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CONTROLLED ENVIRONMENTAL RADIOIODINE TESTS,

PROGRESS REPORT NUMBER THREE

D. F. Bunch, Editor

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0030025

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CONTROLLED ENVIRONMENTAL RADIOIODINE TESTS, PROGRESS REPORT NUMBER THREE

D. F. BUNCH
Editor

HEALTH AND SAFETY
DIVISION

IDAHO OPERATIONS OFFICE
U. S. ATOMIC ENERGY COMMISSION

0030027

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0030028

SUMMARY

The emergence of nuclear reactors as competitive alternates for the production of electricity has given new impetus to the solution of questions regarding the behavior of radioactive materials in the environment. The Controlled Environmental Radioiodine Tests (CERT) program consists of field releases of various chemical species of radioiodine over different types of vegetation and during various meteorological conditions. Data collected from these releases are being used to derive empirical models that describe the movement of iodine through the air-vegetation-cow-milk-human chain. This third progress report contains information gathered during 1966 as well as a compilation of data relating to and including the deposition of I_2 and CH_3I over a wide range of meteorological conditions.

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CONTROLLED ENVIRONMENTAL RADIOIODINE TESTS, PROGRESS REPORT NUMBER THREE

I. INTRODUCTION

The Controlled Environmental Radioiodine Tests (CERT) were originally proposed as a project to determine the fate of radioiodine in the environment from the point of release to its ultimate deposition in humans. As in other areas of nuclear and radiation safety, little information has been available to permit reliable extrapolation of experimental results to all conditions. The CERT program consists of field releases of various chemical species of radioiodine over different types of vegetation and during various meteorological conditions. Data collected from these releases are being used to derive empirical models that describe the movement of iodine through the air-vegetation-cow-milk-human chain. Because much of the investigation is of a rather basic nature, the USAEC's Division of Biology and Medicine has contributed funds for the support of this project.

The purpose of this report is to acquaint the reader with the development of the project and to present the data obtained thus far. No attempt is made in this report to analyze any of the data. Some data evaluation has been given in past progress reports [1-3] and publications [4-6]. We plan to publish several IDO reports covering individual areas of the CERT program.

0030033

II. PROGRAM OBJECTIVES

1. GENERAL OBJECTIVES

As outlined in the introduction, the CERT program involves a detailed examination of the variables which influence the transport of radioiodine in the air-grass-milk-human food cycle. The program has three major goals:

(1) To derive a mathematical model to predict the deposition and retention of radioiodine as a function of (a) vegetation type and state, (b) chemical and physical form of radioiodine, and (c) meteorological conditions

(2) To derive a mathematical model to predict the transfer of radioiodine from vegetation to milk

(3) To derive a mathematical model to predict the dose from radioiodine to humans.

This section describes the objective of each CERT test with respect to the above goals.

2. TEST OBJECTIVES

Table I lists the objective of each test conducted to date. The effort so far has involved an examination of the behavior of molecular forms of radioiodine. Preliminary results indicate that although the radioiodine is released in elemental form, by the time it reaches the site of deposition a significant fraction is attached to particulate matter. An additional objective of future tests will be to examine the behavior of particulate matter in the environment.

The first 12 tests were performed to determine the variation of the three relationships shown in Table I (under CERT 1 objectives) as a function of time of year, chemical species of iodine, and atmospheric conditions. The approach was wholly empirical. As more data were gathered, these objectives were modified so that each successive test series (for example, CERTs 13 through 18 for deposition studies) was designed to provide insight into the phenomena producing the observed variations in the first two of the three basic relationships specified for CERT 1. After sufficient information was gained, the third relationship under CERT 1 was redirected toward inhalation experiments.

0030034

TABLE I

OBJECTIVES OF SPECIFIC CERT TESTS

Test Number	Release Time	Date	Location	Test Objectives
1	1500	5/27/63	Atomic City Area	To check techniques and experimental design to be used in establishing three basic relationships under known natural release conditions: (1) The amount of radioiodine in the air relative to that in soil and vegetation (2) The amount of radioiodine on the vegetation relative to that in milk (3) The quantity of radioiodine in milk relative to that in the human thyroid after drinking the milk.
2	1344	9/2/64	Experimental Dairy Farm (EDF)	To determine the three relationships in test 1 above using an irrigated pasture typical of present farming practices in this area.
3	1354	12/11/64	EDF	To obtain information on the meteorological aspects of iodine deposition using snow as the surface for deposition.
4	0430	5/27/65	South of SL-1	To measure the deposition velocity of I_2 on grass during stable atmospheric conditions.
5	0515	6/10/65	South of SL-1	Same as Test 4.
6	1400	9/14/65	ICPP Stack (Idaho Chemical Processing Plant)	To evaluate the behavior of CH_3I in the milk-food chain.
7	1410	11/22/65	EDF	To determine radioiodine behavior in late fall or winter.
8	2040	5/31/66	NE of ICPP	To check techniques and experimental design to be used in evaluating the deposition of radioiodine under various meteorological conditions.
9	0245	6/7/66	NE of ICPP	Same as Test 8.
10	1040	6/14/66	Test Grid 3	To determine the behavior of elemental iodine over travel distances typical of postulated reactor accidents.
11	1323, 1331	7/21/66	EDF	To evaluate the behavior of CH_3I in the milk-food chain.

0030035

TABLE I (Contd.)

OBJECTIVES OF SPECIFIC CERT TESTS

Test Number	Release Time	Date	Location	Test Objectives
12	2108	7/26/66	EDF	To measure the deposition of CH_3I at night.
13	1020	8/3/66	EDF	To measure the deposition of elemental iodine as a function of meteorological conditions.
14	0234	8/5/66	EDF	Same as Test 13.
15	0540	8/5/66	EDF	Same as Test 13.
16	0230	8/24/66	EDF	Same as Test 13.
17	0530	8/24/66	EDF	Same as Test 13.
18	1955	9/8/66	EDF	Same as Test 13.
19	1024	11/7/66	EDF	To evaluate the behavior of radioiodine in late fall.

0030036

III. EXPERIMENTAL CONDITIONS AND TECHNIQUES

1. GENERAL SUMMARY

As shown in Figure 1 and as described in Table I, there have been a number of locations used for sampling during the 19 field releases. Tests 1, 4, 5, 8, and 9 were conducted over open-range crested wheat grass and the rest of the tests over an irrigated field of mixed pasture grass. Sampling can be broken into three broad categories: (a) measurements of airborne activity, (b) deposited activity, and (c) milk activity. As program needs have been modified and as test objectives have changed, the types of samples taken have varied. This section describes the systems employed in each test.

2. METHODS OF RELEASING RADIOIODINE

In all field tests except Tests 4, 6, 11, and 12, radioiodine was released to the atmosphere by a technique known as "sparging". Sparging involves bubbling a relatively nonreacting gas (in this case nitrogen) into the atmosphere. The experimental apparatus is presented schematically in Figure 2. About 10 mg of stable sodium iodide carrier and an appropriate amount of sodium sulfite are added to the reaction flask to maintain the iodine-131 as reduced iodide prior to release time. Just before sparging is started, a small quantity of sodium nitrite is added to the flask to oxidize the iodide to iodine atoms, which presumably combine and evolve as gaseous I_2.

Test 4 involved the release of radioiodine by CCl_4 extraction and subsequent evaporation. Test 6, as described in Reference 3, involved the evaporation of CH_3I from shipping vials.

Tests 11 and 12 were also tests with CH_3I. A photograph of one release point in CERT 11 is shown in Figure 3. In these tests, the release was accomplished by actuating a spring-loaded pin which broke or crushed a vial containing CH_3I. The liquid flowed into a dish and evaporated.

In all tests except CERT 6 attempts were made to determine the rate of release of material. These measurements were taken by periodically noting the scale deflection of a "Cutie-Pie" dose rate meter or by means of a recording rate meter as shown in Figure 3. In each case the release diminished exponentially with time. Half-times for the releases are shown in Table II and a typical dose decay rate is illustrated in Figure 4. The rate of release with sparging techniques was controlled by the bubbling rate of nitrogen. In CERT 11, the evaporation dish was warmed by the sun and the material evaporated very quickly. In CERT 12, the evaporation dish was cooled prior to the test and the evaporation rate was much slower.

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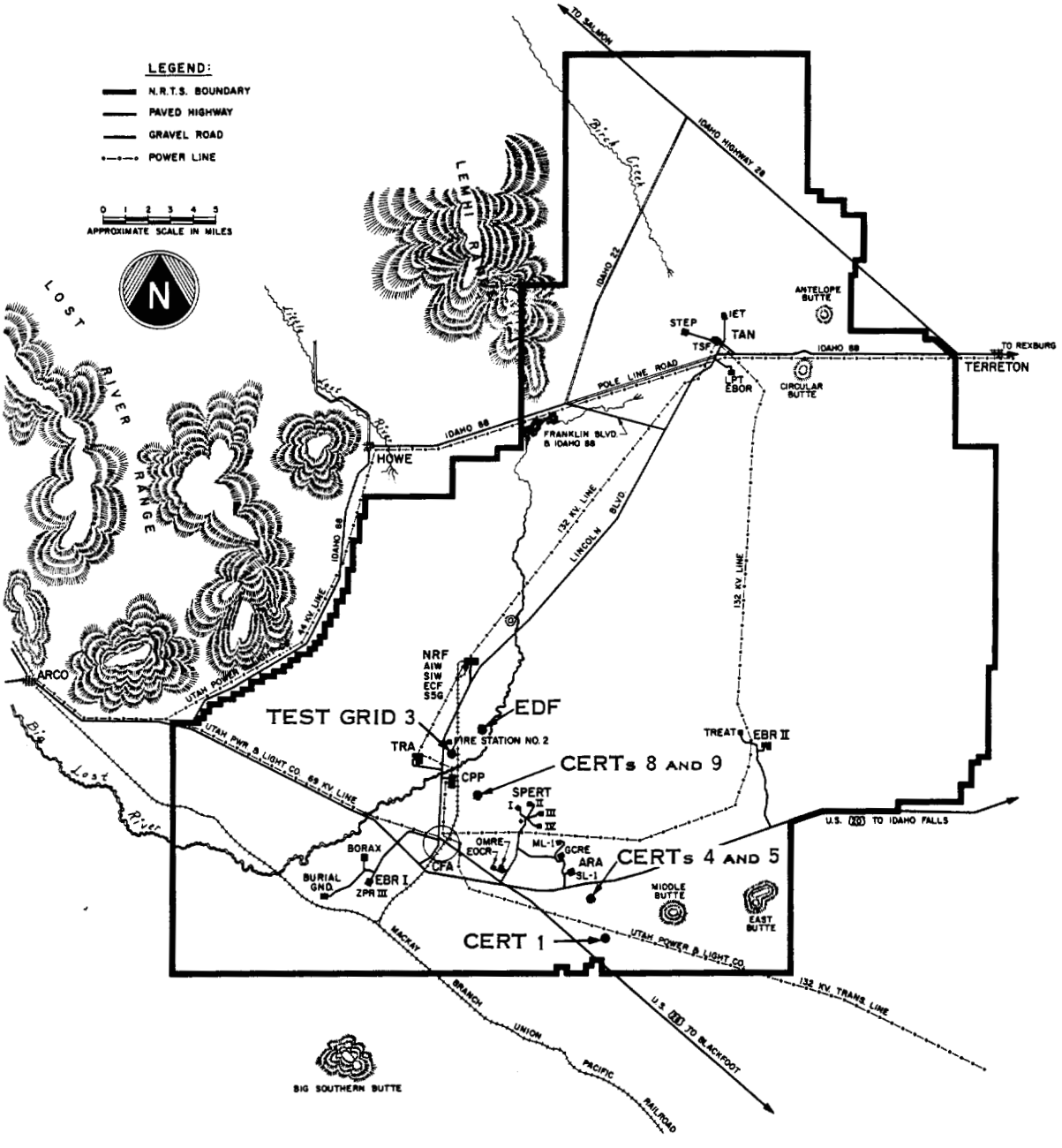

Fig. 1 Locations of individual CERT tests.

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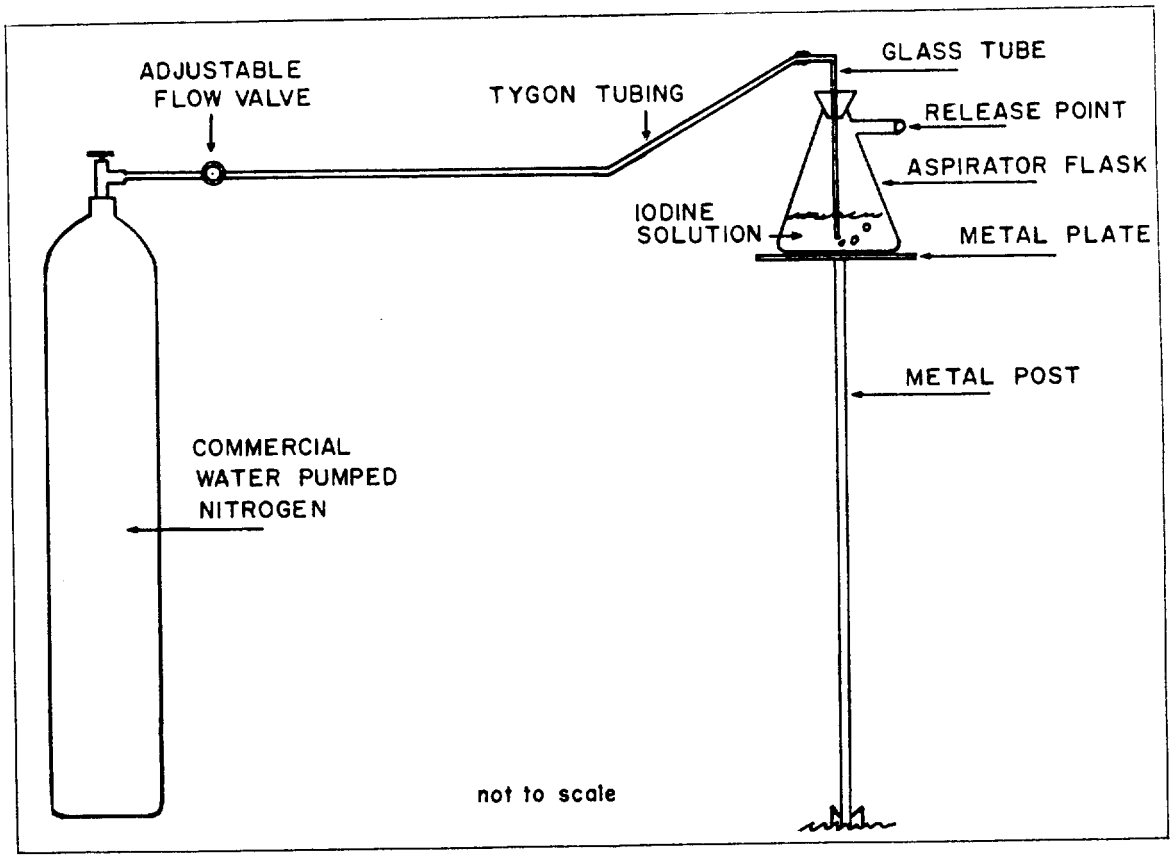

Fig. 2 Schema of iodine generator.

TABLE II

AVERAGE HALF-TIMES
OF RADIOIODINE TO BE RELEASED

Test	Time (minutes)
1	16.0
2	14.0
3	8.0
4	3.2
5	4.6
6	not measured
7	6.3
8	4.1
9	2.6
10	2.6
11	0.2
12	8.6
13	7.0
14	5.2
15	2.4
16	6.3
17	4.8
18	7.2
19	13.0

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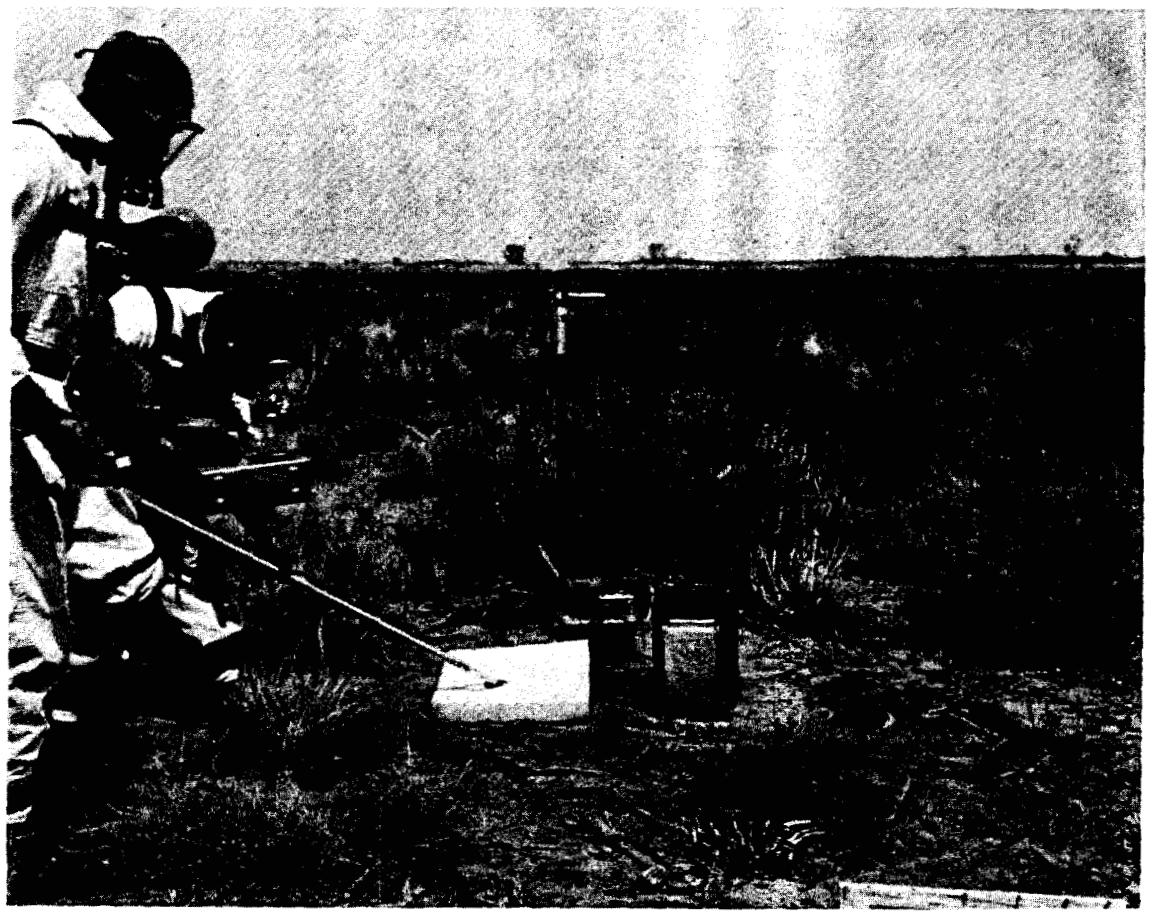

Fig. 3 Method of measuring release rate of radioiodine.

3. GRID SYSTEMS

The grid systems and sampling for Tests 1 through 7 have been previously described [2, 3] so that only grid systems employed during 1966 are discussed here.

3.1 CERTs 8 and 9

Tests 8 and 9 were conducted over a relatively small area of open-range crested wheat grass some 3500 meters south of the Experimental Dairy Farm. As shown in Figures 5a and 5b, two sampling lines (arcs A and B) 100 meters apart were employed.

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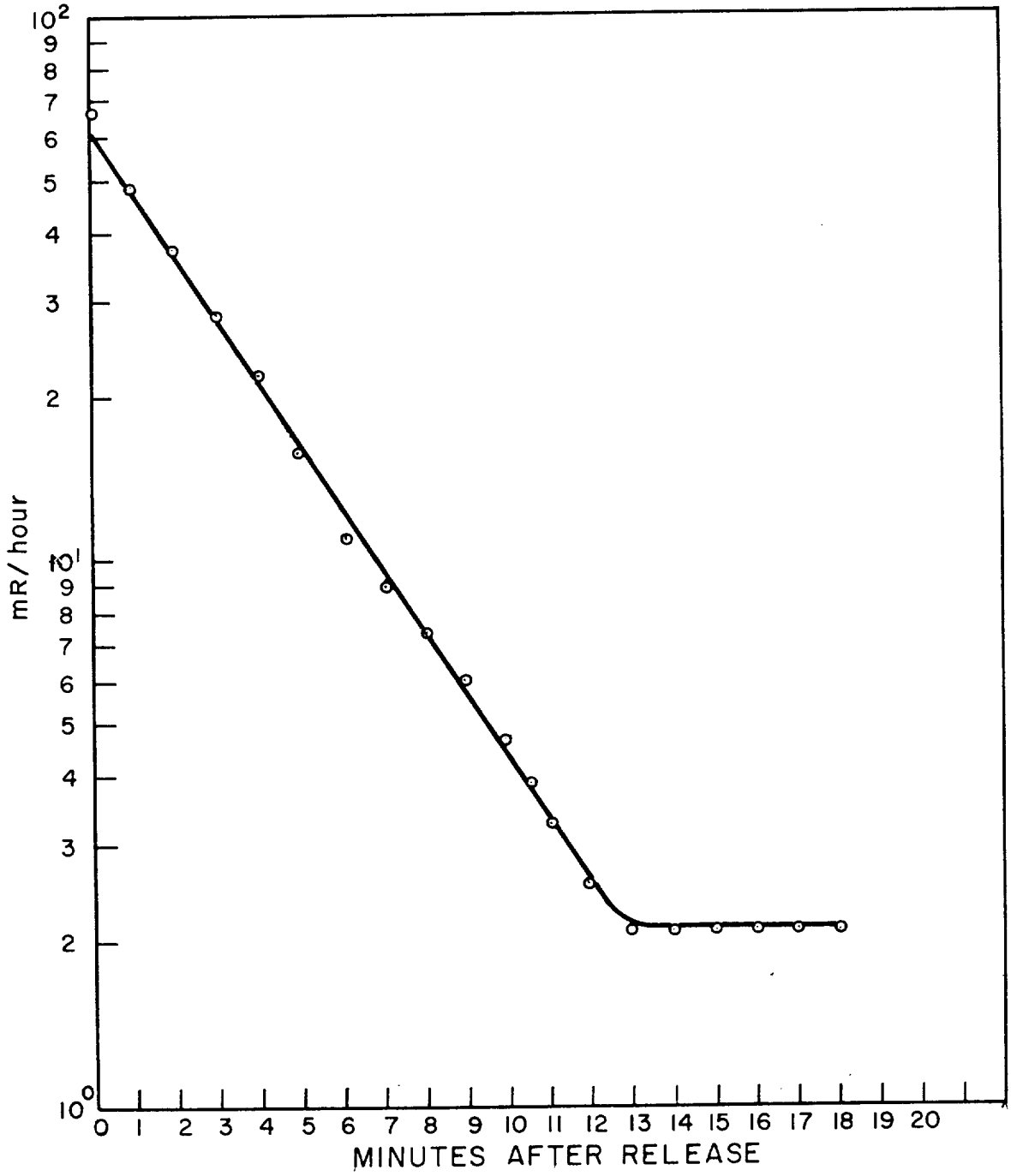

Fig. 4 Dose rates at six inches from release flask during CERT 10.

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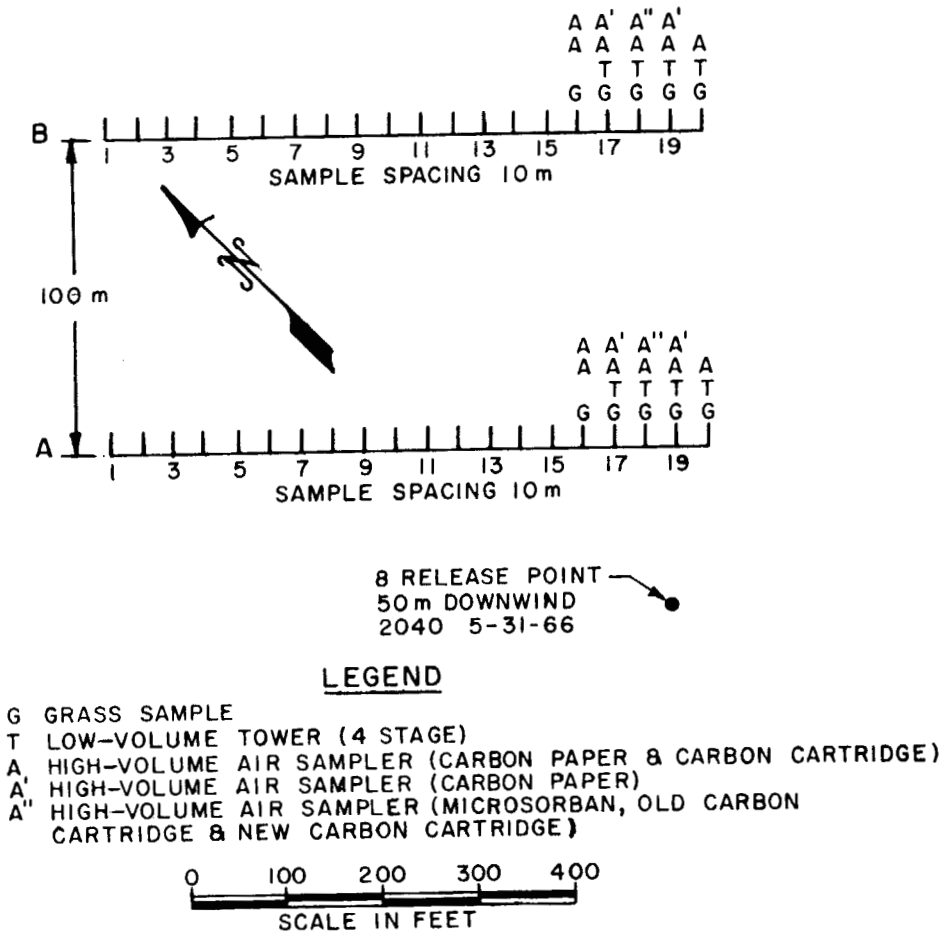

Fig. 5a Grid for CERT 8.

