1148
15'-2"

(1)

SEQUOYAH FUELS CORPORATION
KERR-McGEE CORPORATION
OKLAHOMA CITY, OKLA.
SEQUOYAH FACILITY
GORE, OKLA.
DRAWN RJS
DATE 12-86
APPROVED
UF6 CYLINDER FILLING, SCALE
ROOM AND STEAM CHEST
AREA, PLAN ARRANGEMENT
SCALE 3/8"=1'-0
DRAWING NUMBER
3333-M-1003
REV. NO.
DESCRIPTION
BY
DATE
APPR.
1/8/86 JCS
UF6 PROCESS PLANT
SCALE
CYL. FILL ST
SCALE
CYL. FILL ST
SCALE ROOM
32'-2"
3'-0
6
5
4


8
9
2'-6"
8'-1"
Ax
7
20'-10 5/8"
A
11'-6"
RAILS
MAINT.
21'-0
4'-0
RAILS
B
8'-0
RAILS
WAREHOUSE

Organization Chart
NRC Site Team
Sequoyah Fuels Facility



A-2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MEMORANDUM FOR: Victor Stello, Jr
Acting Executive Director for Operations

FROM: John G. Davis, Director
Office of Nuclear Material Safety and Safeguards

SUBJECT: DOCUMENTS REQUESTED BY CHAIRMAN MARKEY IN LETTER DATED FEBRUARY 4, 1986

Enclosed are additional documents and a list of the documents in response to Chairman Markey's request dated February 4, 1986.

These documents contain information which is restricted under the Privacy Act in that they contain work experience in the private sector and personal information such as birth date.

John G. Davis, Director
Office of Nuclear Material
Safety and Safeguards

Enclosure: Two copies of
documents and list

A-4