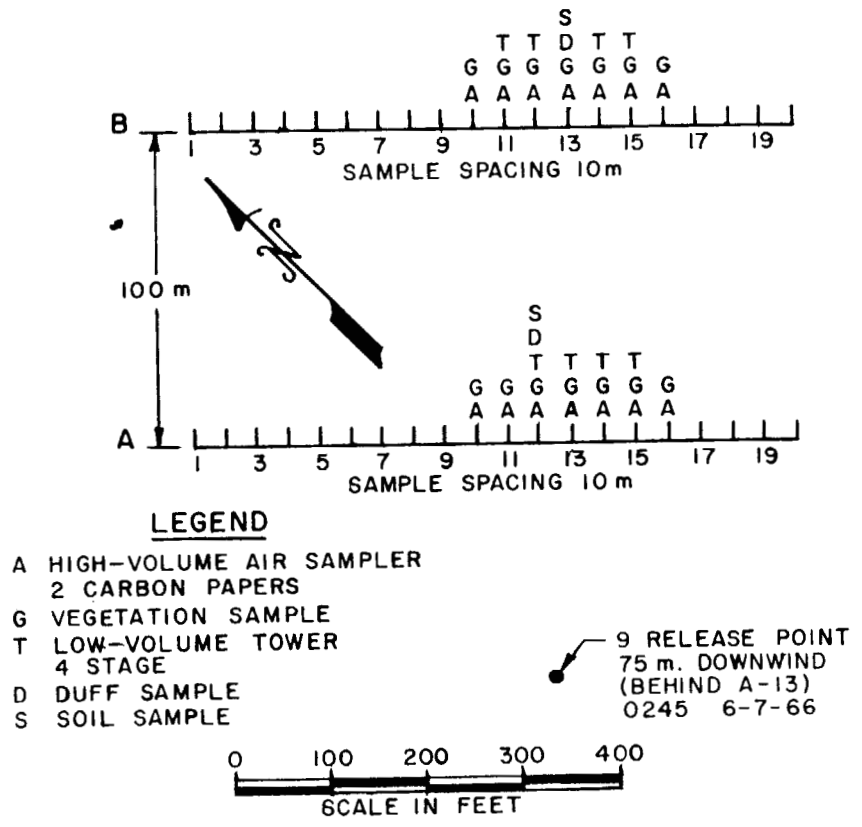

Fig. 5b Grid for CERT 9.

Air sampling instruments used were Staplex high-volume air samplers placed one meter above ground level and low-volume air samplers ($3.7 \times 10^{-4} m^3$/ sec) with samples taken at heights of 0.25, 0.5, 1, and 2 meters above ground level. Filter media used in CERT 8 are shown in Table III. In CERT 9, stations 10 through 16 of arcs A and B were used. The sampling system at each station consisted of one high-volume sampler with two carbon-impregnated filter papers in series. Samples of grass, detritus, and soil were collected adjacent to each air sampler and were analyzed for deposited radioiodine. These samples were taken from an area of 0.5 m^2 for grass and 0.1 m^2 for detritus and soil.

TABLE III

NUMBER AND TYPES OF SAMPLES
FOR CERT 8

Arc Station	Samplers
A & B -- 16	2 Hi-Vols with carbon impregnated paper prefilters followed by carbon cartridge filters.
A & B -- 17	1 Hi-Vol with carbon impregnated paper prefilter followed by carbon cartridge filter.
	1 Hi-Vol with two carbon impregnated papers in series.
	1 Low-Vol Tower (4 stage).
A & B -- 18	1 Hi-Vol with carbon impregnated paper prefilter with carbon cartridge backup filter.
	1 Hi-Vol with microsorban prefilter and two carbon cartridge backup filters (new and old).
	1 Low-Vol Tower (4 stage).
A & B -- 19	Same as A & B -- 17.
A & B -- 20	1 Hi-Vol with carbon impregnated paper prefilter followed by carbon cartridge backup filter.
	1 Low-Vol Tower (4 stage).

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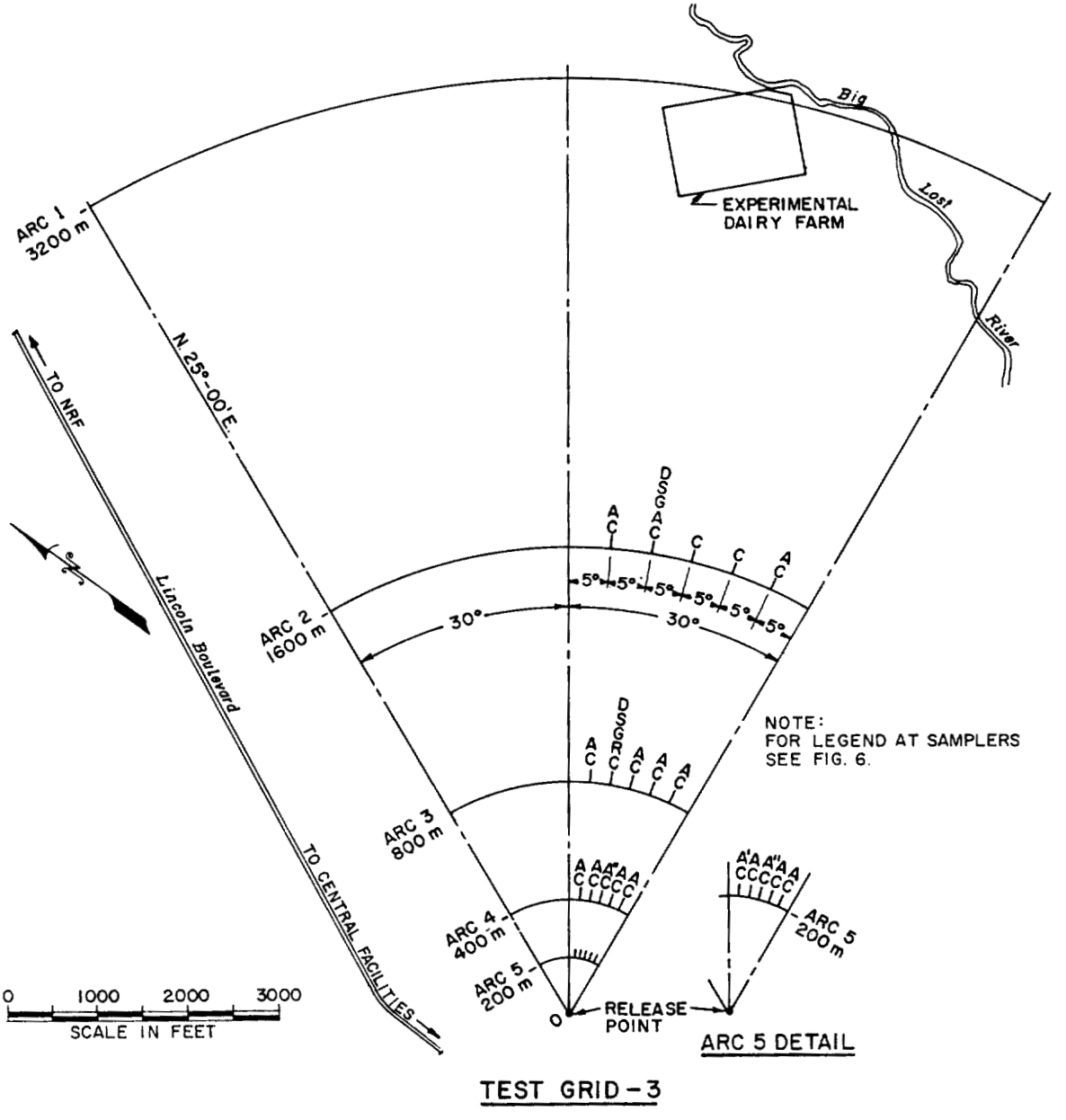
3.2 CERT 10

The grid system used for CERT 10 is shown in Figure 6. Three types of air samples were taken:



(A)

Fig. 6 Grid for CERT 10.

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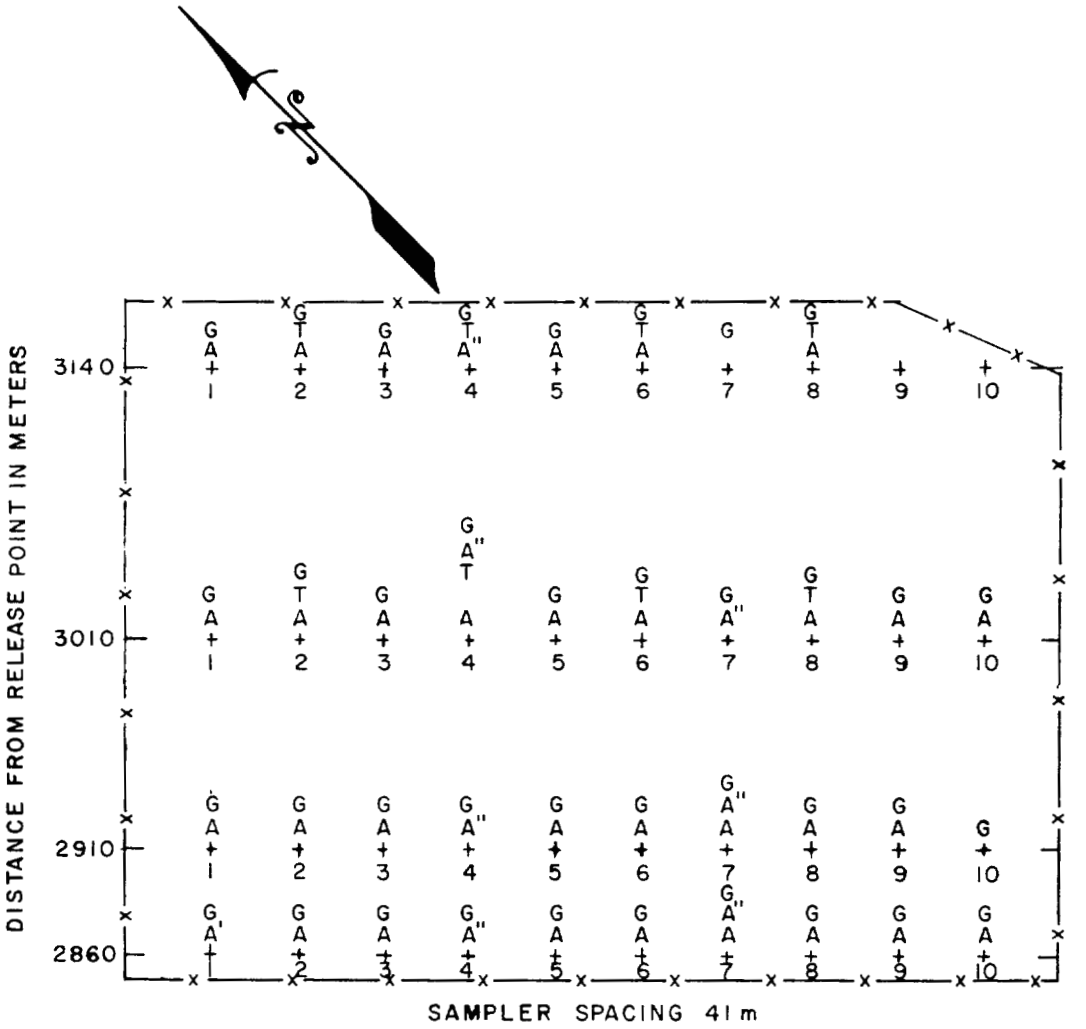

LEGEND

+ SAMPLER POSITION
A HIGH-VOLUME AIR SAMPLER (MICROSORBAN AND CARBON CARTRIDGE)
A' HIGH-VOLUME AIR SAMPLER (MICROSORBAN AND BM 2306)
T TOWER (LOW VOLUME)
A" HIGH-VOLUME AIR SAMPLER (MAY PACK)
G VEGETATION
C CARBON FALLOUTS
R TELEMETERING STATION
S SOIL
D DUFF

0 200 400
SCALE IN FEET

(B)

Fig. 6 Grid for CERT 10.

(1) High-volume air sampler (approximately 7.5×10^{-3} m^3 / sec) using Microsorban paper prefilters and 5-cm-thick activated charcoal filters

(2) High-volume air samplers (approximately 7.5×10^{-3}m / sec) using several different types of filters to determine the chemical species of airborne iodine (described in Reference 3)

(3) Low-volume air sampling towers(approximately 10^{-3}m / sec) using microsorban prefilters and Gelman AC-1 carbon-impregnated glass fibre filters, with samples taken at heights of 6, 12, 25, 50, 100, and 200 cm above ground.

Squares of sticky paper covered with activated charcoal (25 x 25 cm) were placed on the ground beneath each air sampler on arcs not on the EDF. At the EDF, samples of vegetation from 0.5 m^2 of ground surface were taken near each air sampler and from areas in which cows were to graze.

One volunteer for an inhalation study was located 800 meters distant from the release.

3.3 CERTs 11 and 12

The grid system used for CERT 11 (Figure 7) was the same as that used for CERTs 2 and 7. Only two types of samplers were used for collecting airborne CH_3I:

(1) High-volume samplers using 2.5-cm-thick iodine-impregnated activated-charcoal cartridges in series (MSA 46727, carbon charcoal number 85851)

(2) The multifilter high-volume sampler using the same type carbon cartridge as the last sampler in the series

(3) Vegetation samples from 0.5 m^2 of ground surface were taken near each air sampler

(4) Cows were placed on the grid prior to the release and volunteers for inhalation studies were located near air samplers on the "D" arc of the EDF.

The grid system used for CERT 12 is shown in Figure 8. The sampling media were the same as for CERT 11 with the addition of sticky paper coated with activated carbon at grid stations with the multifilter samplers.

0030046

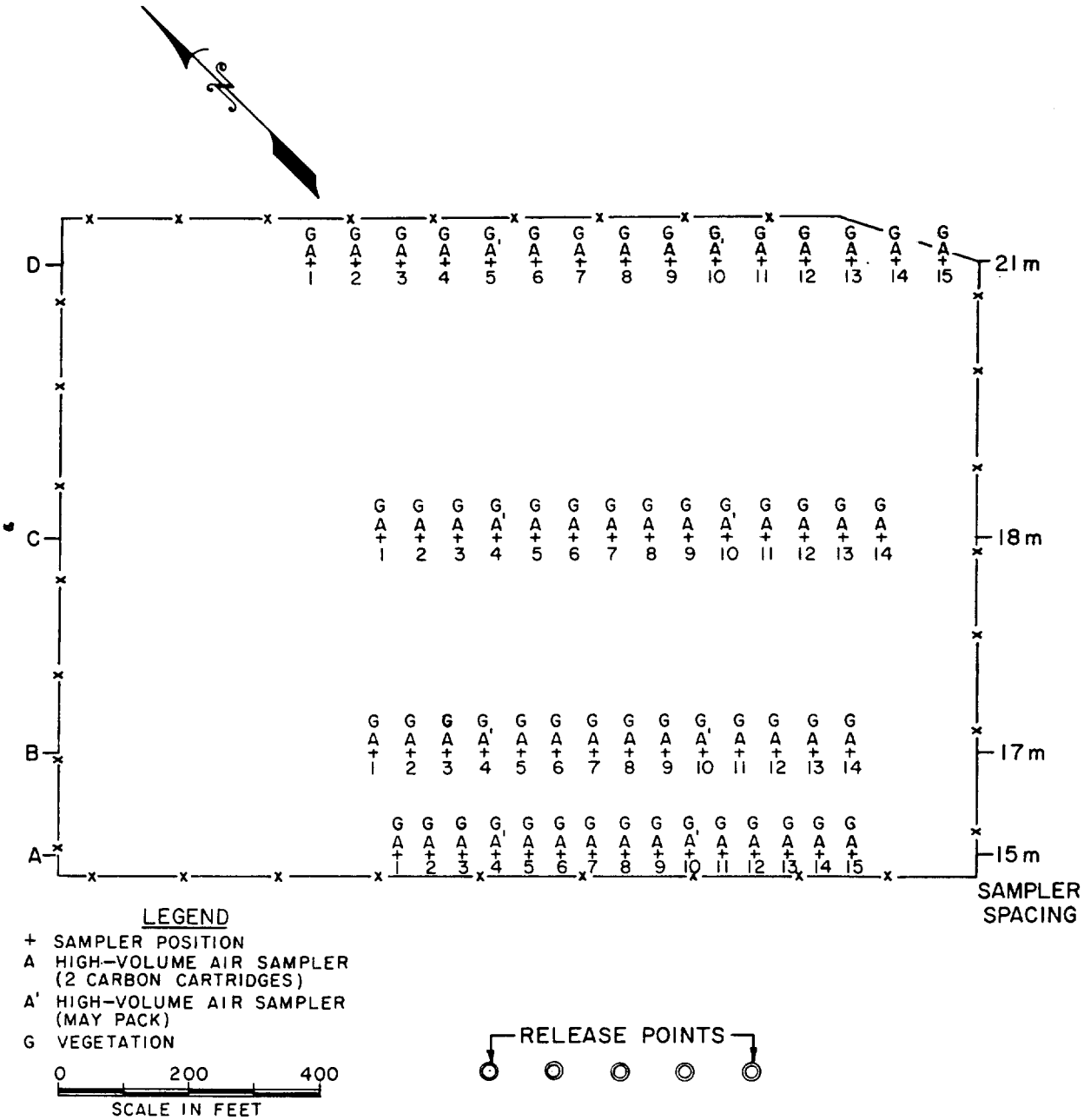

Fig. 7 Grid for CERT 11.

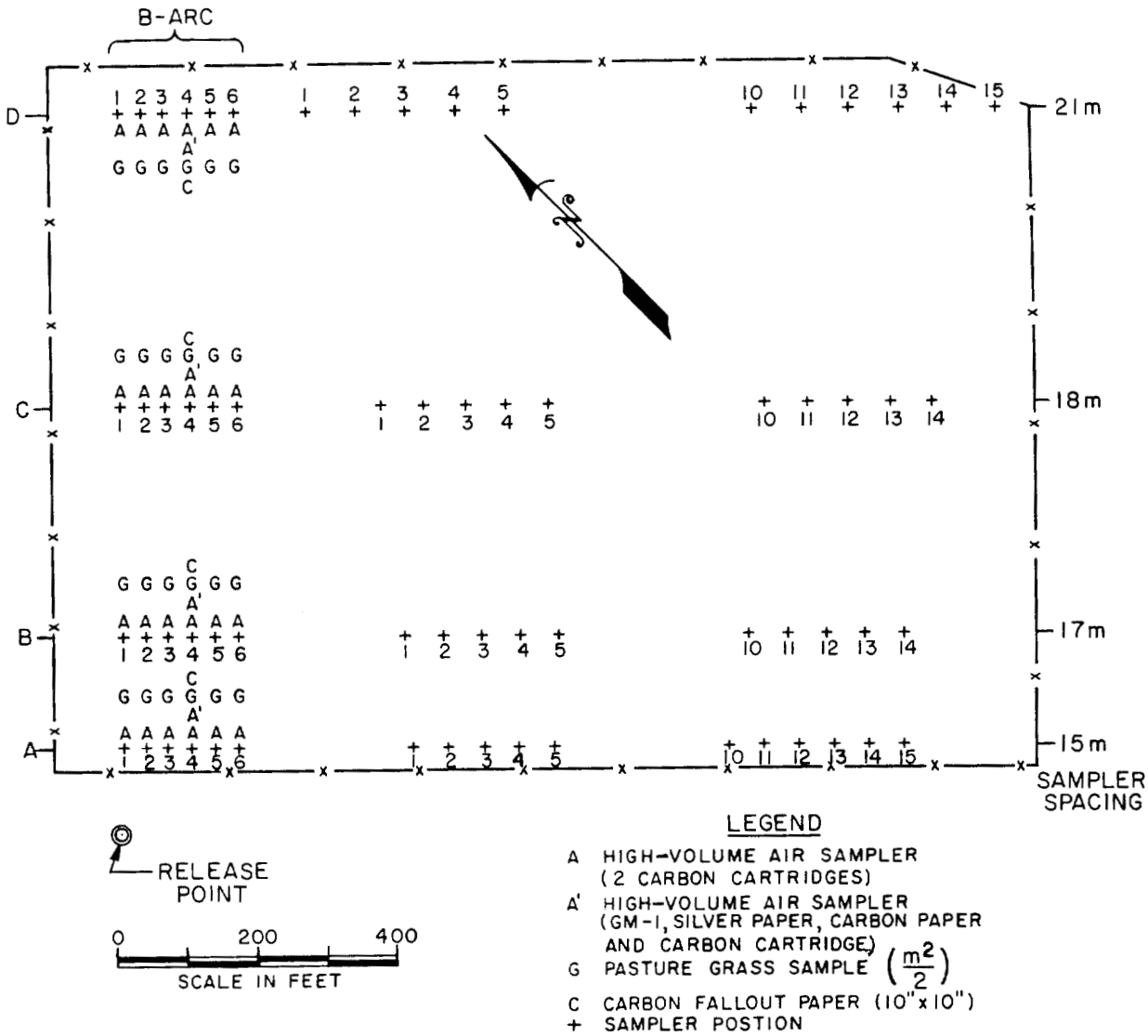

Fig. 8 Grid for CERT 12.

3.4 CERTs 13-18

Tests 13 through 18 were part of a series of tests for which the primary objective was to obtain data on deposition. As such, the samples taken were the same for each test. The grid systems are shown in Figures 9a and 9b. Three types of air samplers were used:

(1) High-volume air samplers with two carbon-impregnated paper filters (Gelman AC-1) in series

0030048

(2) Multifilter high-volume samplers

(3) Low-volume ($10^{-3} m^3/sec$) towers using a GM-1 prefilter and AC-1 filter in series (6, 12, 25, 50, 100, 200, and 400 cm above ground level).

Deposition samples were taken as in CERT 12. In an attempt to separate meteorological variables from physiological variables of plants which control deposition, CERTLE experiments were conducted on the EDF pasture simultaneously with these test runs.

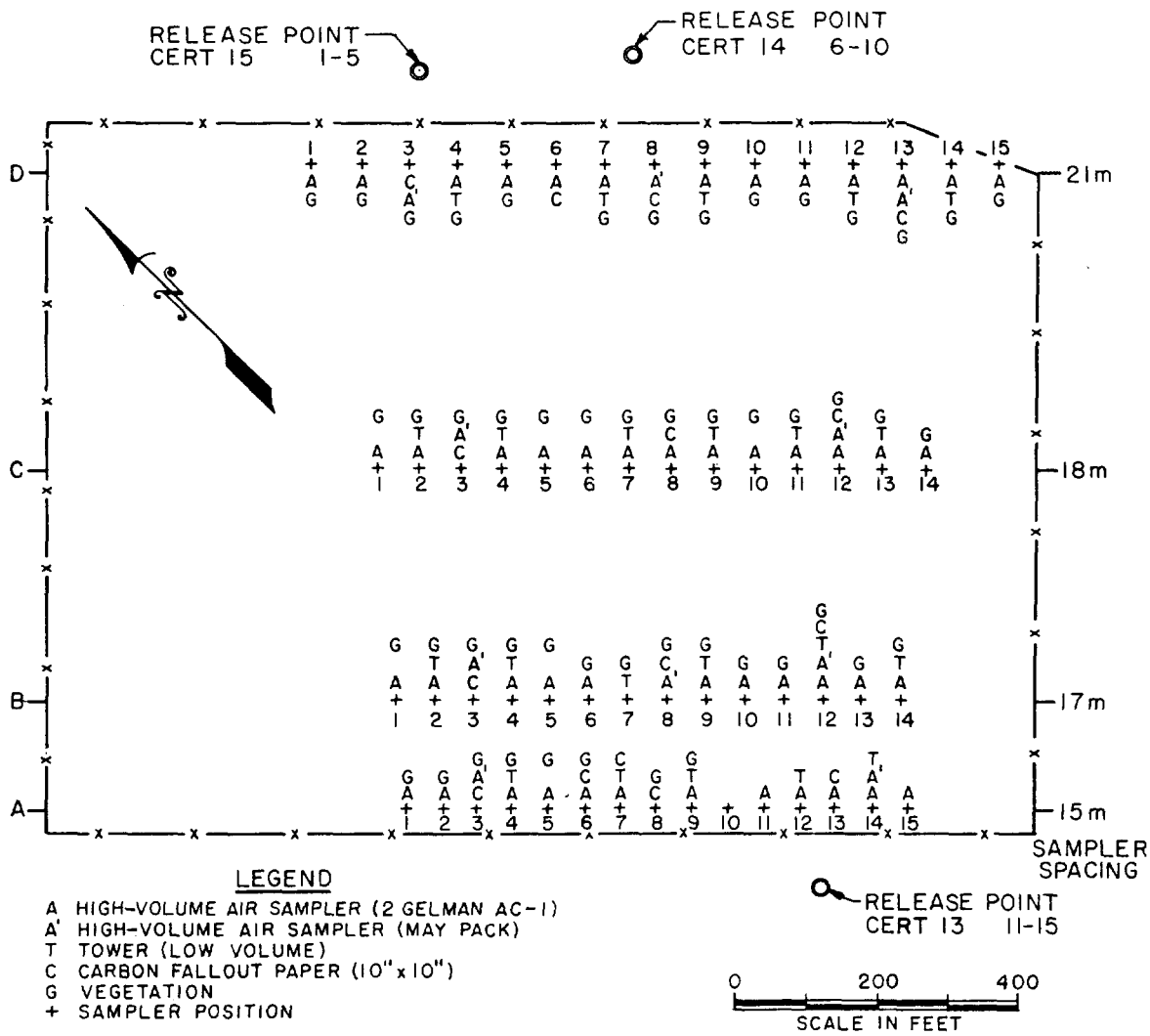

Fig. 9a Grids for CERTs 13-15.

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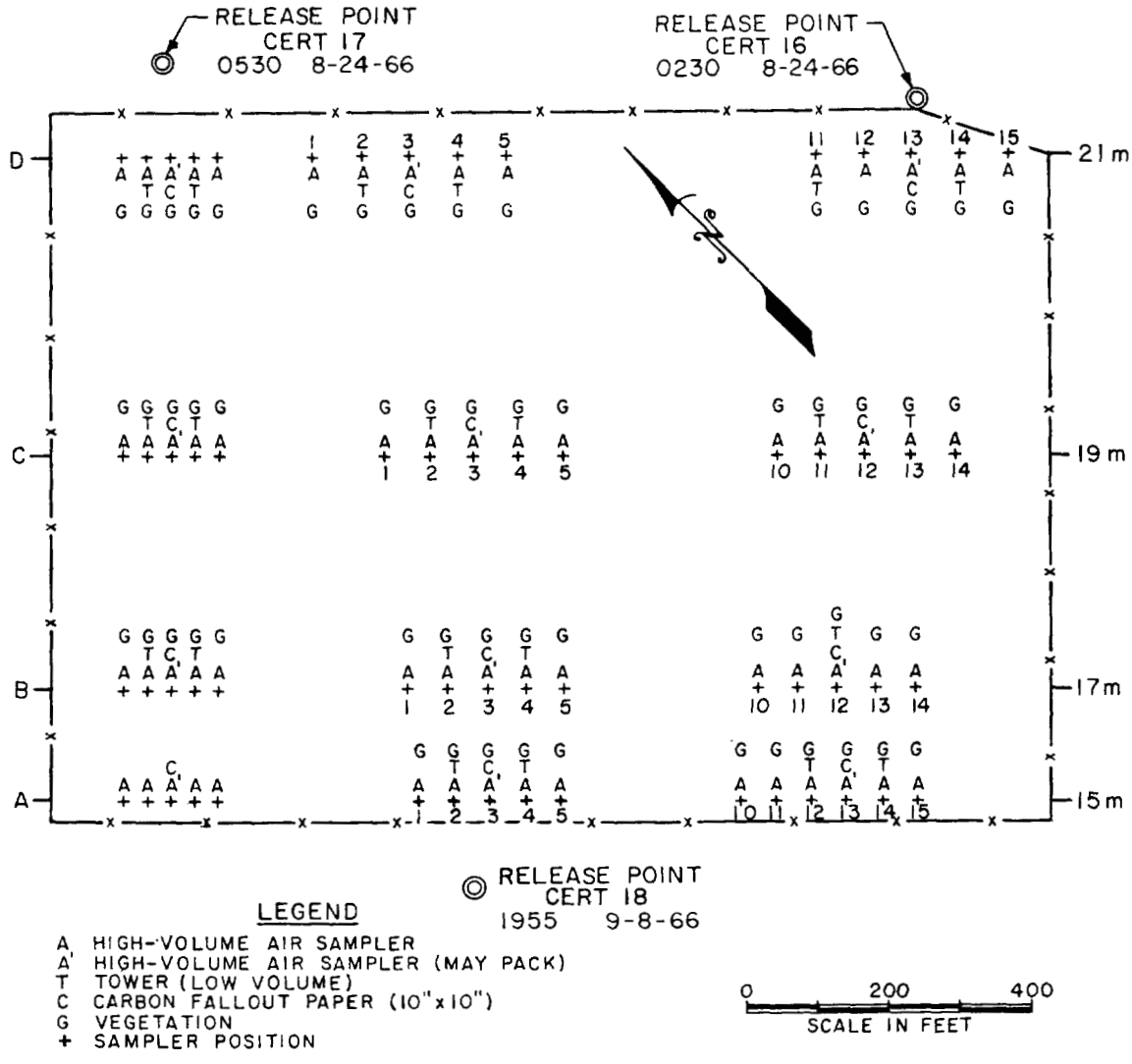

Fig. 9b Grids for CERTs 16-18.

3.5 CERT 19

In the last test (CERT 19), a grid system (Figure 10) similar to the one in CERT 7 was used. The samples taken were the same as in CERTs 13 through 18. In addition to these samples a variety of other measurements were made. These included measurements of resuspension, measurements of efficiencies of a variety of filters, and others. These samples will be discussed in later sections.

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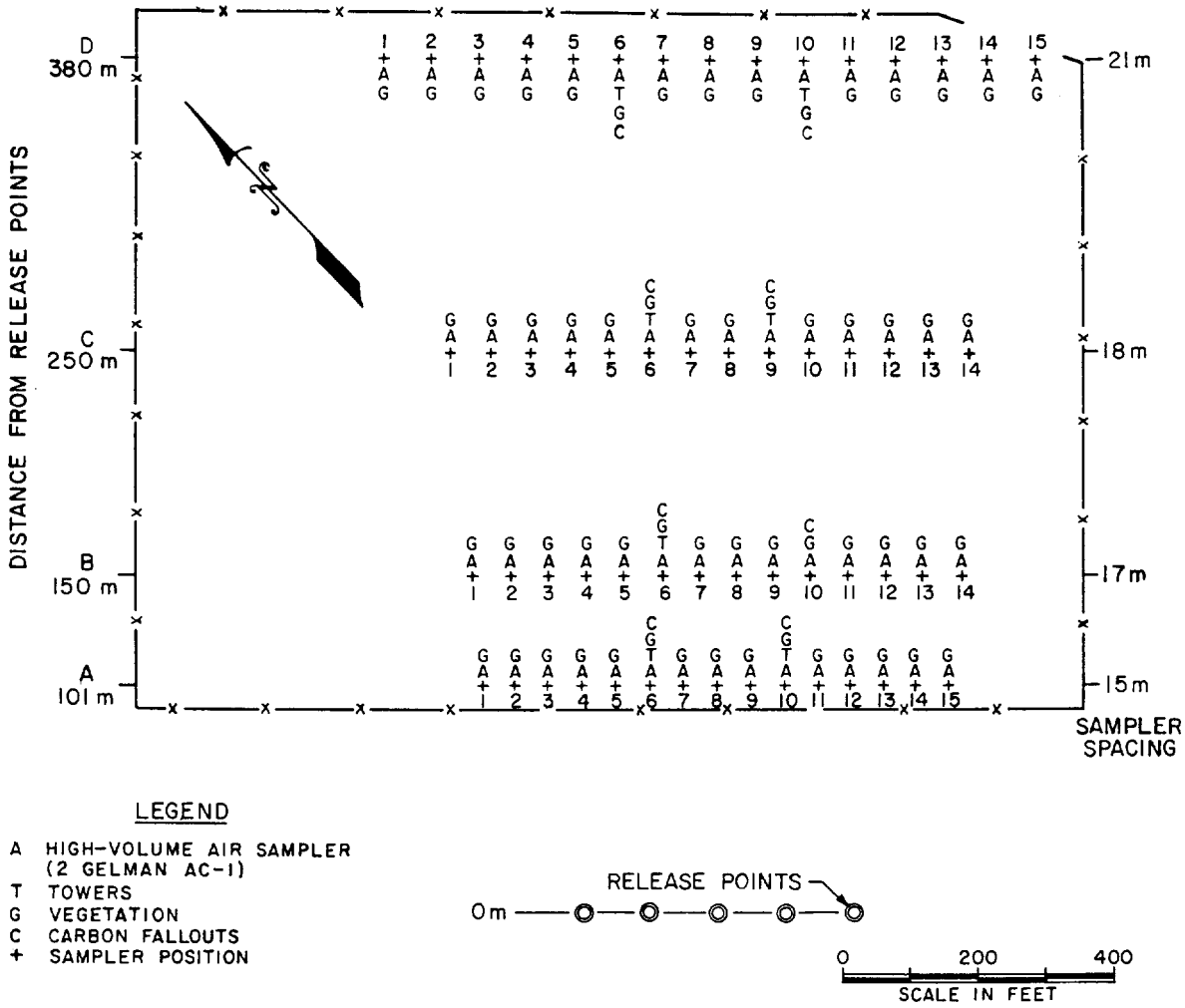

Fig. 10 Grid for CERT 19.

0030051

IV. METEOROLOGICAL DATA FOR CERT SERIES

1. INTRODUCTION

The turbulent structure, temperature, and moisture content of the atmosphere are important meteorological factors which govern the transfer of fine particles and gases from air to ground and their retention on the ground surface. Therefore, profiles of wind and temperature along with direct turbulence measurements from bivanes and anemometers were made for the field releases. Relative humidity was also recorded.

2. LOCATIONS AND INSTRUMENTATION

Meteorological data were gathered from two locations during most of the releases; one location provided low-level measurements (ie, near the ground) from a portable mast over the areas of measured deposition and the other provided higher level measurements from a fixed tower.

The portable mast instrumentation consisted of sensitive cup anemometers and shielded, unaspirated thermocouples or shielded, aspirated resistance bulbs which were mounted at or below a height of 4 m to near the grass top level. The fixed tower at the Air Resources Field Research Office's (ARFRO) permanent research location was instrumented to a height of 61 m with shielded, aspirated thermocouples, sensitive cup anemometers, and bivanes. Turbulence (wind) measurements were not made below the 4 m level at the ARFRO location because low level data at this point would not necessarily have been indicative of conditions in the area of measured deposition.

The outputs from the portable mast instrumentation were recorded on charts (temperature) and counters (wind speed). The ARFRO tower sensor outputs were digitized and recorded via high and low speed digital data acquisition systems.

Wind direction and speed at the 6 m level were measured and recorded routinely on a strip chart by a less sensitive propeller-vane on a separate mast near the area of measured deposition.

0030052

3. DATA REDUCTION

Data from the areas of measured deposition resulted in averaged values of wind and temperature for the travel time of the effluent over the area of interest (Tables IV and VI). Low-level wind and temperature profiles can then be constructed from these average values. For the ARFRO location, lateral (0), vertical (o), and longitudinal (u) turbulence and averaged values of wind and temperature for the travel time of effluent over the area of interest were computed from the digital data (Tables IV, V, and VII). Average values of relative humidity at the Central Facilities Area (CFA) during the effluent travel time were recorded (Table VI).

TABLE IV

AVERAGED WIND DATA (m/s) AT SPECIFIED HEIGHTS (m)

Field Release Number	Deposition Area Speeds on Mast 0.17m	0.5m	1m	2m	3m	4m	Dir 6m	Spd 6m	ARFRO Tower Speeds 4m	16m	61m
1			5.2				242	6.6	7.1	8.4	8.4
2							229	10.0	9.3	11.3	12.3[a]
3	3.1	4.3	5.0	5.7		6.0	254	6.0	6.0	7.4	8.9
4		0.8	1.2	1.8		3.1					0.9
5		1.7	2.7	3.0		3.7	049	3.6			8.9
6							230	7.6			15.2
7		3.3	4.7	5.0		5.4	225	5.4	4.8		6.9
8		4.9	5.8	7.3		8.5	262	8.1	8.5	11.3	13.8
9							185	-	2.4	3.3	4.7
10		3.7	4.8	6.5		6.8	245	7.6	6.9	8.7	10.0
11		3.5	5.0	5.8		6.9	207	6.5	5.4	8.2	9.1
12		2.4	3.7	4.2		5.3	235	5.4	4.2	6.6	11.1
13		3.7	5.0	5.9		7.0	215	7.1	7.1	9.5	10.9
14		0.5	0.8	1.1		1.5	085	2.5	1.6	2.1	2.8
15		0.5	0.6	0.8		1.0	012	1.6	1.4	1.4	3.4
16		0.1	0.9	1.4		2.0	035	2.7			6.7
17		0.1	0.6	0.8		1.2	075	1.3			5.4
18	0.1	0.6	1.0	1.2	1.9	2.2	240	1.3	2.1	2.9	4.2
19		5.9	7.4	7.8	8.2	8.5	240	7.1	6.7	8.6	9.7

[a]Measurement made at 32m level.

0030054

TABLE V

TURBULENCE DATA FOR SPECIFIED HEIGHTS (m) ON ARFRO TOWER

Field Release Number	$(\overline{\theta'^2})^{1/2}$ (degrees)			$(\overline{\phi'^2})^{1/2}$ (degrees)			$(\overline{\mu'^2})^{1/2}$ (m/s)		
	4m	16m	61m	4m	16m	61m	4m	16m	61m
1		14.3			6.07				
2	15.1		11.0[a]	7.55	6.04	6.01[a]	1.54	1.48	1.49[a]
3	12.1	9.1		5.44	5.15				
4									
5	12.4			1.29					
6									
7	14.8	9.6	7.56			4.90	0.87		0.90
8	10.1	7.6	5.1	8.13	5.71	5.03	1.96	2.16	2.44
9	25.0	24.8	20.5	7.37	6.29	5.91	0.63	0.82	0.86
10	16.9	15.4	13.4	7.73	6.91	7.51	1.58	1.77	1.83
11	21.2	23.3	15.3		7.01	7.66	1.34	1.59	1.50
12	7.6	5.5	9.6	6.50	3.76	1.59	0.83	0.93	1.01
13	11.4	11.5	7.8	9.26	5.08	6.05	1.11	1.03	0.77
14				1.92	1.19	3.37	0.29	0.24	0.21
15		11.9	54.0	4.35	5.98	2.75	0.68	0.94	0.86
16									
17									
18	60.1	13.8	12.2	1.94	1.99	2.31	0.32	0.59	0.36
19	18.9	10.3	8.7	7.34	5.33	10.25	1.26	1.28	1.08

[a]Measurements made at 32m level.

0030055

TABLE VI

TEMPERATURES AND RELATIVE HUMIDITY AT SPECIFIED HEIGHTS (m)

Field Release Number	Temperatures (°C) on Mast at Deposition Area					Rel. Hum. (%) at CFA
	0.17m	0.5m	1m	2m	4m	2m
1						21
2						32
3						71
4		-2.6[a]	-1.8[a]		2.7[a]	99
5		9.9[a]	9.9[a]	9.8[a]	10.2[a]	74
6						33
7		9.7[a]	9.3[a]	9.0[a]	8.8[a]	34
8		12.5[a]	12.7[a]	13.0[a]	13.3[a]	34
9		13.2[a]	13.2[a]	13.2[a]	13.3[a]	43
10						25
11		29.2[a]	29.2[a]	29.0[a]	29.1[a]	23
12		20.6[a]	21.2[a]	22.0[a]	22.4[a]	17
13		22.0[a]	22.1[a]	22.7[a]	22.9[a]	30
14		10.4[a]	10.9[a]	11.6[a]	11.5[a]	67
15		13.2[a]	12.7[a]	13.3[a]	12.8[a]	72
16						21
17						26
18	11.1	13.1		16.8		11
19	4.6	4.1		3.6		71

[a] Temperature units not aspirated.

0030056

TABLE VII

TEMPERATURES (°C) ON ARFRO TOWER

Field Release Number	Height (m)						
	1	2	4	8	16	32	61
1	22.3[a]		21.1[a]		20.5[a]		
2	16.8	16.2	15.7	15.3	14.5	14.1	
3	-1.9	-2.0	-1.9	-1.9	-2.1	-2.2	-2.2
4							
5							
6							
7	4.8	4.6	4.4	4.2	3.8	3.6	3.3
8	11.1	11.1	11.1	11.1	11.2	11.1	10.9
9	12.9	12.9	13.1	13.1	13.1	13.0	12.8
10	26.4	25.9	25.2	24.7	24.3	23.6	
11	31.1	30.6	29.9	29.0	28.4	28.0	
12	21.7	21.9	22.1	22.7	23.5	24.4	
13	23.7	23.6	23.5	23.2	23.0	22.7	22.4
14							
15							
16	7.2	8.8	10.6	11.2	12.1	13.4	16.3
17	4.3	5.3	6.7	8.2	9.2	10.6	12.9
18	17.3	19.1	21.2	22.2	23.3	25.3	26.2
19	3.8	3.6	3.4	3.1	2.7	2.4	2.1

[a] Temperature units not aspirated

V. DEPOSITION DATA

1. INTRODUCTION

The first step in predicting ingestion exposures is to determine the amount of airborne material that is retained on vegetation or soil surfaces. Ground retention is also important in assessing external radiation exposures from ground deposited radionuclides. This section summarizes the data, relevant to the problem of deposition, fathered during the CERT program through 1966.

2. METHODS OF REPORTING DATA

One of the most common ways to describe deposition is by the use of the parameter "deposition velocity" as defined by the following expressions:

$$V_d(M/sec) = \frac{\text{deposition rate } (Ci/M^2\text{-sec})}{\text{air concentration } (Ci/m^3)} \tag{1}$$

$$V_d(z) = \frac{\text{flux}}{\chi(z)} \tag{2}$$

where $\chi(z)$ is the air concentration of radionuclide at height z above the ground.

Measuring the deposition rate for short-time releases is difficult; therefore, V_d is determined by [3]:

$$V_d(m/sec) = \frac{\text{total deposition } (ci/M^2)}{\text{time-integrated air concentration } \frac{(Ci\text{-sec})}{m^3}} \quad . \tag{3}$$

CERT and CERTLE [3] experiments found that V_d is related to grass density (g/m^2). Figure 11 shows 23 experimental values of V_d plotted against grass density (g/m^2) [7] . These data correlate at a significance level of greater than 99 percent as shown by the correlation coefficient, R, of 0.87. The deposition velocity as defined in Equations (1) through (3) is generally less variable for grass deposition if it is divided by grass density, ie,

$$V_D = V_d/D \tag{4}$$

where D = grass density in units of mass/unit horizontal area.

0030058

In CERT tests for which grass density was measured, these measurements have been used to calculate values of V_D which are shown in the data tables.

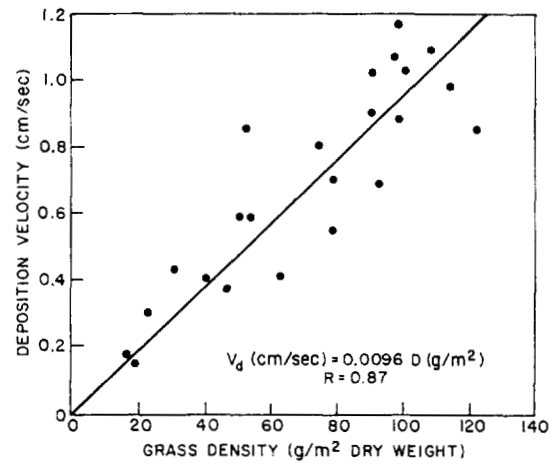

Fig. 11 Relationship between deposition velocity and grass density (CERT 2).

Measurement of V_d is arbitrary and caution should be used when comparing our measurements with those of others for the following reasons: The concentration of an airborne contaminant changes with height, and the rate of change with height depends on meteorological conditions. Measurements of air concentration made below one meter would tend to give higher values of V_d than those taken at one meter. The contaminant covers not only the live vegetation sampled in our program but also the dead organic layer between the vegetation and soil (detritus) and also the soil. Unless otherwise stated, values of deposition velocity reported here have been calculated from air concentrations at one meter above ground level and total deposition per unit area on grass cut at 5 cm above ground level. The following data are also presented:

(1) Values of air concentration as a function of height

(2) Values of apparent particle fraction of airborne materials as a function of height

(3) Values of deposition on surfaces other than edible grass (soil, carbon plates, sticky paper, sand).

Using these data, it is possible to compare values of V_d from test to test.

3. RESULTS OF CERT RELEASES

3.1 Deposition Data -- Vegetation

Table VIII summarizes the median values of V_d and V_D determined in each of the CERT releases. Because the frequency distributions of V_d and V_D for each test appear to be log-normal, values of the geometric standard deviation are also presented. The distributions are shown in Figures A-1 through -13 in Appendix A.

0030059

TABLE VIII

SUMMARY OF DEPOSITION DATA

Test	Median V_d (cm/sec)	Geometric Standard Deviation	Median V_D (cm^3/g-sec)	Geometric Standard Deviation	Sample Type	Grass Condition	General Meteorological Condition	Release Form
1	0.85				ORCW[a]	Green Growing	Unstable	I_2
2	0.61	1.6	106	1.37	IMP[a]	Green Growing	Unstable	I_2
3	0.34	1.1			SNOW	Snow	Neutral	I_2
4	0.15		30[c]	2.0	ORCW	Green Damp	Stable	I_2
5	0.10		26[f]	1.5	ORCW	Green Damp	Stable	I_2
6	10^{-2}[c]				IMP	Green	Unstable	CH_3I
7	1.0	1.2	84	1.4	IMP	Dry	Unstable	I_2
8	0.14	1.2	30	1.06	ORCW	Dusty-Dry	Stable	I_2
9	0.28, 0.54[d]		48,100		ORCW	Dusty-Dry	Stable	I_2
10	0.79	2.00	175	1.70	IMP	Green Growing	Unstable	I_2
11	10^{-4}[e]		10^{-2}		IMP	Green Growing	Unstable	CH_3I
12	10^{-4}[e]		10^{-2}		IMP	Green Growing	Stable	CH_3I
13	0.79	1.5	115		IMP	Green Growing	Neutral	I_2
14	0.26, 0.63[d]		22, 74		IMP	Green Growing, Freshly mown	Stable	I_2
15	0.23	2.20	21	2.30	IMP	Green Growing, Freshly mown	Stable	I_2
16	1.7	2.6	220	1.8	IMP	Green Growing, Freshly mown	Stable	I_2
17	3.5	3.3	435	3.8	IMP	Green	Stable	I_2
18	.087	2.03	8.2	2.10	IMP	Green	Stable	I_2
19	1.2	1.6	96	1.4	IMP	Dry	Unstable	I_2

[a] Open-range crested wheat grass.
[b] Irrigated mixed pasture grasses.
[c] No significant deposition.
[d] Two significant deposition.
[e] Deposition velocity inversely proportional to concentration to at least 10^{-4} cm/sec.
[f] Extrapolated from fresh weight assuming 30 percent dry weight.

0030060

3.2 Supplementary data

3.21 Profiles of Concentration. If the ground were a perfect sink for iodine-131, we would expect that the profiles of iodine-131 concentration with height to be the same as the wind velocity profiles reported in Section IV. Figures A-14 through -24 in Appendix A show the measured concentration profiles. The profiles from one sampling system to the next were compared by ignoring the exponent in the concentration term. As an example, samples at two towers of 6×10^3 $C_i$sec/m^3 and 1.4×10 C_i-sec/m^3 and of 6×10^2 and 1.4×10^3 would be plotted as 6 and 14 on the figures.

3.22 Apparent Particulate Fractions. An attempt was made to infer the nature of the depositing material by determining the "apparent particulate fraction" which is defined as the fraction of the radioiodine collected on a membrane particulate filter to total quantity collected. The profiles of these fractions are shown in Figures A-25 through -33 in Appendix A.

3.23 Total Deposition. As indicated earlier in this report, determinations of the total deposition per unit area are important in studies of cloud depletion and direct dose from deposited materials. The results of data collected during several of the CERT tests are shown in Table IX.

TABLE IX

TOTAL DEPOSITION (NORMALIZED TO V_d-GRASS = 1)

Date	Grass Type	V_d-Grass	V_d-Detritus	V_d-Soil	V_d-Total
June	IMP	1	0.54	0.05	1.6
	ORCW	1	0.10	0.30	1.4
August	IMP	1	0.40	0.02	1.4
November	IMP	1	0.67	0.02	1.7
August	IMP (recently mown)	1	0.60	0.10	1.7

0030061

3.24 Deposition Velocity -- Carbon Fallout Plates. Gummed papers coated with activated charcoal offer an attractive means of iodine-131 deposition sampling. Such samples can be prepared and collected easily and have a reasonably homogenous surface of known area. For these reasons, carbon fallout papers have been used in most tests to determine if, in fact, they can serve as a reliable indicator of iodine deposition on vegetation. The results are shown in Table X.

TABLE X

DEPOSITION VELOCITIES FOR CARBON FALLOUT PLATES

Test	V_d-(Carbon)	V_d-(Carbon/V_g Grass)
1	0.80	1.1
2	0.87	1.36
4	0.036	0.33
5	0.33	3.3
7	0.35	0.35
10	0.65	0.74
12	0.12	$10^3(CH_3I)$
15	0.06	0.36
16	0.32	0.15
17	0.10	0.07
18	0.032	0.44
19	0.63	0.50

0030062

3.25 CERTLE. During 1966, several CERTLE tests (CERT Laboratory Experiments, described in Reference 3) were made at the EDF in an attempt to isolate the effects of variable meteorological conditions on deposition. Thirteen runs were performed in June 1966 as a separate study. The results of these tests are shown in Table XI.

TABLE XI

RESULTS OF CERTLE EXPERIMENTS AT THE EXPERIMENTAL DAIRY FARM

Test Number [a]	Date 1966	Hour MST	Rel. Humidity (Percent)	T °F	°C	V_d cm/sec	V_D cm^3/g-sec	D, dry grams
1	6-2	1500	23	71	22	1.75	250	70
2	6-3	1130	29	55	13	0.13	10.5	123
3	6-3	1345	22	59	15	0.04	8.5	49
4	6-6	1300	24	70	21	0.16	11.9	132
5	6-6	1440	24	71	22	0.17	17.7	98
6	6-7	1020	52	58	15	0.09	13.4	65
7	6-7	1500	40	68	20	0.04	7.8	53
8	6-8	1130	34	65	19	0.08	12.9	61
9	6-8	1500	24	69	20	0.11	9.2	123
10	6-8	2245	56	53	12	0.35	62.3	56
11	6-8	2300	57	53	12	0.22	35.9	63
12	6-9	1130	27	72	22	0.09	12.1	77
13	6-9	1500	20	76	24	0.18	11.1	161

[a] Note: Not the same series of numbers as for CERT tests.

VI. RETENTION DATA

During CERT 19, measurements were made of the retention of iodine-131 on the pasture grass as a function of time. Table XII shows the results expressed in Ci/m^2 and Ci/g.

TABLE XII

RESULTS OF RETENTION MEASUREMENTS, CERT 19 GRASS

Sampling Date	$\mu Ci/m^2$		$\mu Ci/gram$	
	Dry	Green	Dry	Green
9/8/66 (after release)	0.433	0.429	5.41×10^{-3}	1.73×10^{-3}
9/12/66	0.236	0.299	2.41×10^{-3}	9.74×10^{-4}
9/14/66	0.173	0.171	2.40×10^{-3}	5.78×10^{-4}
9/16/66	0.098	0.119	1.19×10^{-3}	4.12×10^{-4}
9/19/66	0.117	0.116	8.87×10^{-3}	3.29×10^{-4}
9/21/66	0.089	0.093	9.28×10^{-4}	3.34×10^{-4}

0030064

VII. TRANSPORT OF RADIOIODINE FROM GRASS TO MILK

1. INTRODUCTION

The second major area of study in the CERT program has been that of determinations of the transport of radioiodine from grass to milk. The following data are included:

(1) Milk concentration versus time

(2) Grass concentration versus time

(3) Daily milk production versus time.

As in previous years, the cows grazed within small fenced areas of a size sufficient to provide one day's forage. Grass concentrations were measured each morning before the cows were moved onto a new pasture. In general, the cows were moved to areas of progressively higher contamination so that the length of the study could be protracted. At the same time, half-life determinations are not applicable to these data.

2. RESULTS

Figures 12 through 14 show the average iodine-131 concentrations in milk for the six-cow dairy herd versus time during CERTs 10, 12, and 17. Also included are the measured high and low concentrations for each sampling period. On the same figures are included the iodine-131 concentrations on pasture grass. Table XIII shows the body weight, estimated grass consumption, and birth date of last calf.

Tables XIV through XVI show the milk production of each cow for each of the three CERT tests.

To determine the effect of the stage of lactation on the concentration of iodine-131 in milk, averages of milk production and iodine-131 concentrations for each cow are listed in Tables XVII and XVIII, respectively. Using the individual consumption estimates in Table XIII and assuming that the grass concentrations of iodine-131 were the same for each cow, the relative effect of lactation on the iodine-131 concentration in milk among the six cows can be calculated.

0030065

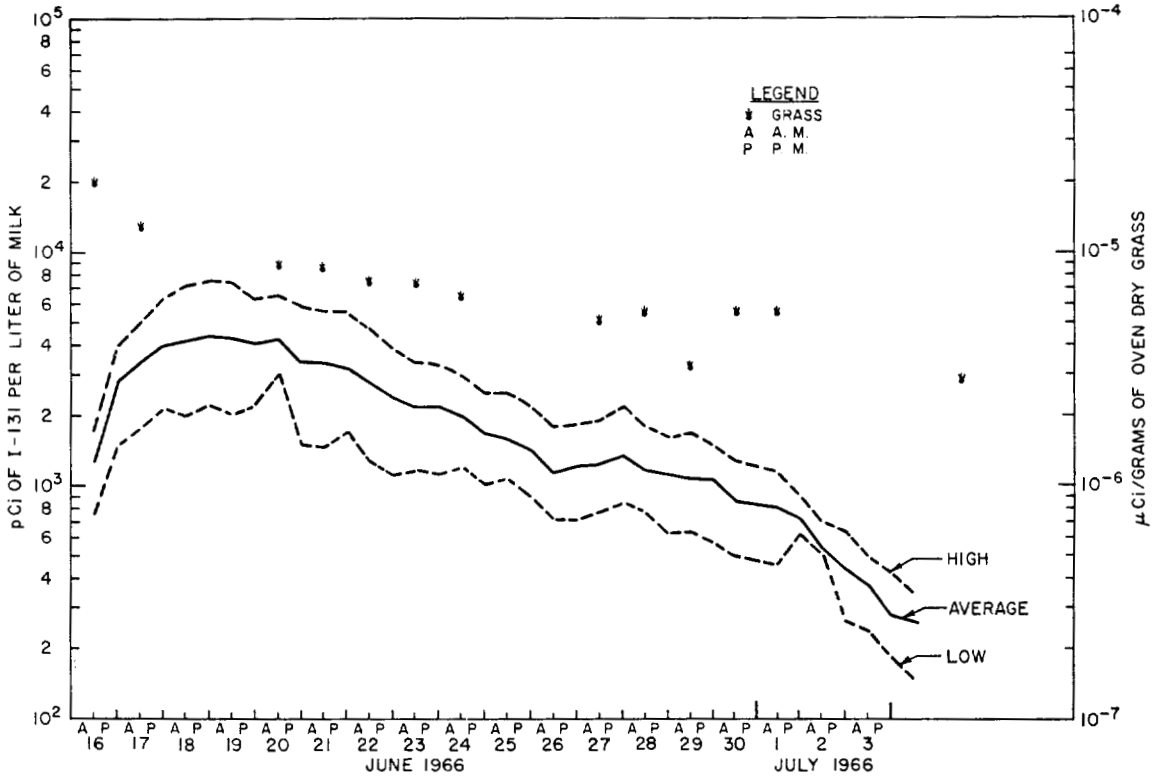

Fig. 12 Average, high, and low milk concentrations and grass concentrations of iodine-131 measured during CERT 10.

TABLE XIII

PERTINENT STATISTICS FOR EACH COW IN EXPERIMENTAL DAIRY FARM HERD

Cow No.	Body Weight (kg)	Estimated Grass Consumption[a] (dry kg/day)	Birth Date of Last Calf
2	580	17.2	3-26-66
50	660	11.3	5-24-65
60	550	14.0	3-16-66
89	640	11.8	5-19-65
96	580	10.9	10-8-65
100	520	10.1	10-10-65

0030066

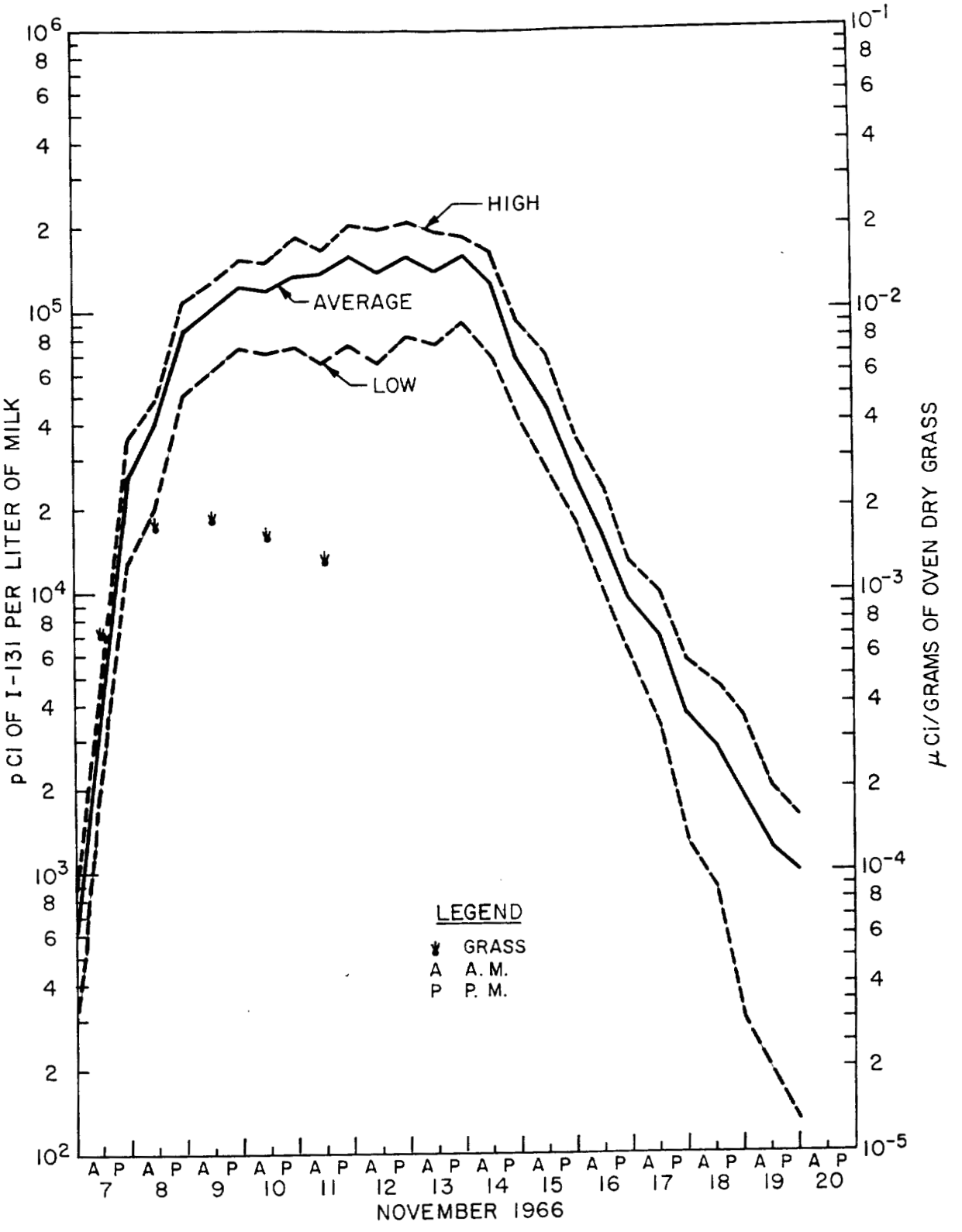

Fig. 13 Average, high, and low milk concentrations and grass concentrations of iodine-131 measured during CERT 12.

0030067

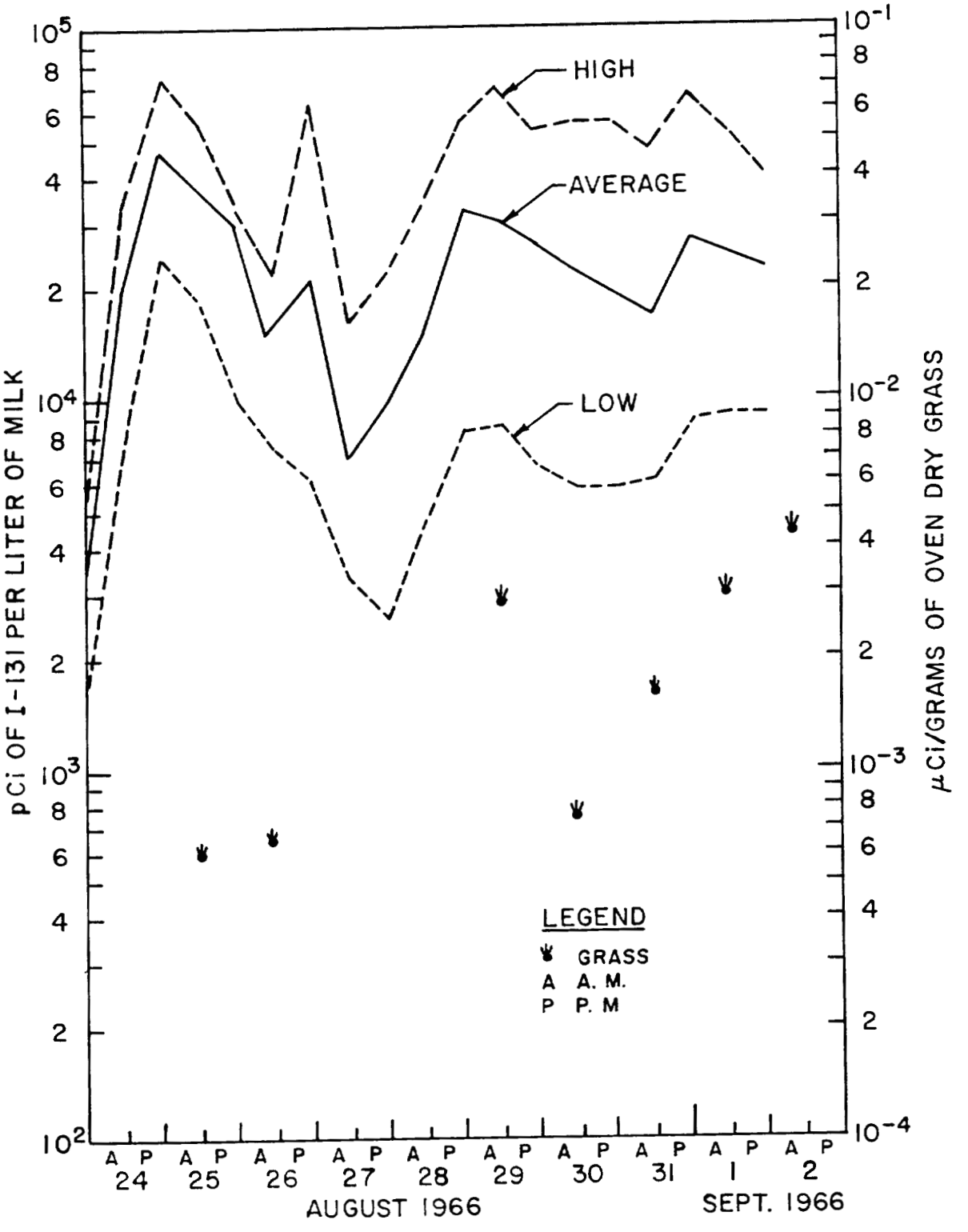

Fig. 14 Average, high, and low milk concentrations and grass concentrations of iodine-131 measured during CERT 17.

0030068

TABLE XIV

MILK PRODUCTION MEASUREMENTS DURING CERT 10

Date		liters/milking					
		Cow #2	#50	#60	#89	#96	#100
6-16	A.M.	11.7	5.1	13.3	7.1	11.7	8.6
	P.M.	17.5	3.6	10.4	7.2	8.4	7.2
17	A.M.	16.5	5.8	13.3	8.1	11.0	8.0
	P.M.	16.0	2.7	9.7	4.0	8.7	6.3
18	A.M.	12.2	5.2	11.3	8.7	11.1	9.1
	P.M.	13.3	4.2	9.7	6.1	8.6	7.0
19	A.M.	16.4	5.3	5.3	7.8	11.5	9.0
	P.M.	12.6	5.7	10.2	6.0	9.3	7.2
20	A.M.	16.2	6.2	1.2	8.0	11.4	9.2
	P.M.	12.6	3.1	--	--	8.3	6.8
21	A.M.	16.3	4.8	10.4	8.4	11.1	8.5
	P.M.	12.4	6.4	9.4	4.6	8.1	7.2
22	A.M.	16.0	5.4	9.7	8.8	11.7	8.7
	P.M.	12.0	5.3	8.6	5.7	8.3	6.6
23	A.M.	16.8	6.3	12.4	8.5	11.5	8.4
	P.M.	12.0	7.6	9.0	5.7	8.2	6.2
24	A.M.	16.2	6.6	12.4	8.3	11.6	8.4
	P.M.	11.7	4.4	10.6	6.2	8.6	2.4
25	A.M.	15.6	4.8	12.8	7.7	10.5	7.1
	P.M.	12.2	4.4	10.0	6.4	8.4	6.5
26	A.M.	15.5	7.3	12.8	7.6	11.0	8.1
	P.M.	14.8	4.6	10.2	7.5	10.4	6.8
27	A.M.	15.1	3.5	13.3	6.8	11.3	2.8
	P.M.	12.4	6.3	9.8	6.8	7.6	6.8
28	A.M.	16.5	7.1	13.3	8.3	12.2	7.8
	P.M.	11.1	4.1	10.0	5.3	7.7	6.2
29	A.M.	16.8	7.0	12.4	9.3	12.3	8.0
	P.M.	11.1	4.6	9.5	5.7	8.4	6.3
30	A.M.	15.8	6.4	11.7	8.3	10.8	8.0
	P.M.	11.5	3.3	9.7	3.7	7.8	6.4
7- 1	A.M.	16.6	8.1	10.7	9.1	11.3	8.6
	P.M.	12.0	4.0	9.7	3.5	7.7	6.2
2	A.M.	15.3	3.3	8.6	8.4	11.4	8.2
	P.M.	12.7	7.7	10.4	7.7	9.7	6.4
3	A.M.	14.6	5.8	10.6	7.3	10.3	8.4
	P.M.	11.1	3.3	9.4	5.8	8.8	6.3
4	A.M.	14.8	4.0	10.2	5.1	8.6	8.0
	P.M.	12.4	7.3	1.1	8.6	8.6	7.1
5	A.M.	15.5	5.5	10.3	6.7	11.5	3.2

TABLE XV

MILK PRODUCTION MEASUREMENTS DURING CERT 12

Date		liters/milking					
		Cow #2	#50	#60	#89	#96	#100
11-7	A.M.	9.3	2.0	7.3	6.0	4.4	4.2
	P.M.	7.1	1.5	4.7	4.4	3.4	3.8
8	A.M.	10.2	2.0	7.5	5.7	4.3	4.5
	P.M.	6.6	1.2	5.2	4.2	3.5	3.9
9	A.M.	10.5	2.2	7.8	5.2	4.0	4.9
	P.M.	6.2	1.3	4.7	4.9	3.2	3.9
10	A.M.	10.2	2.0	6.9	5.6	4.3	5.3
	P.M.	6.4	1.1	4.9	4.0	3.5	3.9
11	A.M.	9.6	2.1	6.7	5.3	4.0	4.8
	P.M.	6.2	1.3	5.3	3.5	3.5	4.2
12	A.M.	8.4	1.6	6.2	6.2	4.0	5.1
	P.M.	6.0	1.1	5.4	4.0	3.1	4.0
13	A.M.	7.8	1.6	6.2	4.8	4.0	5.4
	P.M.	6.8	1.3	5.3	4.4	3.3	4.2
14	A.M.	8.4	1.5	6.3	5.3	3.5	5.1
	P.M.	6.2	1.2	5.3	4.3	3.5	3.9
15	A.M.	10.7	1.6	7.3	5.8	5.1	5.3
	P.M.	6.2	1.2	5.0	3.7	3.5	4.2
16	A.M.	11.6	1.8	7.3	5.8	4.8	5.3
	P.M.	6.8	1.0	5.1	4.5	3.5	4.0
17	A.M.	11.6	1.5	7.3	5.7	4.8	4.8
	P.M.	7.1	1.3	4.7	4.4	3.1	4.2
18	A.M.	11.1	1.7	6.9	5.4	5.5	5.1
	P.M.	7.1	1.2	4.9	5.5	3.4	4.3
19	A.M.	11.1	1.2	6.5	5.8	4.5	4.9
	P.M.	7.4	1.3	4.9	3.5	3.5	4.2
20	A.M.	7.3	1.3	7.5	6.2	4.9	4.7
	P.M.	7.3	1.3	5.8	3.3	4.0	4.3

TABLE XVI

MILK PRODUCTION MEASUREMENTS DURING CERT 17

Date		liters/milking					
		Cow #2	#50	#60	#89	#96	#100
8-24	A.M.	13.3	4.4	9.4	7.1	9.8	6.9
	P.M.	11.4	4.0	7.2	5.3	6.4	6.3
25	A.M.	12.9	5.1	9.8	6.9	8.5	6.7
	P.M.	10.0	2.9	7.2	5.8	6.0	5.3
26	A.M.	14.1	4.7	9.1	7.5	8.9	7.0
	P.M.	9.3	3.2	6.0	2.9	7.0	5.1
27	A.M.	13.1	5.8	7.1	8.4	8.7	6.9
	P.M.	11.1	2.7	7.3	5.8	7.4	6.2
28	A.M.	13.1	4.4	7.8	5.8	7.4	6.1
	P.M.	10.2	4.2	6.9	6.4	7.4	6.1
29	A.M.	12.7	4.4	8.0	6.2	8.1	6.7
	P.M.	10.0	4.0	2.2	6.0	6.0	4.9
30	A.M.	13.8	5.0	9.9	6.4	9.5	6.7
	P.M.	9.5	3.5	5.5	4.9	6.2	6.6
31	A.M.	12.9	3.1	9.5	6.9	8.4	6.9
	P.M.	9.8	4.2	7.1	5.1	6.9	5.2
9- 1	A.M.	12.9	4.9	8.7	5.8	8.0	5.8
	P.M.	10.0	3.7	8.0	5.8	6.2	5.9
2	A.M.	14.0	4.9	8.7	7.1	8.9	6.2

0030071

TABLE XVII

AVERAGE MILK PRODUCTION
FOR EACH COW DURING CERT TESTS 13-19

Date	liters/milking					
	Cow #2	#50	#60	#89	#96	#100
5-5 to 5-9	27.2	10.7	17.3	13.1	18.4	14.3
5-10 to 5-14	29.5	12.6	20.7	13.8	19.4	15.5
5-15 to 5-19	31.9	12.7	24.5	14.5	20.2	15.9
5-20 to 5-24	33.1	13.9	21.1	15.8	21.9	16.2
5-25 to 5-31	34.3	12.0	23.0	15.9	21.8	15.8
6-1 to 6-5	33.9	13.1	22.2	15.1	21.9	15.4
6-6 to 6-10	32.9	12.7	24.8	15.5	22.1	14.8
6-11 to 6-15	31.8	10.3	21.0	14.9	21.1	15.4
6-16 to 6-20	31.1	9.5	22.2	14.0	20.2	15.9
6-21 to 6-25	28.4	10.4	21.1	14.2	19.7	15.0
6-26 to 6-30	28.4	10.9	22.7	13.9	20.0	14.5
7-1 to 7-5	27.5	10.7	20.0	13.9	19.2	14.3
7-6 to 7-10	28.2	11.4	19.6	14.7	19.6	15.3
7-11 to 7-15	27.4	10.4	19.5	13.8	18.8	14.8
7-16 to 7-20	25.6	8.6	20.3	12.5	17.8	12.8
7-21 to 7-25	24.9	8.7	19.8	11.8	17.6	13.4
7-26 to 7-31	32.2	8.8	17.1	11.4	16.4	14.9
8-1 to 8-5	23.0	9.3	16.1	11.8	15.9	13.5
8-6 to 8-10	25.3	9.0	18.5	12.5	16.3	12.5
8-11 to 8-15	24.6	9.0	17.5	12.7	15.9	11.7
8-16 to 8-20	23.8	8.9	18.3	13.0	16.6	12.0
8-21 to 8-25	23.2	8.7	17.5	12.6	16.0	12.9
8-26 to 8-31	23.2	8.2	17.3	12.1	15.2	12.0
9-1 to 9-5	22.8	8.6	17.5	12.1	14.3	10.5
9-6 to 9-10	21.7	8.2	15.8	10.6	14.1	10.8
9-11 to 9-15	20.1	8.4	14.2	11.3	12.2	10.8
9-16 to 9-20	21.1	8.0	13.8	11.7	13.0	11.0
9-21 to 9-25	22.4	7.7	16.5	12.4	13.7	10.2
9-26 to 9-30	23.2	7.7	16.2	11.0	13.0	10.6
10-1 to 10-5	22.2	7.7	14.9	10.7	12.2	11.1
10-6 to 10-10	21.5	7.5	14.4	11.3	10.8	10.0
10-11 to 10-15	21.4	7.7	14.7	11.1	10.5	9.5
10-16 to 10-20	20.7	6.5	14.2	9.7	9.3	9.0
10-21 to 10-25	18.4	6.1	12.5	9.6	8.6	9.4
10-26 to 10-31	18.5	5.3	12.2	9.7	8.5	8.6

0030072

TABLE XVII (Contd.)

AVERAGE MILK PRODUCTION
FOR EACH COW DURING CERT TESTS 13-19

Date	liters/milking					
	Cow #2	#50	#60	#89	#96	#100
11-1 to 11-5	17.1	4.7	11.8	9.7	8.1	7.8
11-6 to 11-10	16.6	4.1	12.1	9.7	7.7	7.6
11-11 to 11-15	15.3	3.9	11.8	9.5	7.5	9.3
11-16 to 11-20	18.4	3.6	12.2	9.9	8.4	9.6
11-21 to 11-25	17.9	3.1	11.2	9.0	7.3	7.9
11-25 to 11-30	18.1	2.9	12.1	8.3	7.2	7.7
12-1 to 12-5	16.4	2.5	12.1	7.8	7.2	8.0

TABLE XVIII

AVERAGE IODINE-131 CONCENTRATIONS
IN MILK FOR EACH COW DURING CERT TESTS 13-19

Date	Average pCi I-131 per liter					
	Cow #2	#50	#60	#89	#96	#100
6-11 to 6-15	1.38×10^{2}	7.9×10^{1}	5.6×10^{1}	1.70×10^{2}	1.50×10^{2}	1.07×10^{2}
6-16 to 6-20	2.82×10^{3}	3.57×10^{3}	2.32×10^{3}	1.65×10^{3}	5.24×10^{3}	3.94×10^{3}
6-21 to 6-25	2.13×10^{3}	2.72×10^{3}	1.77×10^{3}	1.26×10^{3}	3.96×10^{3}	3.41×10^{3}
6-26 to 6-30	9.96×10^{2}	1.34×10^{3}	8.01×10^{2}	7.07×10^{2}	1.79×10^{3}	1.39×10^{3}
7-1 to 7-5	4.26×10^{2}	6.13×10^{2}	4.03×10^{2}	3.12×10^{2}	6.36×10^{2}	6.31×10^{2}
7-21 to 7-25	7.50×10^{2}	8.95×10^{2}	6.77×10^{2}	5.77×10^{2}	1.49×10^{3}	1.28×10^{3}
7-26 to 7-31	2.68×10^{2}	4.50×10^{2}	2.83×10^{2}	2.28×10^{2}	5.82×10^{2}	4.28×10^{2}
8-1 to 8-5	1.83×10^{4}	1.61×10^{4}	9.05×10^{3}	1.10×10^{4}	2.31×10^{4}	2.31×10^{4}
8-6 to 8-10	5.87×10^{4}	7.78×10^{4}	4.05×10^{4}	4.36×10^{4}	7.81×10^{4}	7.18×10^{4}
8-11 to 8-15	5.18×10^{3}	1.39×10^{3}	8.31×10^{3}	1.07×10^{3}	1.44×10^{4}	1.30×10^{3}
8-16 to 8-20	3.43×10^{3}	9.45×10^{4}	5.09×10^{4}	5.10×10^{3}	1.16×10^{4}	7.84×10^{4}
8-21 to 8-25	7.42×10^{3}	1.37×10^{4}	1.33×10^{4}	6.58×10^{3}	1.95×10^{4}	1.56×10^{4}
8-26 to 8-31	1.43×10^{4}	2.58×10^{4}	9.82×10^{3}	7.86×10^{3}	3.85×10^{4}	3.10×10^{4}
9-1 to 9-5	1.41×10^{4}	2.90×10^{4}	2.01×10^{4}	1.04×10^{4}	4.56×10^{4}	3.40×10
9-6 to 9-10	5.38×10^{3}	1.18×10^{4}	7.66×10^{3}	9.97×10^{3}	9.83×10^{3}	5.52×10^{3}
11-6 to 11-10	6.03×10^{4}	4.14×10^{4}	7.32×10^{4}	4.22×10^{4}	8.55×10^{4}	8.15×10^{4}
11-11 to 11-15	1.05×10^{5}	1.49×10^{5}	1.43×10^{5}	6.80×10^{4}	1.47×10^{5}	1.48×10^{5}
11-16 to 11-20	4.69×10^{3}	1.08×10^{4}	8.52×10^{3}	5.69×10^{3}	8.40×10^{3}	7.47×10^{3}
11-21 to 11-25	3.20×10^{2}	1.04×10^{3}	7.37×10^{2}	4.93×10^{2}	9.94×10^{2}	5.76×10^{2}

0030073

VIII. REFERENCES

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2. C. A. Hawley, Jr, (ed.), Controlled Environmental Radioiodine Tests at the National Reactor Testing Station 1965 Progress Report, IDO-12047 (February 1966).

3. D. F. Bunch (ed.), Controlled Environmental Radioiodine Tests Progress Report Number Two, IDO-12053 (August 1966).

4. E. H. Markee, Jr., and C. A. Hawley, Jr., "Controlled Environmental Radioiodine Tests (CERT) at the National Reactor Testing Station", in Oak Ridge National Laboratory, Eighth AEC Air Cleaning Conference, Oak Ridge National Laboratory, October 22-25, 1963, TID-7677 (1963) pp 392-400.

5. C. A. Hawley, Jr., and E. H. Markee, Jr., "Controlled Environmental Radioiodine Tests", in Radioactive Fallout from Nuclear Weapons Tests. AEC Symposium Series No. 5. Oak Ridge: USAEC Division of Technical Information Extension, 1965, pp 821-835.

6. D. F. Bunch, "The Comparative Environmental Hazards from a Release of Methyl Iodide or Elemental Iodine", from the Ninth AEC Air Cleaning Conference, Boston, Massachusetts, September 13-16, 1966.

7. E. H. Markee, Jr., "Turbulent Transfer Characteristics of Radioiodine Effulents from Air to Natural Surfaces", from the Conference of the American Meteorological Society on Physical Processes in the Lower Atomosphere, Ann Arbor, Michigan, March 20-22, 1967.

0030074

APPENDIX A
TABULATION OF DEPOSITION DATA

0030075

0030076

APPENDIX A -- TABULATION OF DEPOSITION DATA

As indicated in earlier sections of this report, values of V_d in different experiments may not be meaningfully compared unless consideration is given to factors which influence those values. To allow a comparison, three types of information have been included to supplement data previously discussed. In Figures A-1 through -13, observed values of V_d and V_D at each sampling station are tabulated. In Figures A-14 through -24, the variation of concentrations of airborne materials with height is shown. Finally, variations in the amount of activity collected on particulate filters with sampling height are described.

As later reports will show, seemingly wide variation in reported values of deposition velocities can be understood in terms of the variation of meteorological conditions, natural aerosol concentrations, and released species.

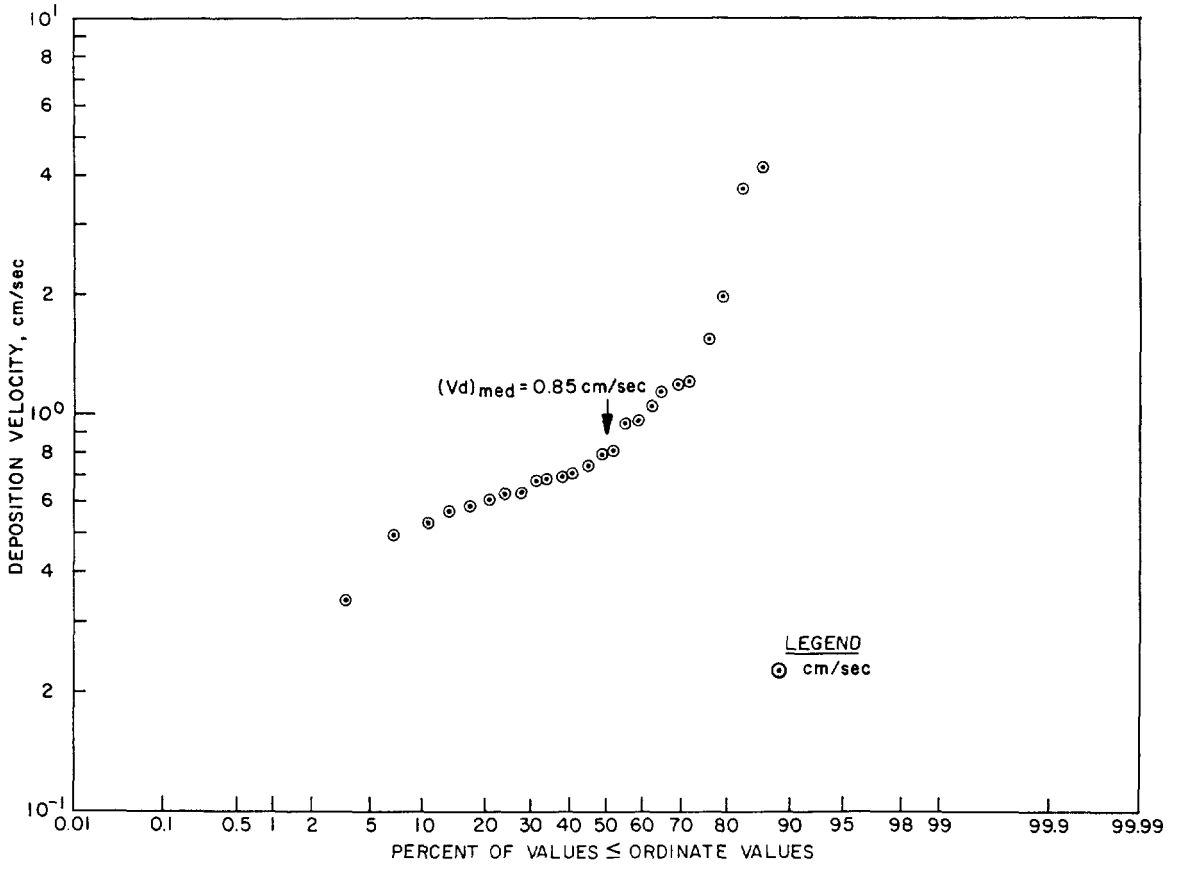

Fig. A-1 Calculated values of V_d and V_D in CERT 1.

0030077

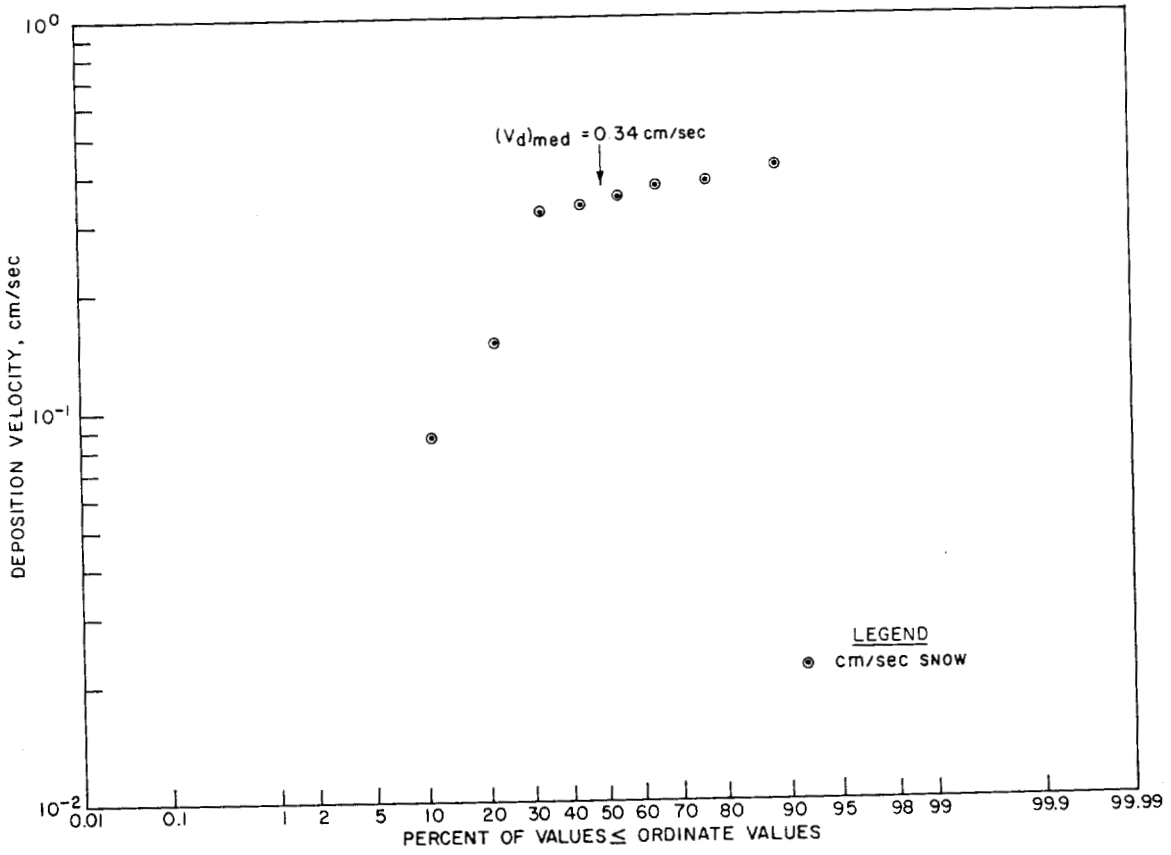

Fig. A-2 Calculated values of V_d and V_D in CERT 3.

0030078

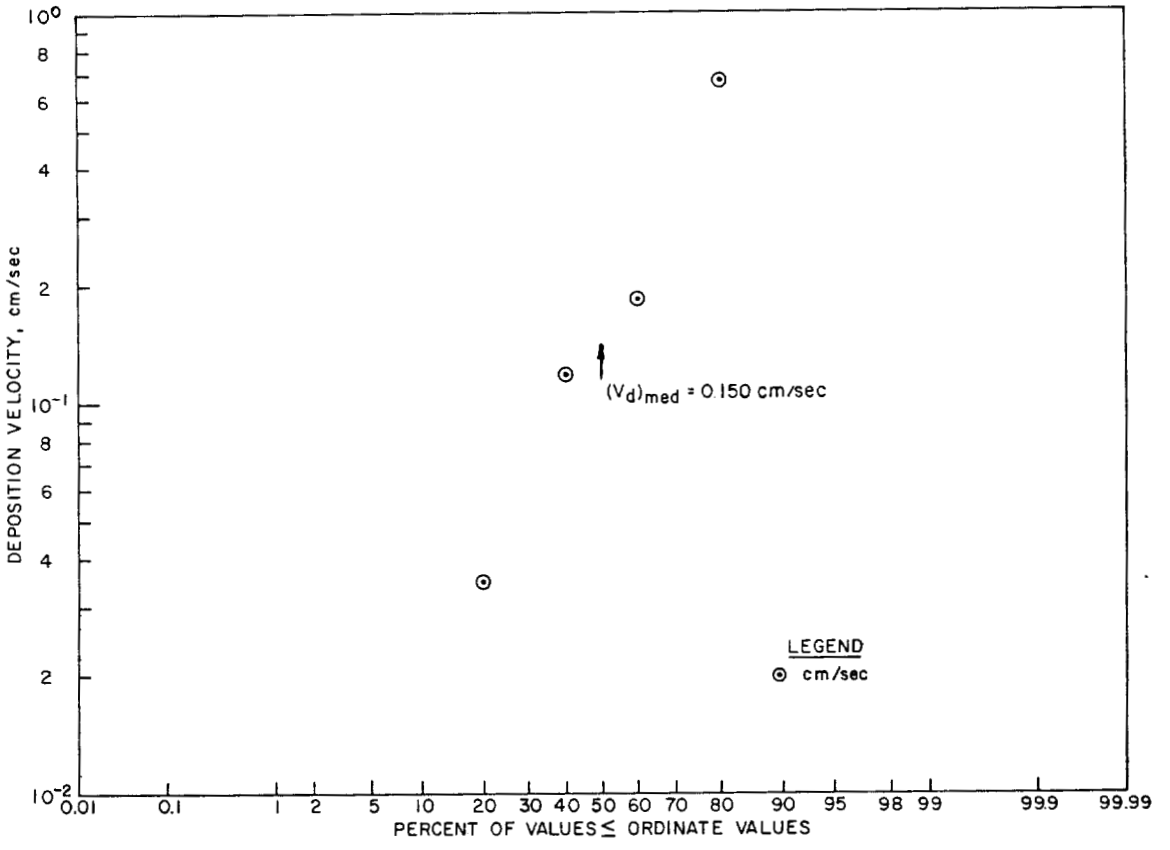

Fig. A-3 Calculated values of V_d and V_D in CERT 4.

0030079

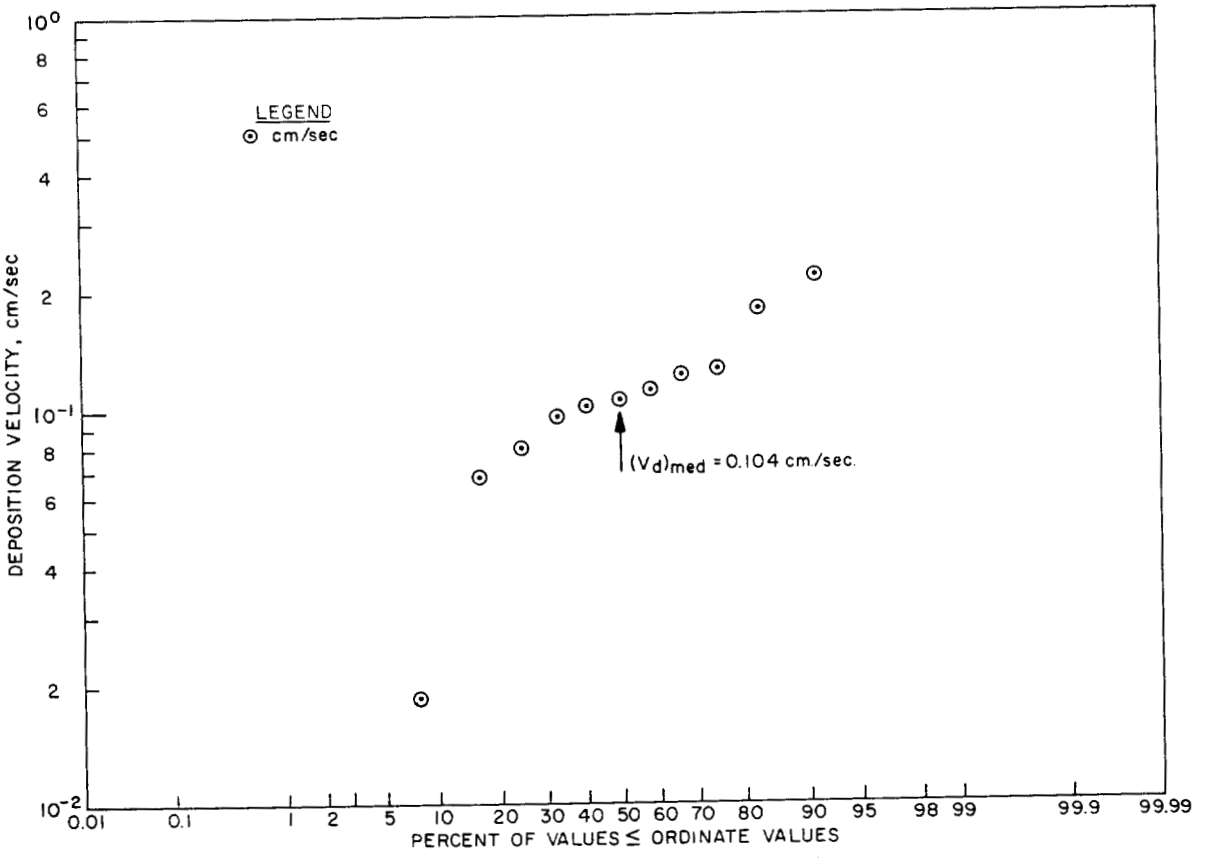

Fig. A-4 Calculated values of V_d and V_D in CERT 5.

0030080

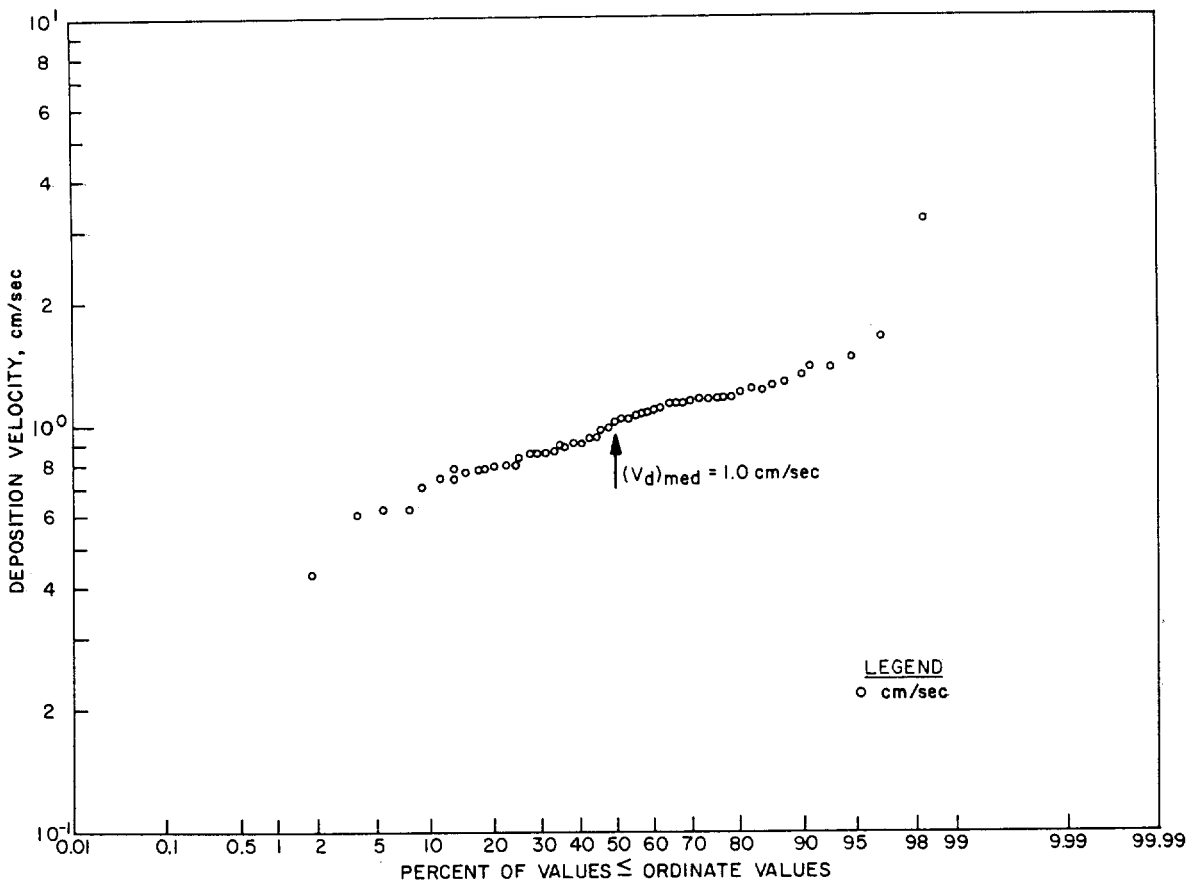

Fig. A-5 Calculated values of V_d and V_D in CERT 7.

0030081

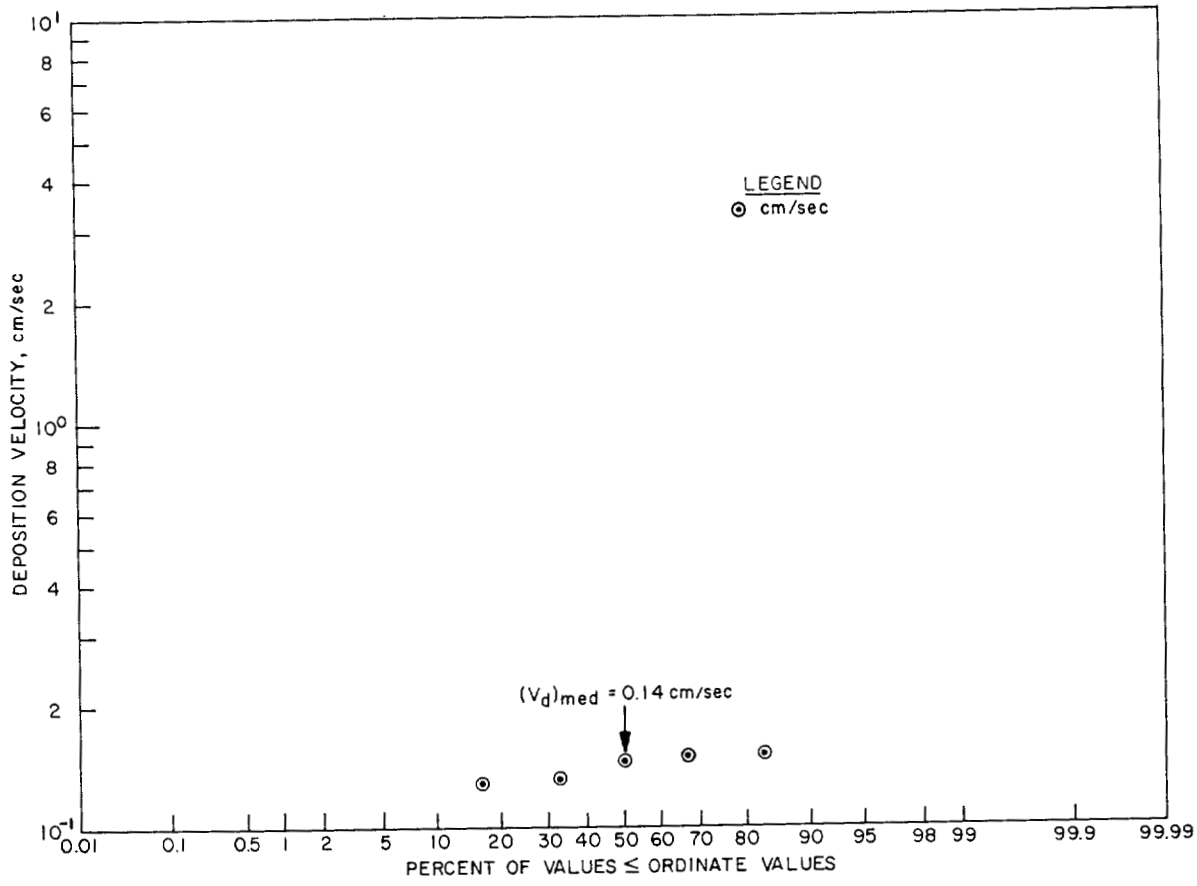

Fig. A-6 Calculated values of V_d and V_D in CERT 8.

0030082

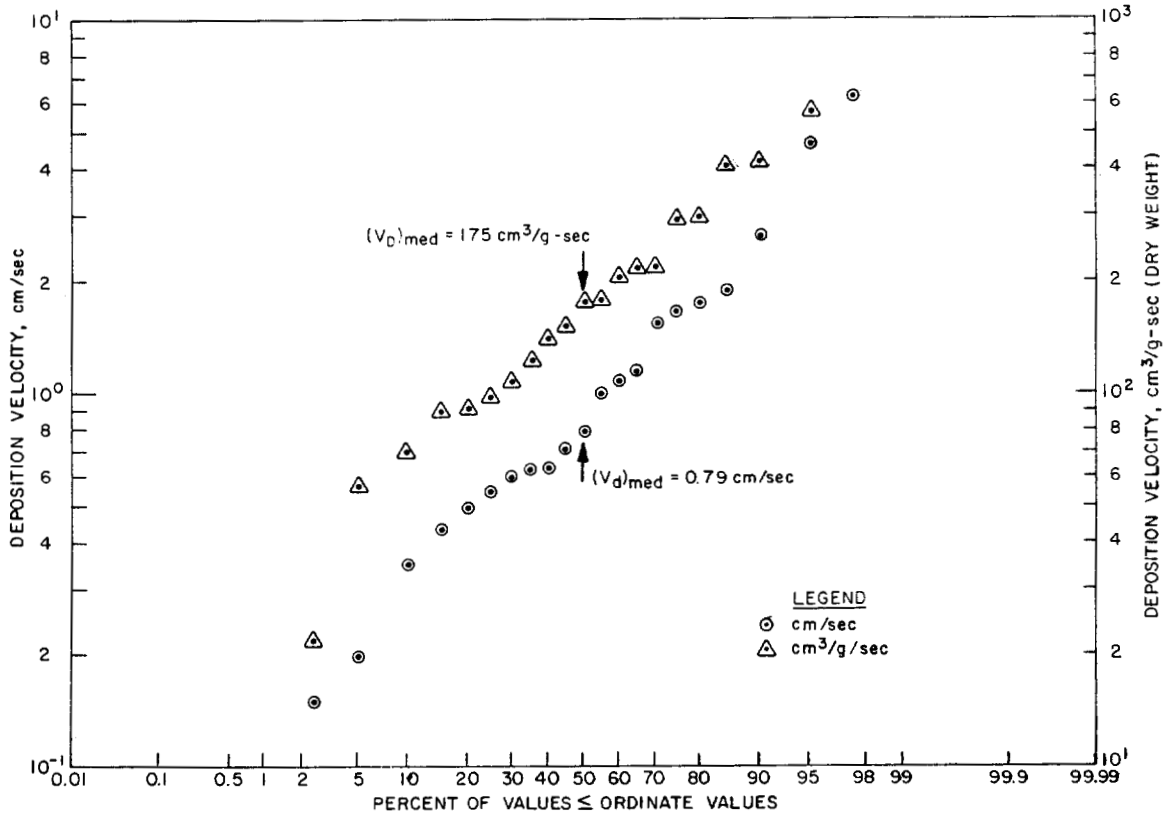

Fig. A-7 Calculated values of V_d and V_D in CERT 10.

0030083

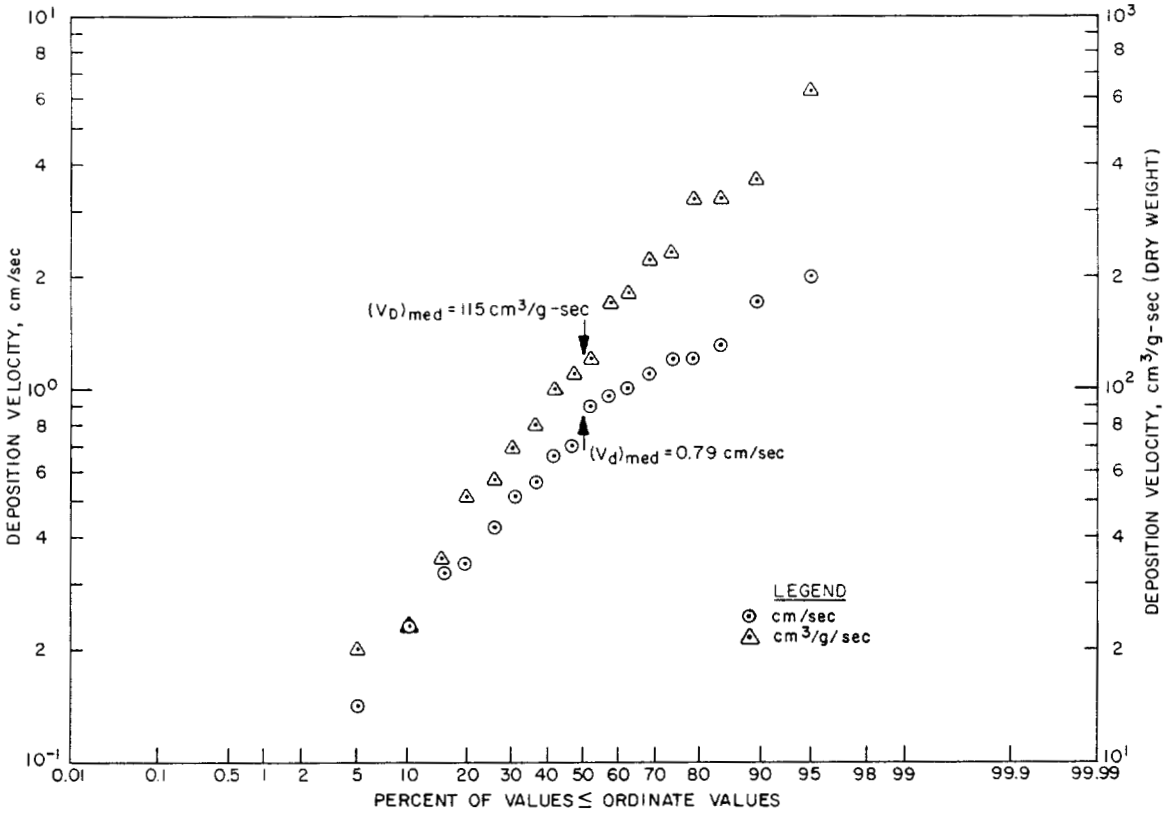

Fig. A-8 Calculated values of V_d and V_D in CERT 13.

0030084

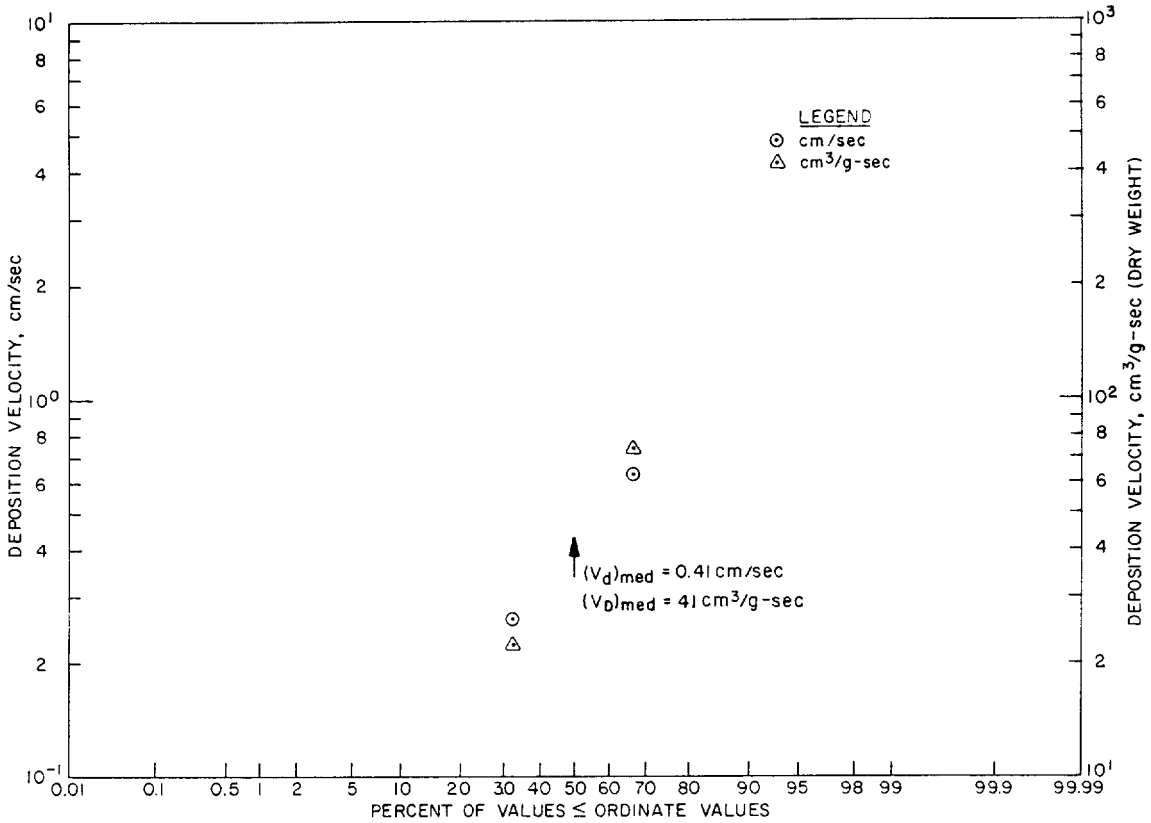

Fig. A-9 Calculated values of V_d and V_D in CERT 14.

0030085

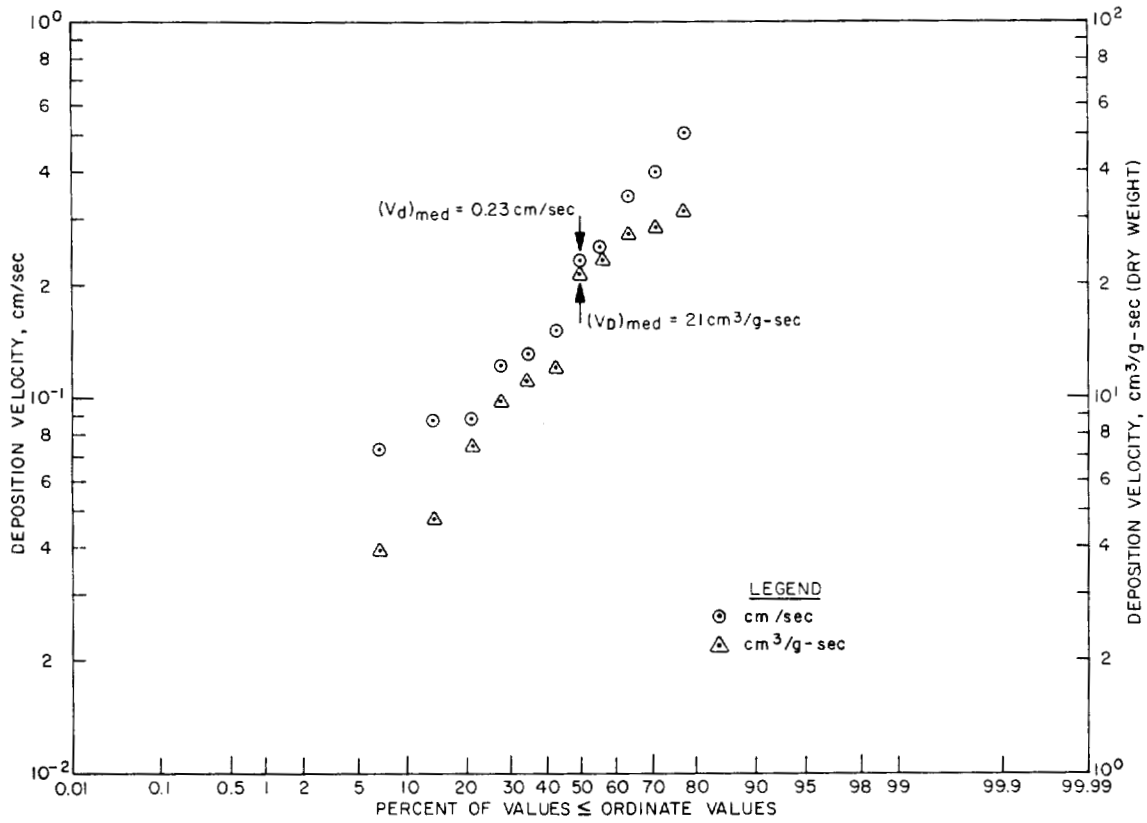

Fig. A-10 Calculated values of V_d and V_D in CERT 15.

0030086

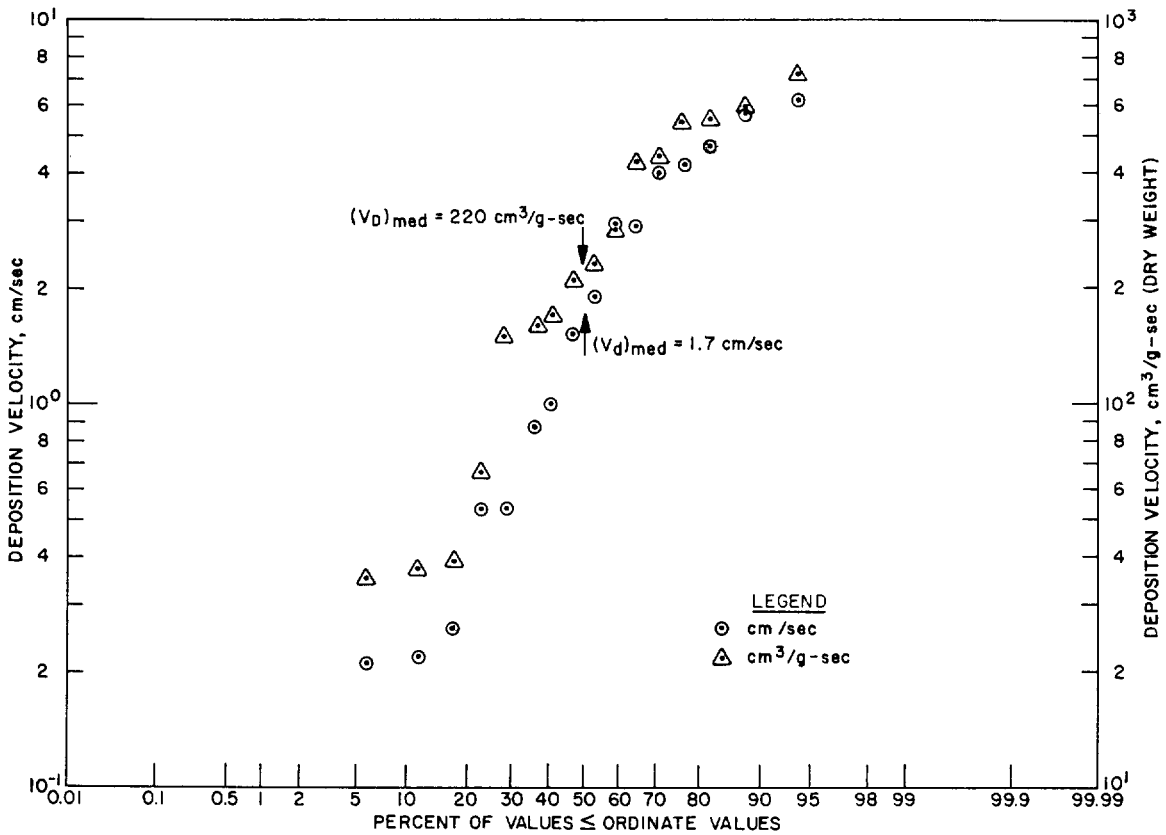

Fig. A-11 Calculated values of V_d and V_D in CERT 16.

0030087

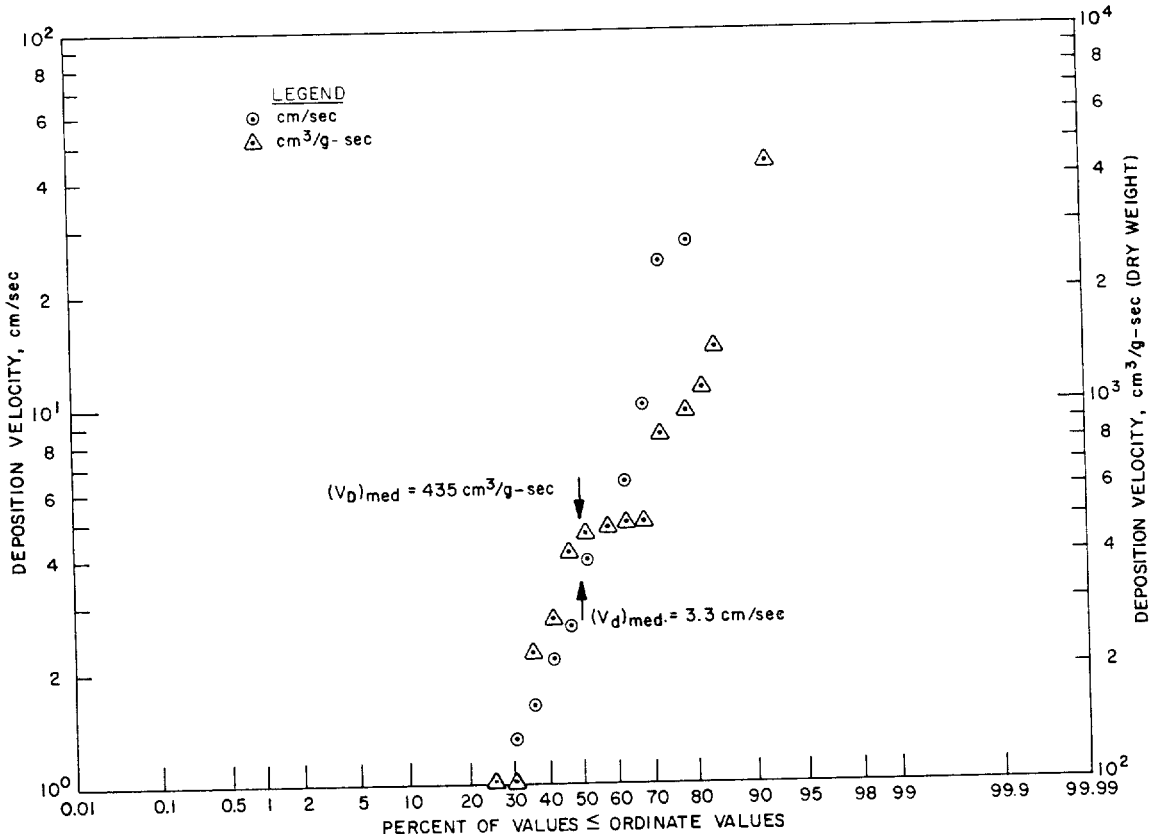

Fig. A-12 Calculated values of V_d and V_D in CERT 17.

0030088

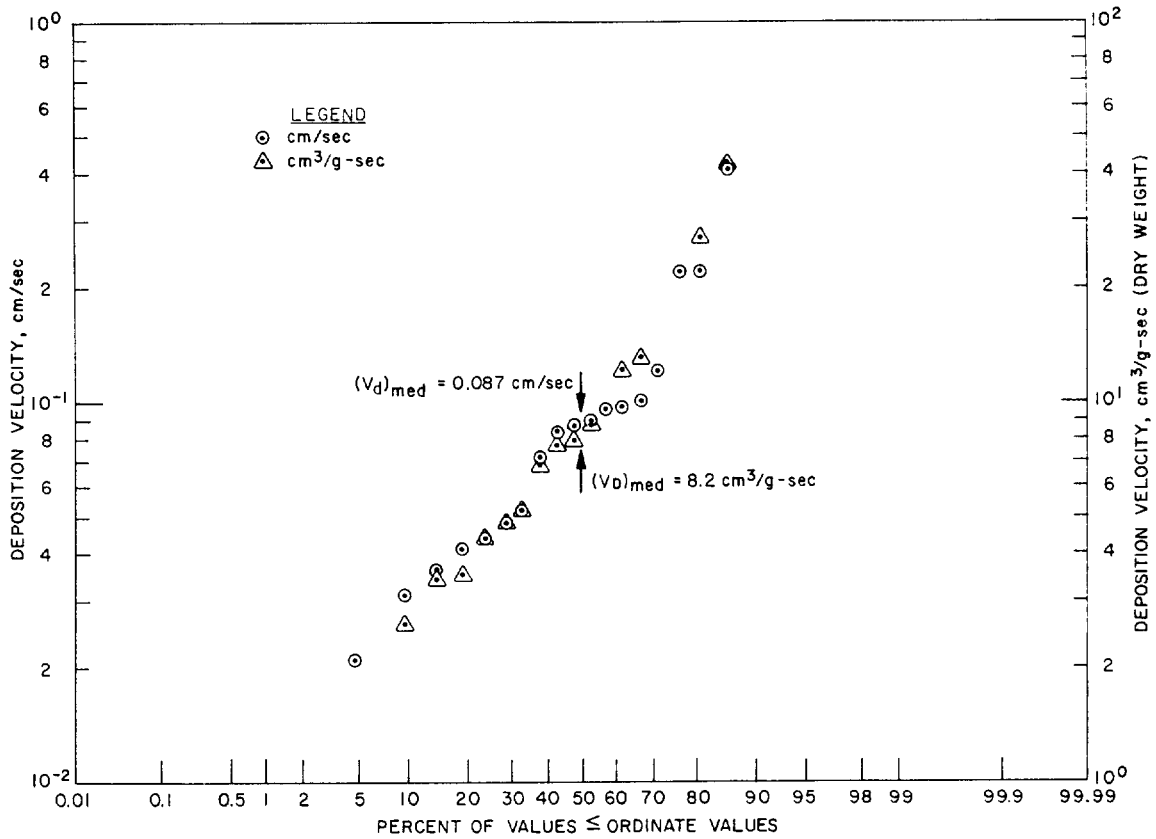

Fig. A-13 Calculated values of V_d and V_D in CERT 18.

0030089

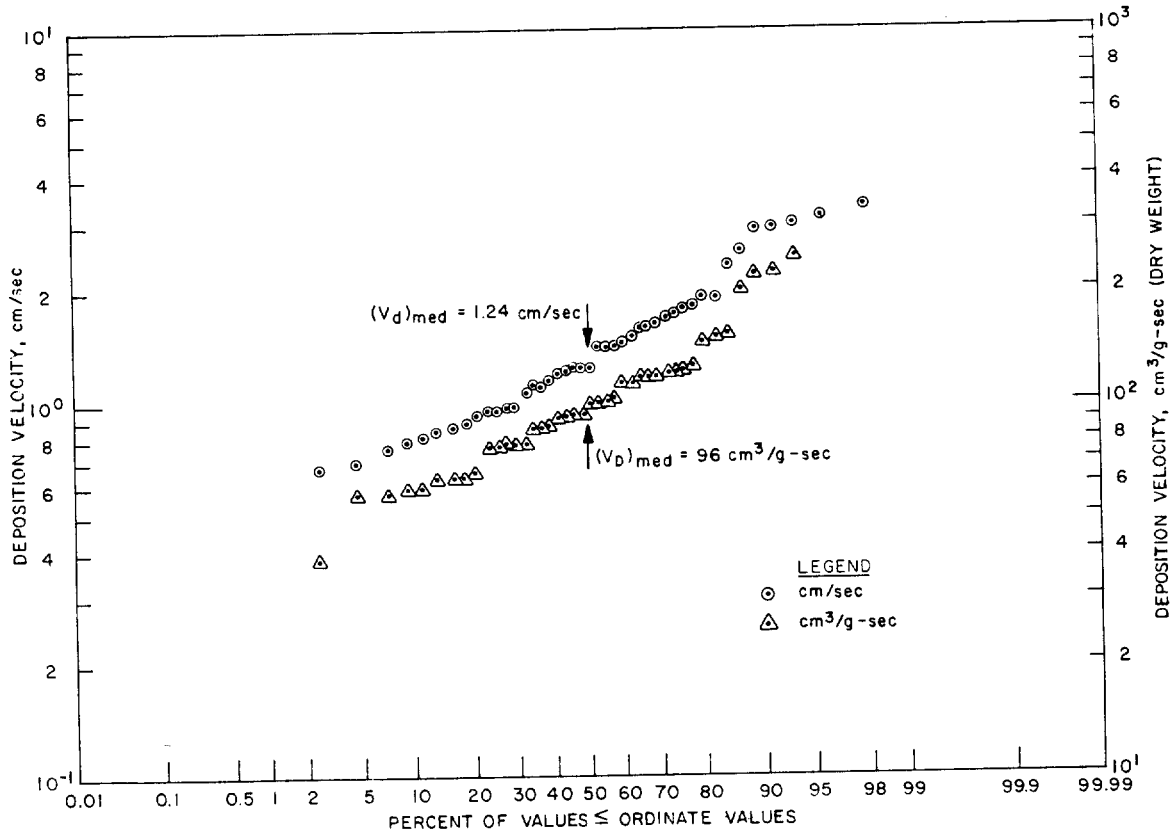

Fig. A-14 Measured concentration profiles in CERT 19.

0030090

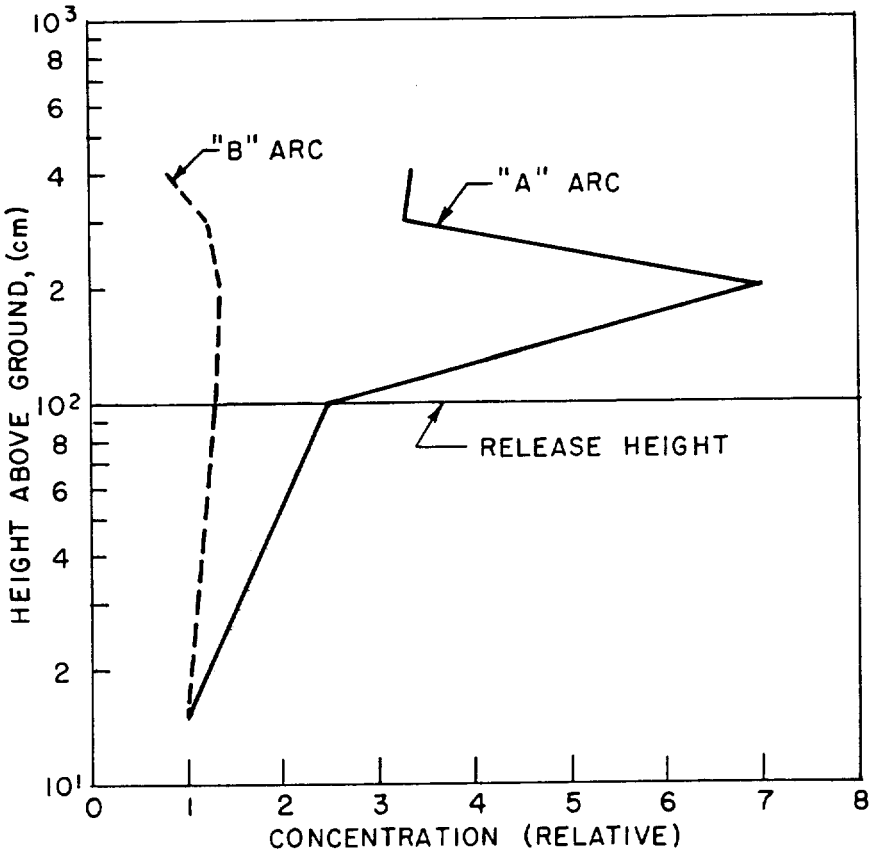

Fig. A-15 Measured concentration profiles in CERT 2.

0030091

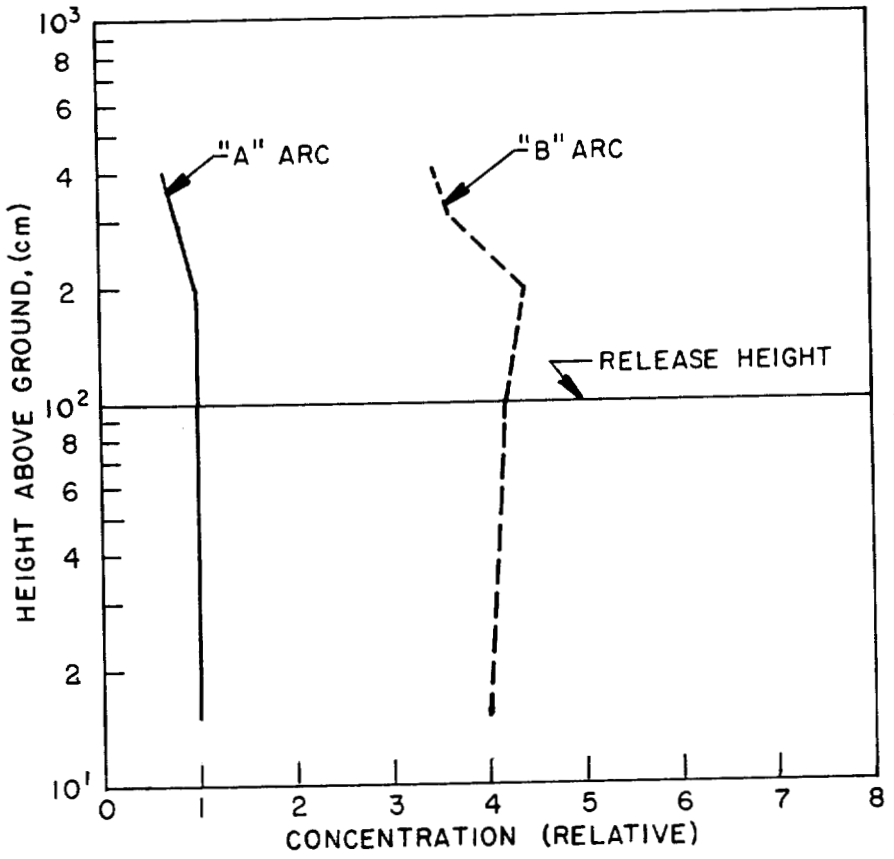

Fig. A-16 Measured concentration profiles in CERT 6.

0030092

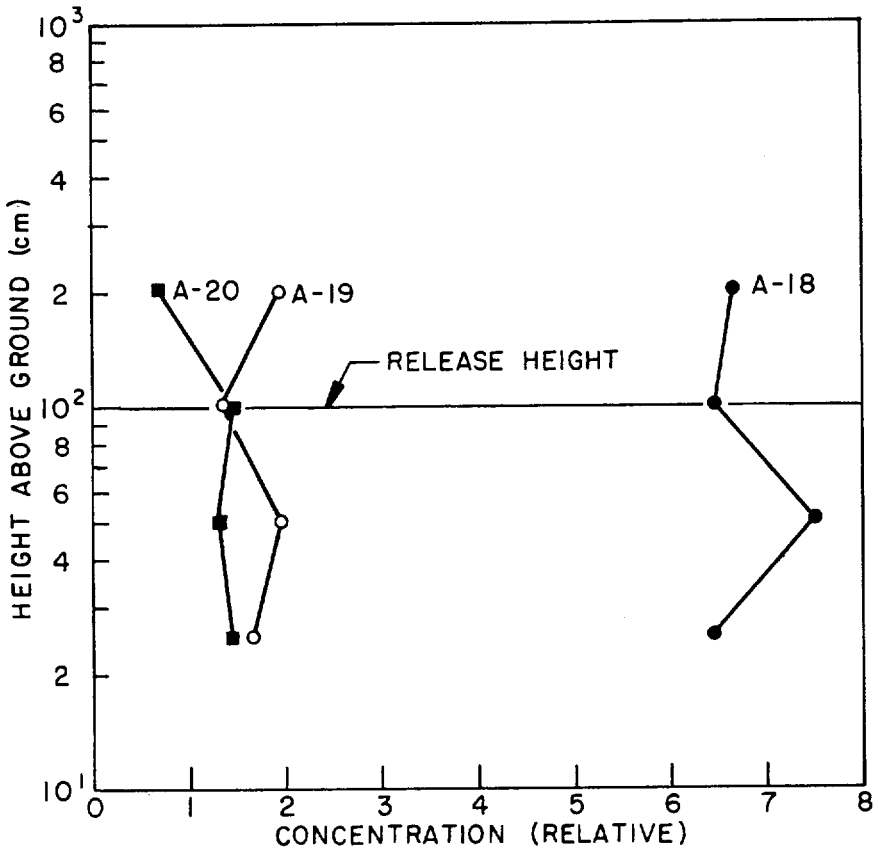

Fig. A-17 Measured concentration profiles in CERT 8.

0030093

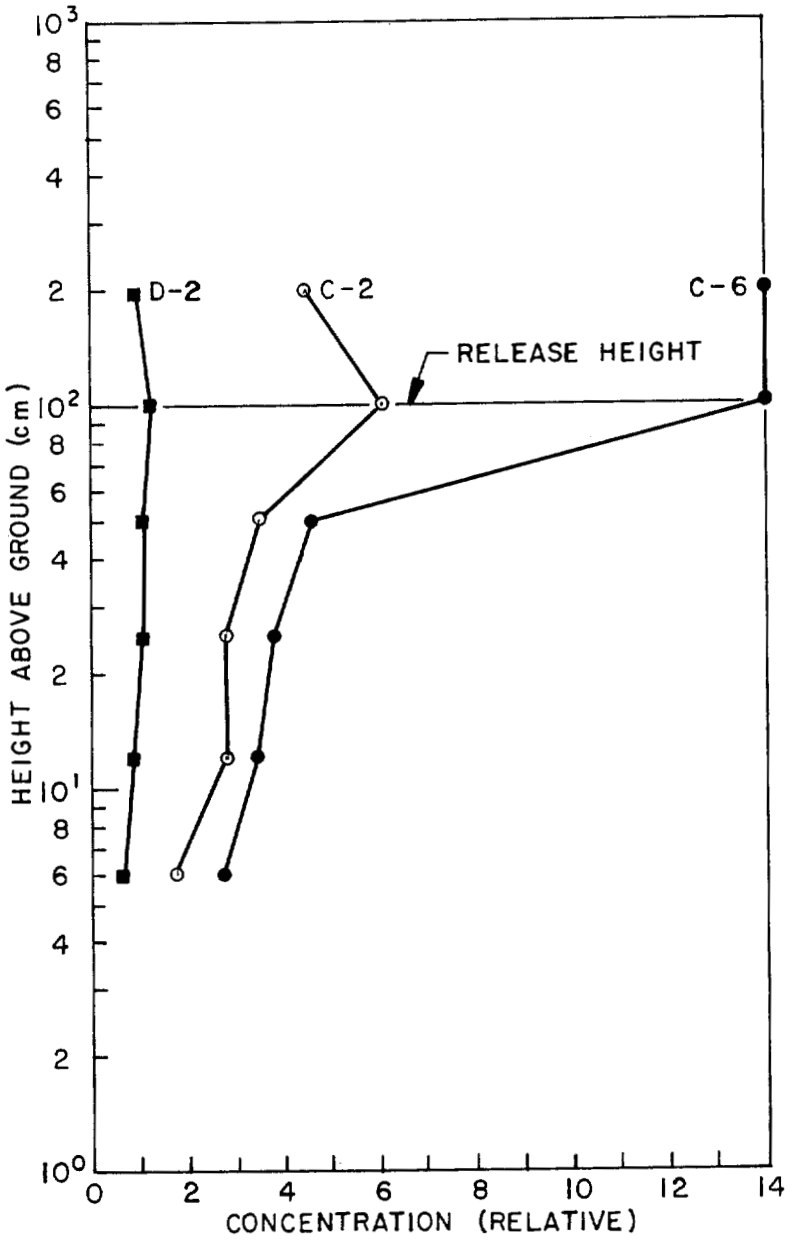

Fig. A-18 Measured concentration profiles in CERT 10.

0030094

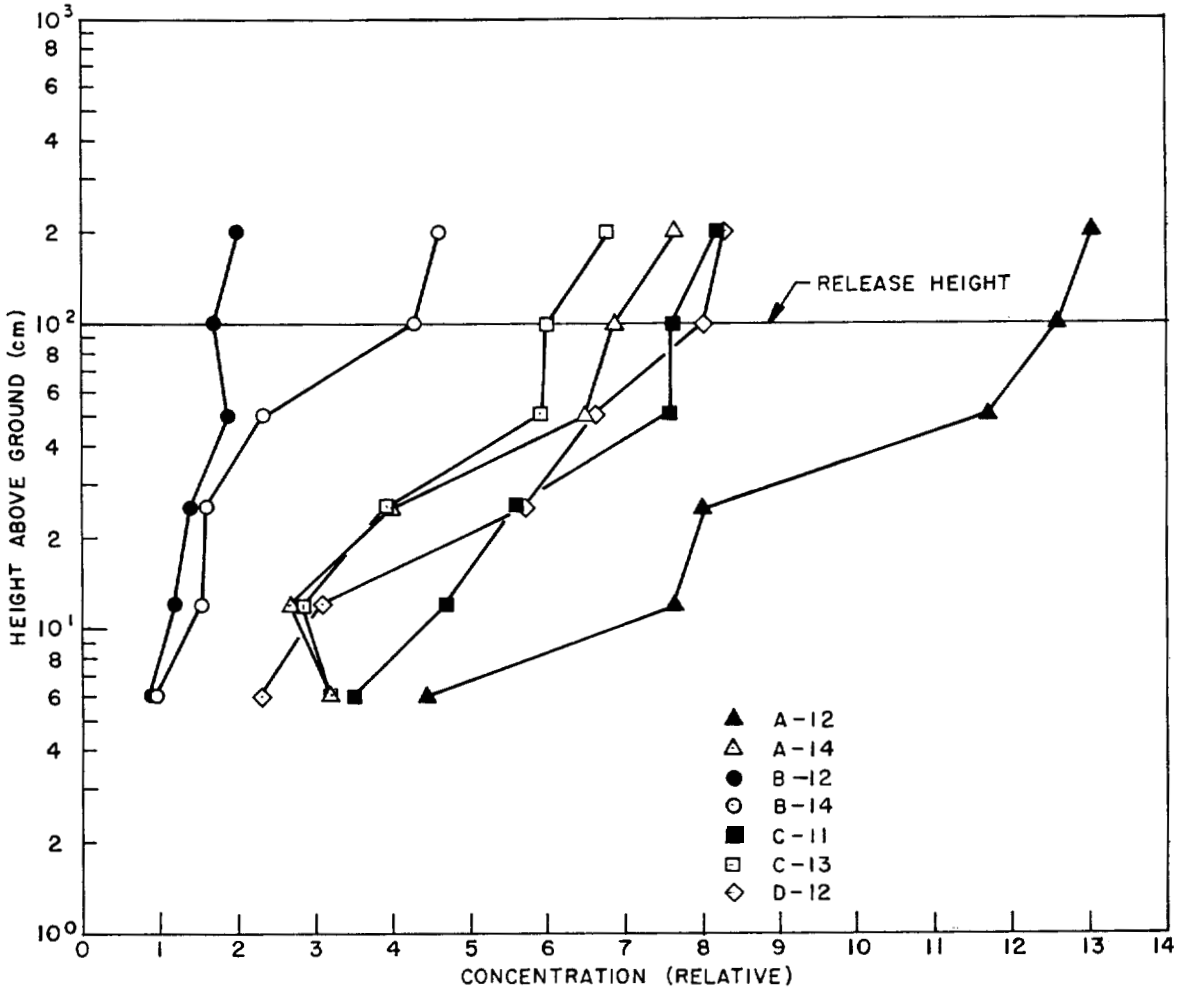

Fig. A-19 Measured concentration profiles in CERT 13.

0030095

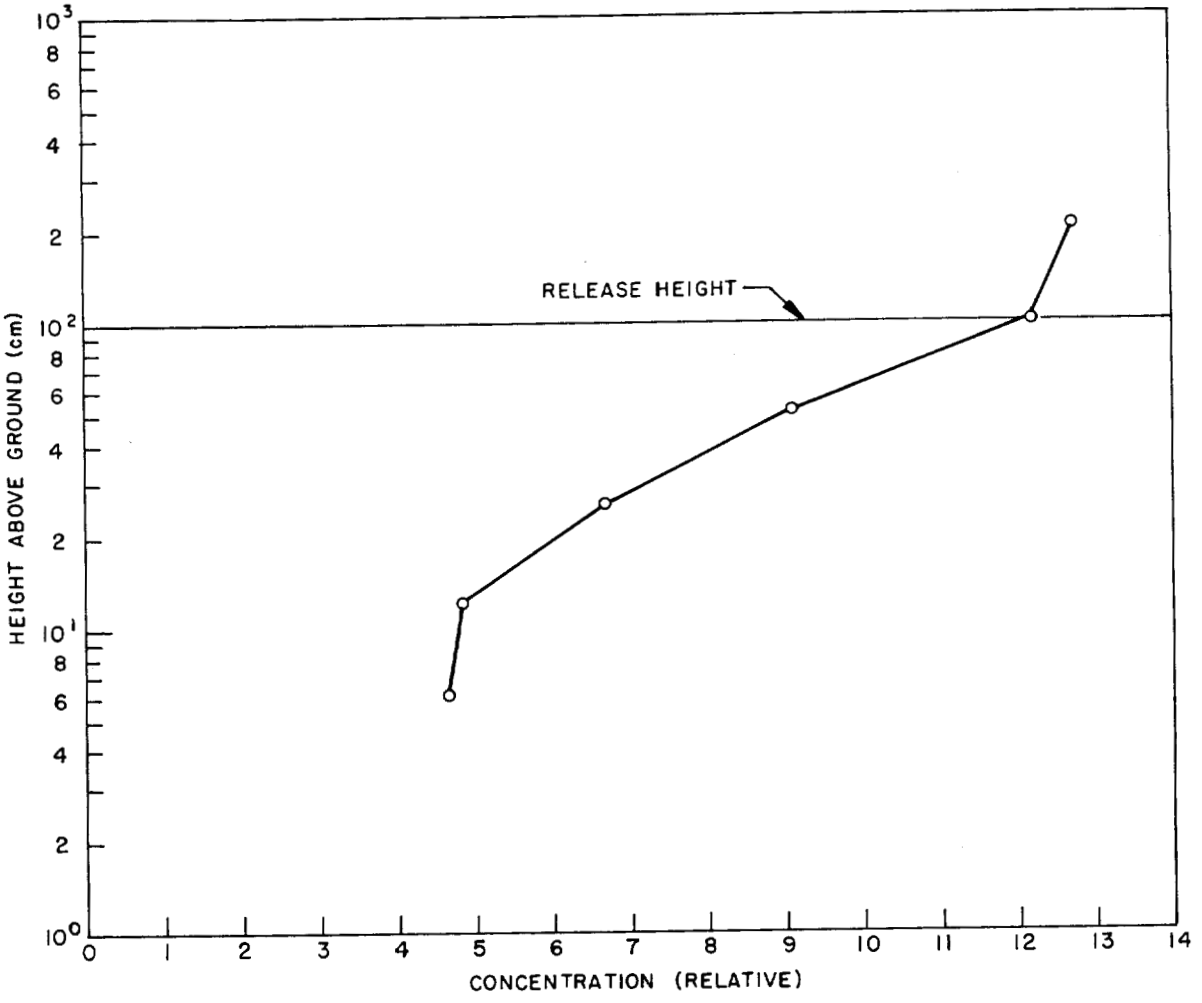

Fig. A-20 Measured concentration profiles in CERT 14.

0030096

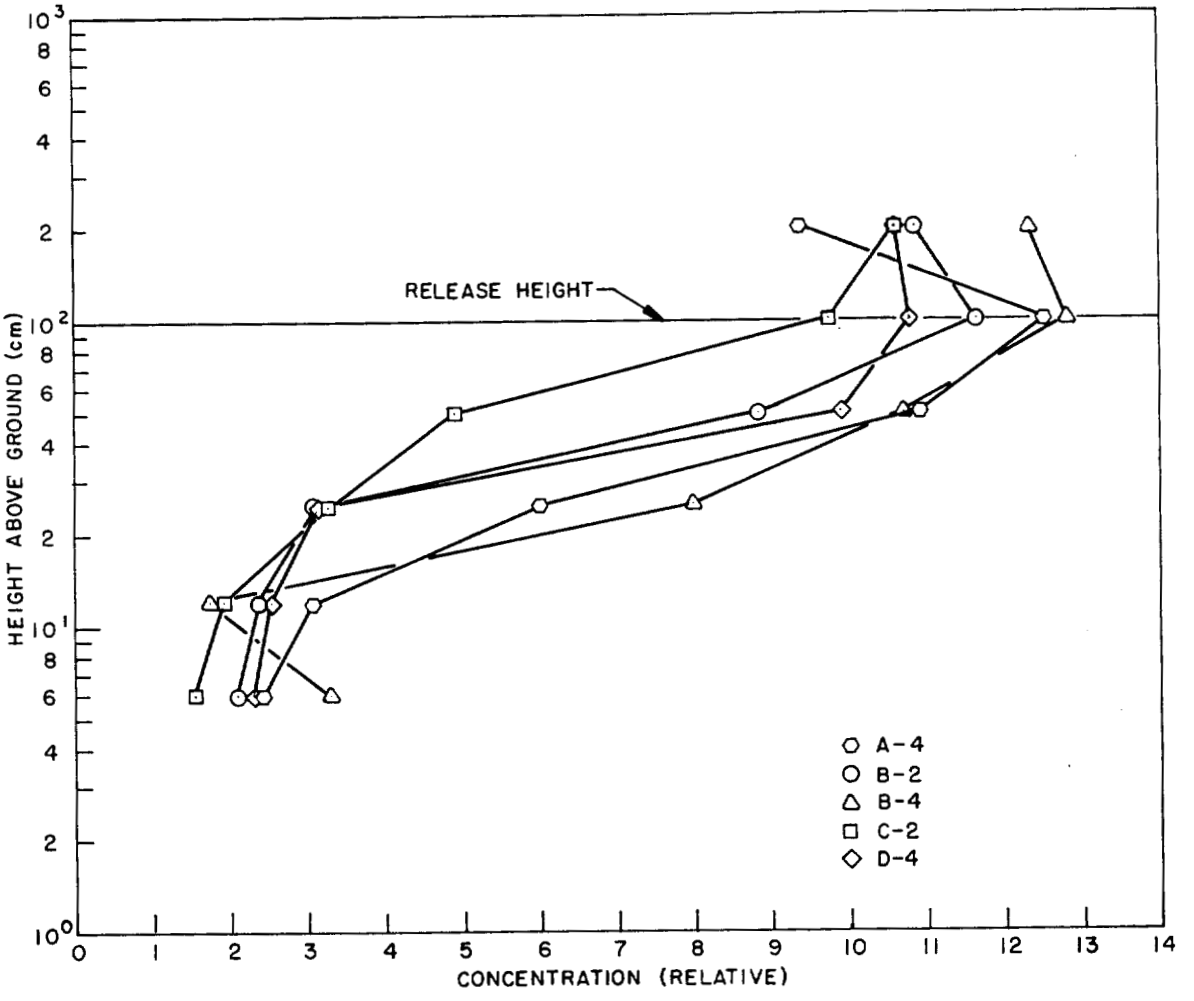

Fig. A-21 Measured concentration profiles in CERT 15.

0030097

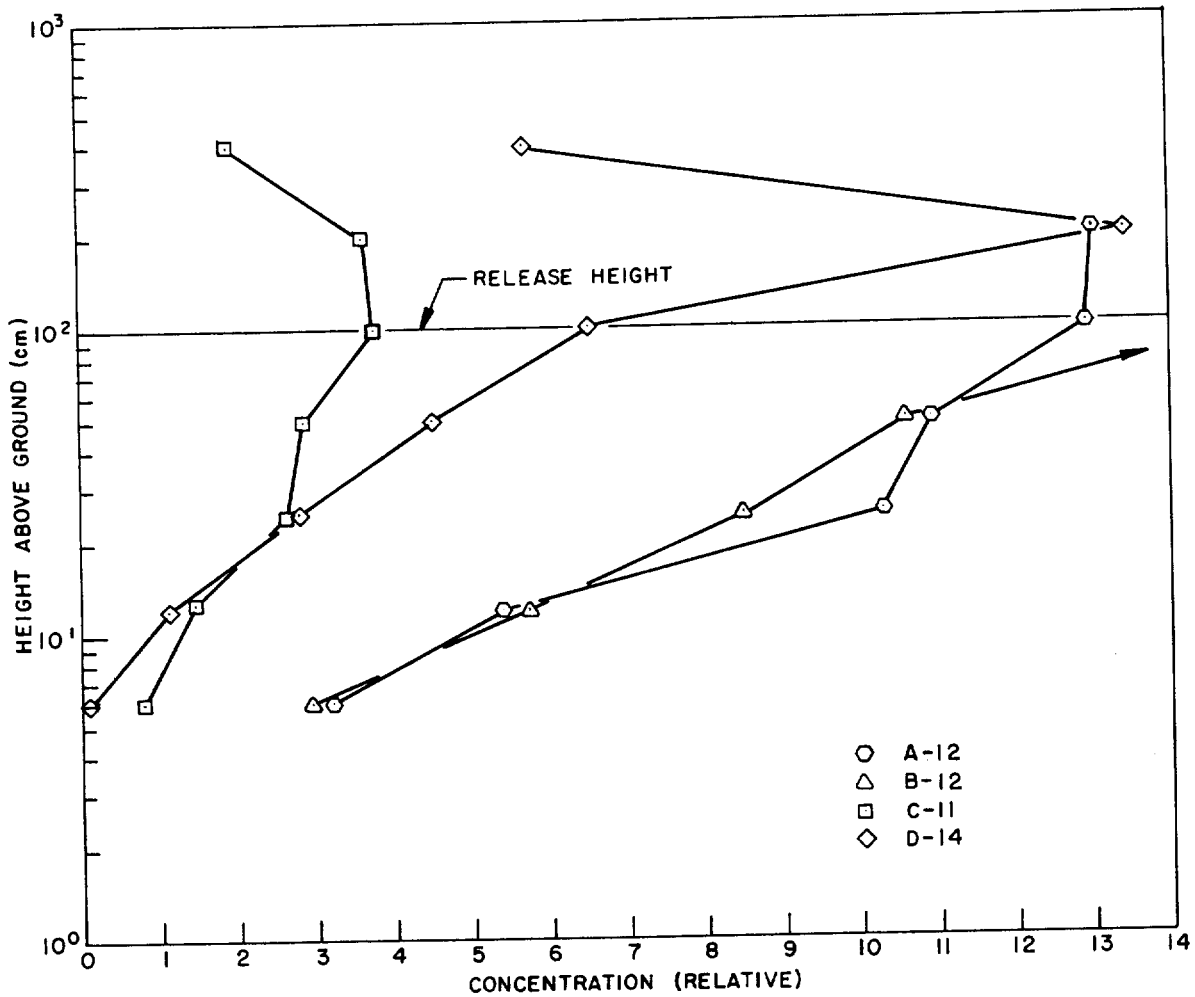

Fig. A-22 Measured concentration profiles in CERT 16.

0030098

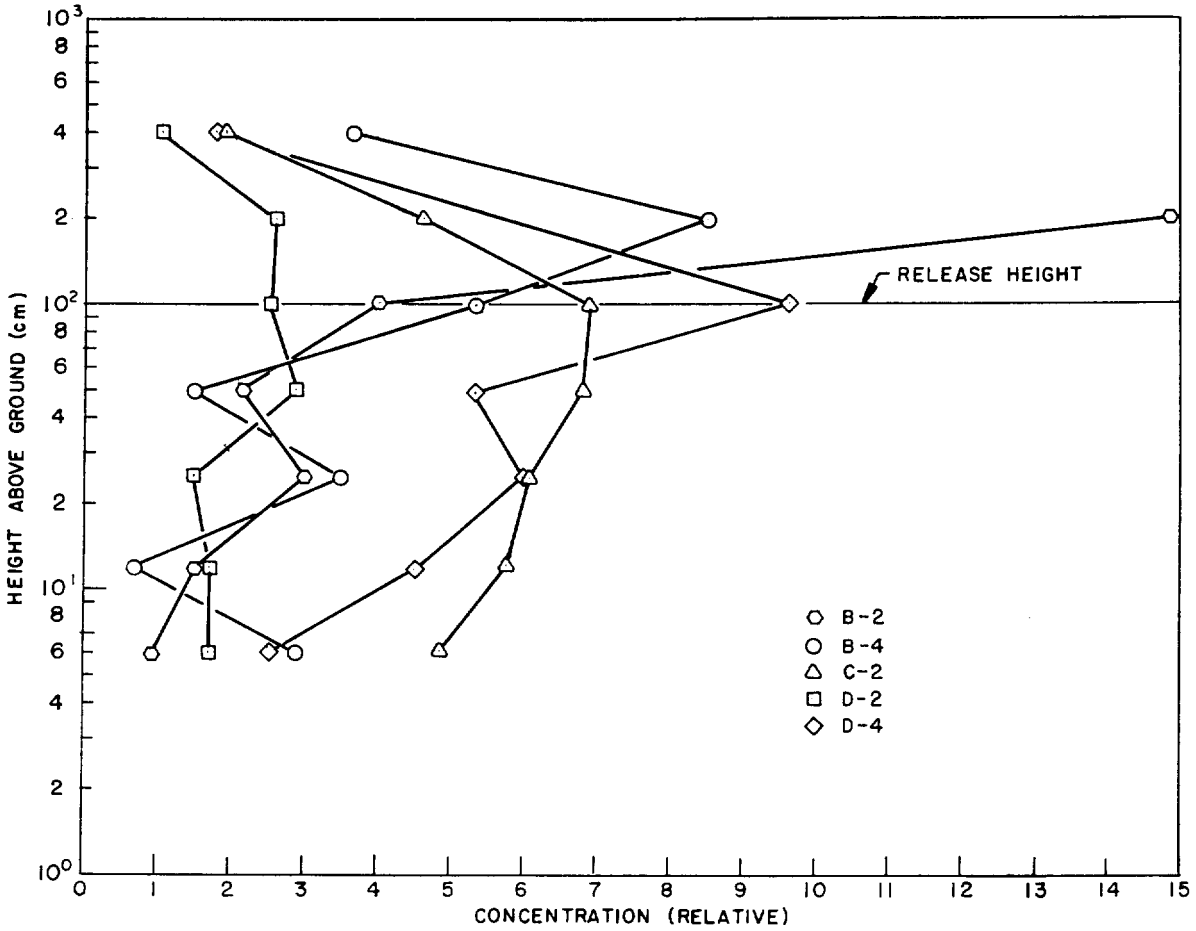

Fig. A-23 Measured concentration profiles in CERT 17.

0030099

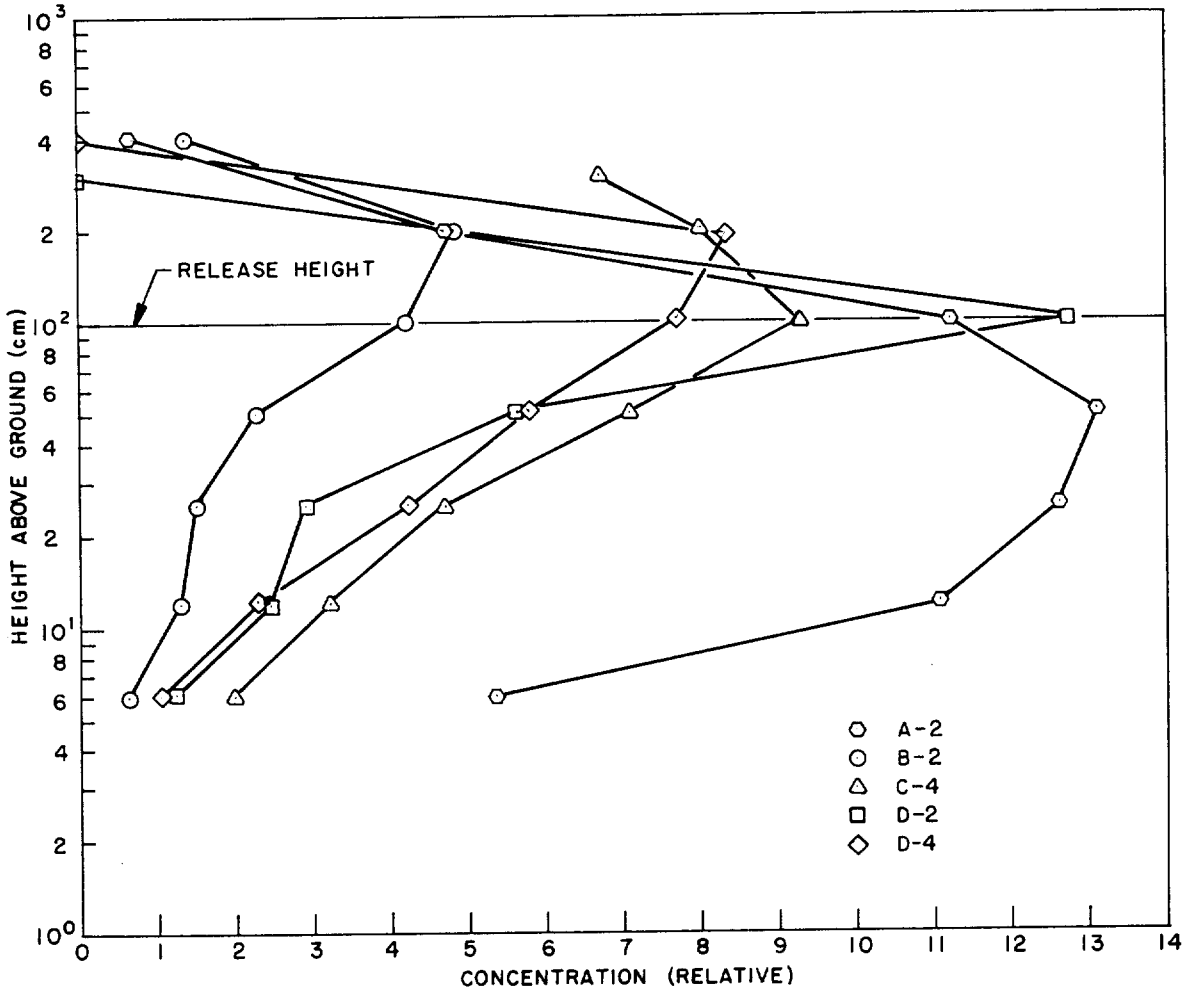

Fig. A-24 Measured concentration profiles in CERT 18.

0030100

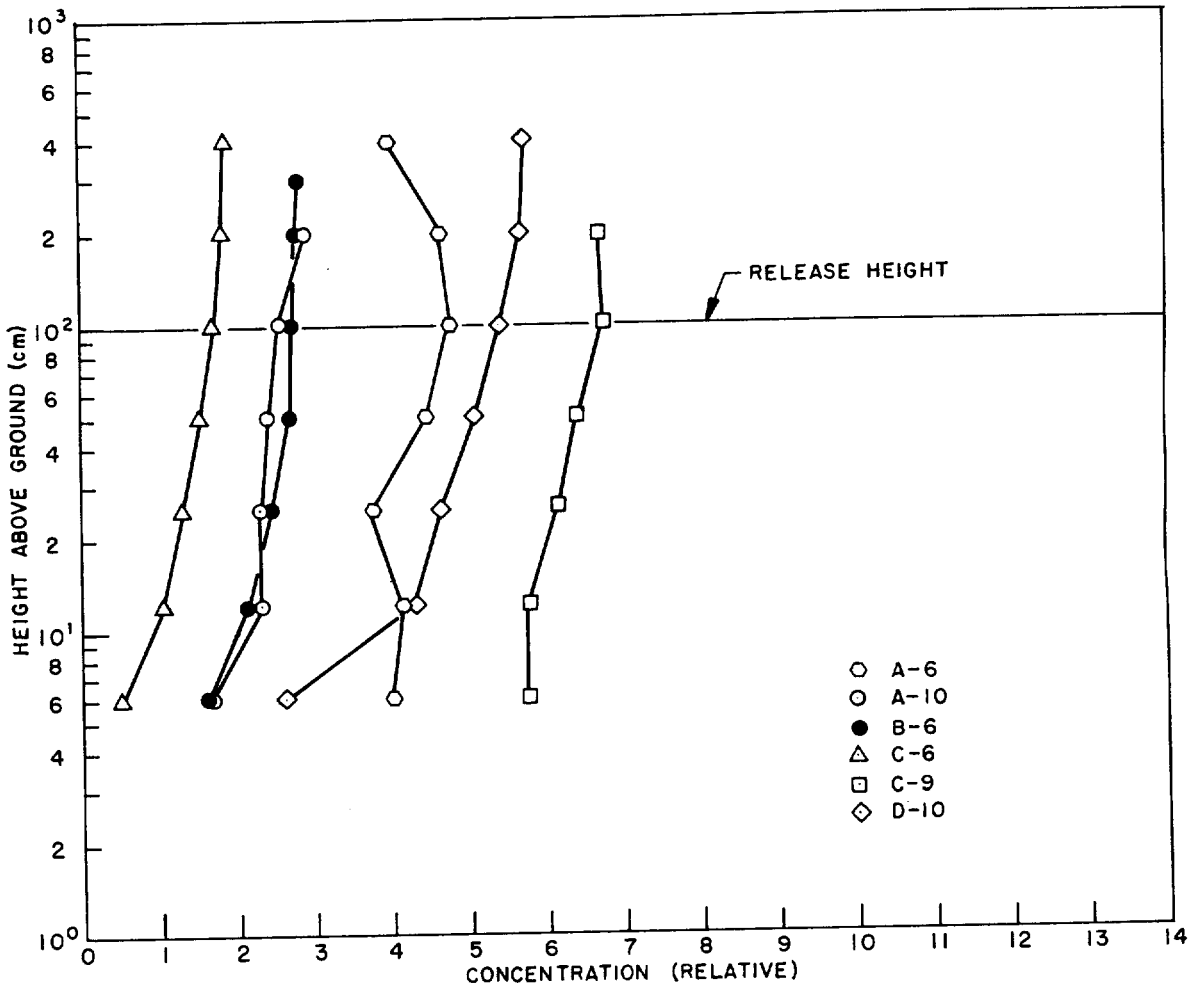

Fig. A-25 Apparent particulate fraction profiles in CERT 19.

0030101

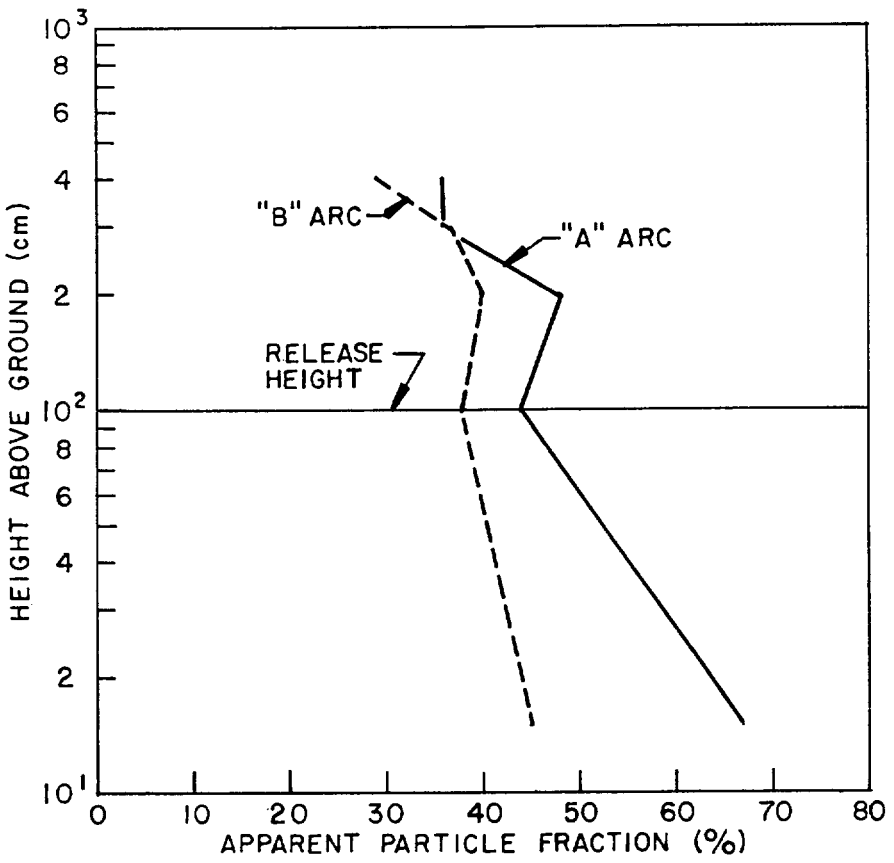

Fig. A-26 Apparent particulate fraction profiles in CERT 2.

0030102

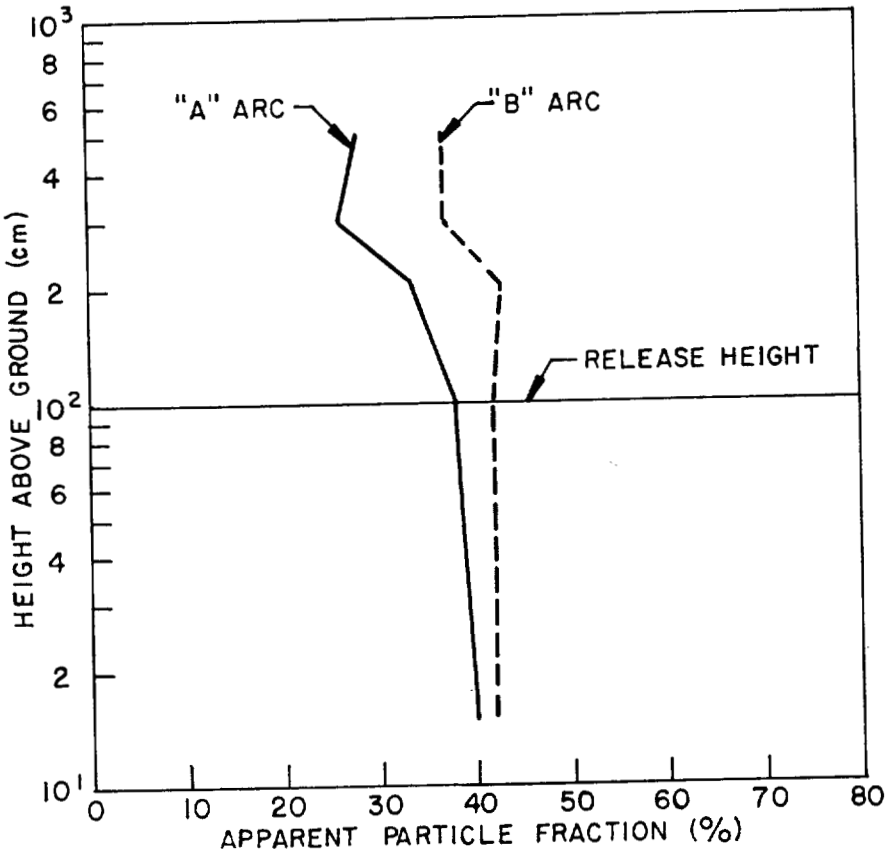

Fig. A-27 Apparent particulate fraction profiles in CERT 6.

0030103

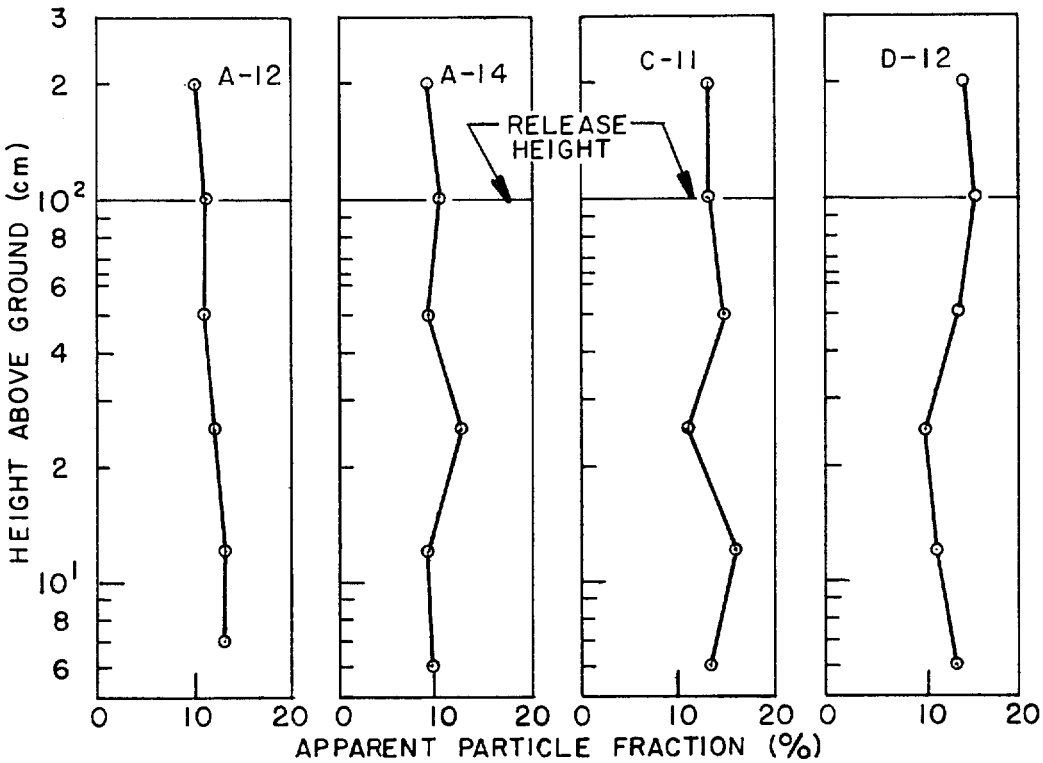

Fig. A-28 Apparent particulate fraction profiles in CERT 13.

0030104

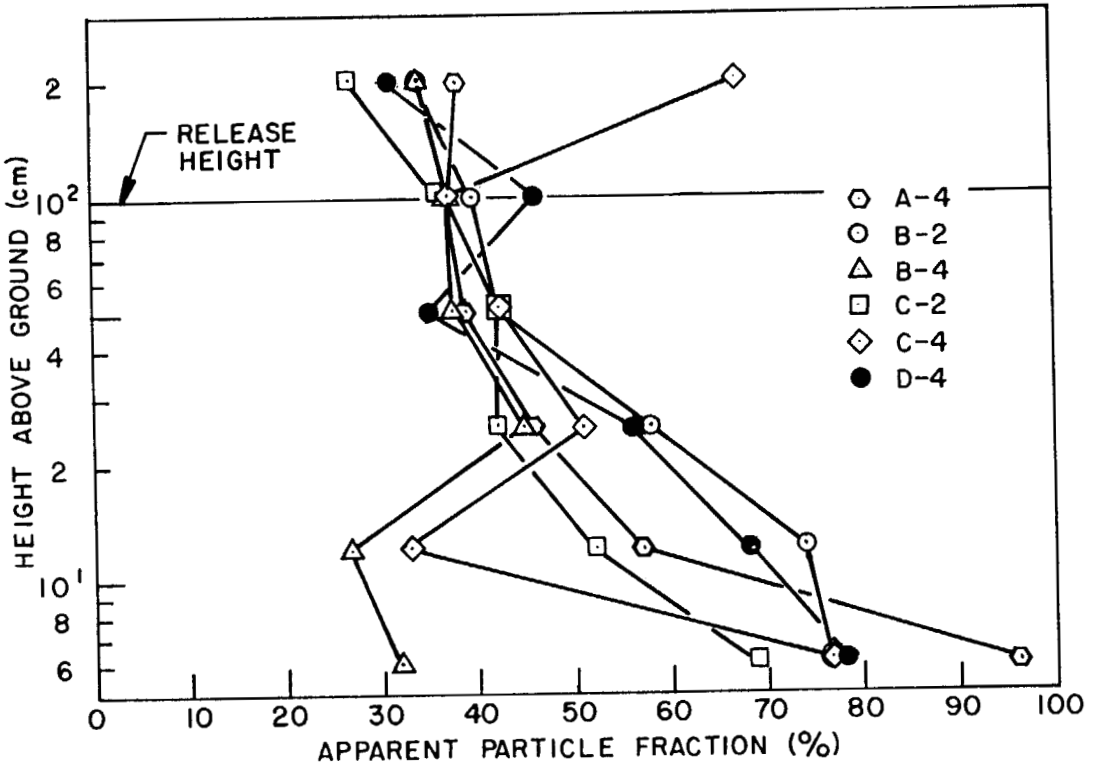

Fig. A-29 Apparent particulate fraction profiles in CERT 15.

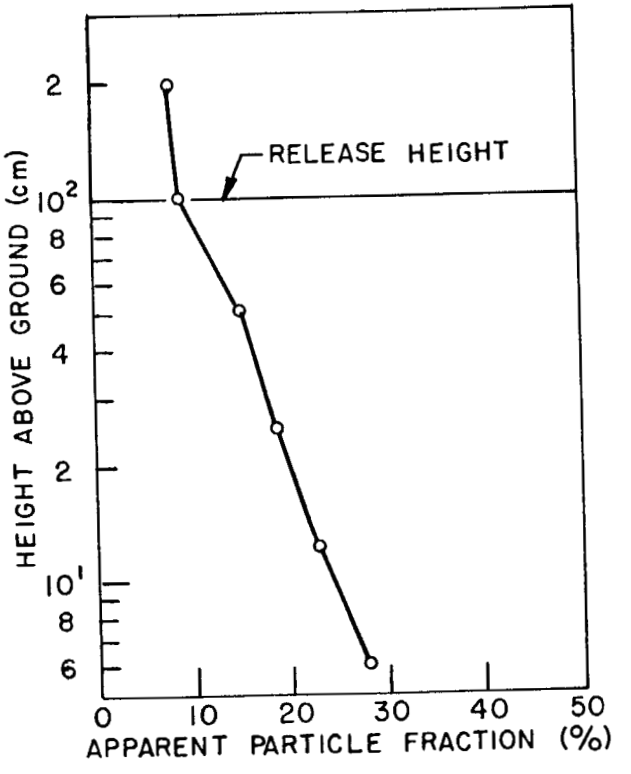

Fig. A-30 Apparent particulate fraction profiles in CERT 14.

0030105

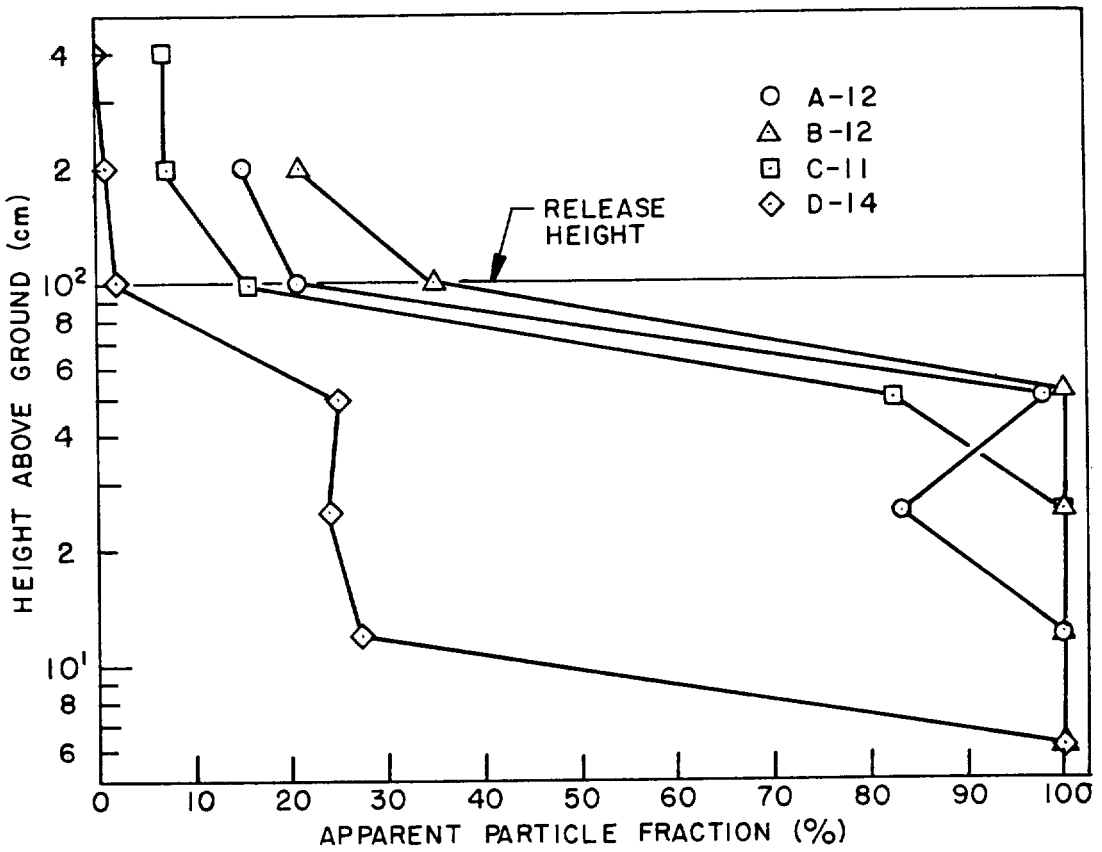

Fig. A-31 Apparent particulate fraction profiles in CERT 16.

0030106

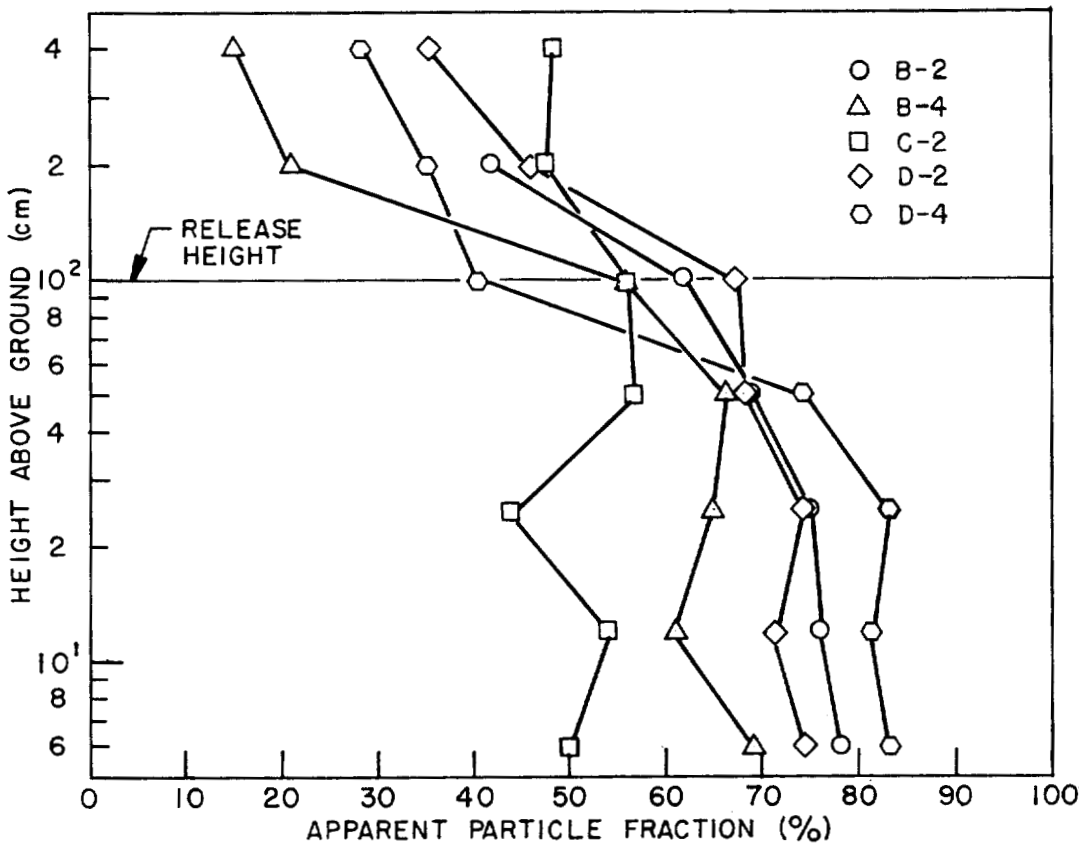

Fig. A-32 Apparent particulate fraction profiles in CERT 17.

0030107

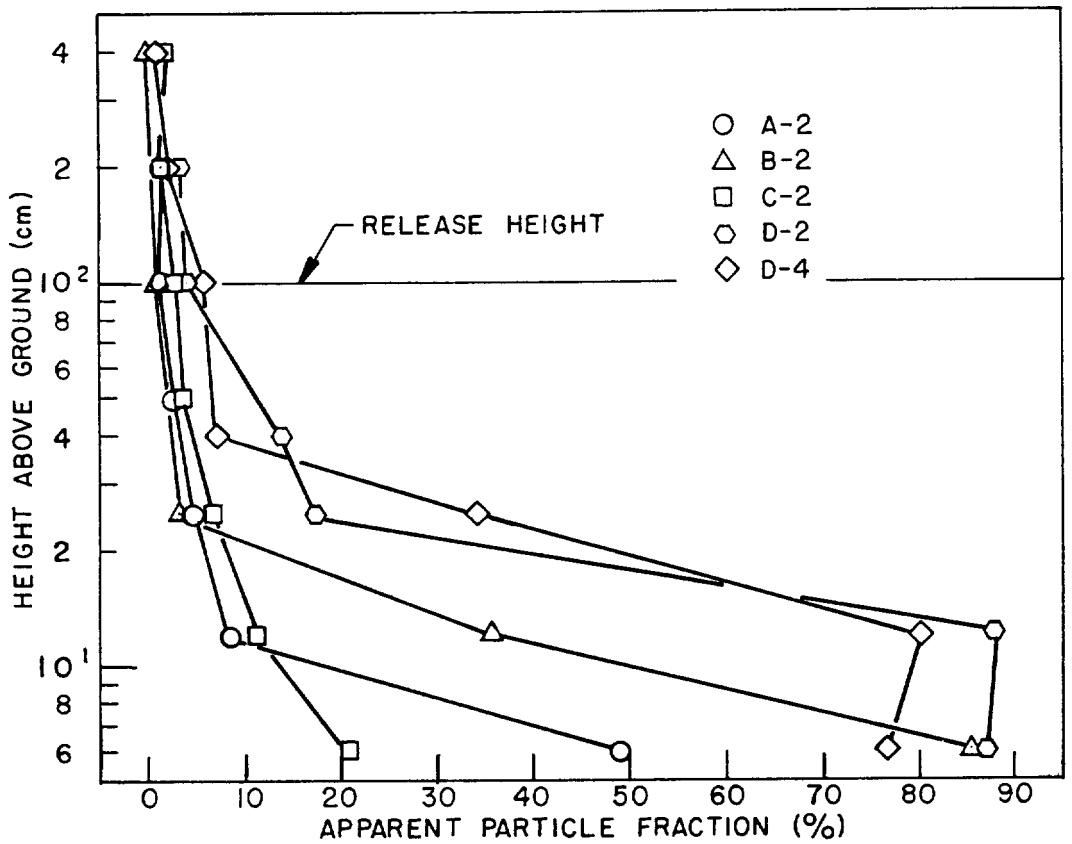

Fig. A-33 Apparent particulate fraction profiles in CERT 18.

0030108

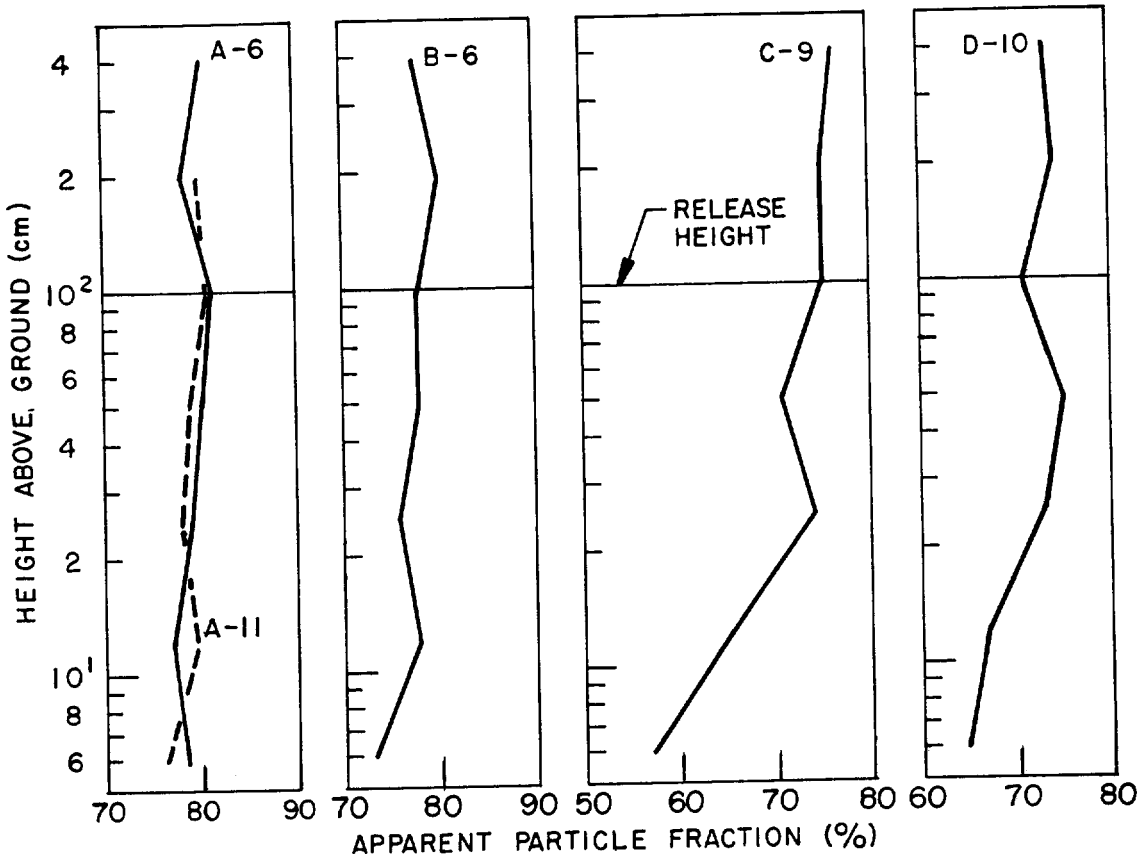

Fig. A-34 Apparent particulate fraction profiles in CERT 19.

0030109