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NOAA Technical Memorandum ERL ARL-61

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Environmental Research Laboratories

DIFFUSION UNDER LOW WINDSPEED CONDITIONS NEAR OAK RIDGE, TENNESSEE

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UNITED STATES
DEPARTMENT OF COMMERCE
Elliot L. Richardson, Secretary

NATIONAL OCEANIC AND
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Robert M. White, Administrator

Environmental Research
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CONTENTS

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A series of controlled gaseous tracer releases was conducted to study terrain effects on atmospheric dispersion, under low wind speeds, and neutral to moderately stable conditions (as determined by vertical temperature gradient according to NRC Regulatory Guide 1.23). Analyses of aerial and ground-level samplings of sulfur hexafluoride and dibromodifluoromethane gaseous tracers used an electron capture gas chromatograph. Because winds during testing periods were often below the threshold (approximately 0.3 m s^{-1}) of sensitive cup and vane anemometers and bi-directional vanes, mean windspeed measurements were determined by laser anemometry. In comparisons of sampled tracer concentration measurements with Pasquill's predicted values for flat terrain (the conditions of low windspeed and surface roughness are beyond the expected range of applicability of the curves) all of the observed axial concentrations were less than those predicted by the Pasquill-Gifford curves for the appropriate stability classes. The standard deviation of lateral plume spread, σ_y, averaged 6.0 times greater than predicted values. This increase is attributable mainly to wind meander. The derived vertical plume spread statistic, σ_z, averaged 5.7 times greater than Pasquill-Gifford predicted values. Roughness of the surface (vegetation and topography) enhanced the vertical diffusion. After correcting for plume centerline elevation the overall average dilution of ground-level peak concentrations was about 29 times greater than would be predicted for flat terrain. Dilution decreased with increasing downwind distance and increased with increasing stability. This dilution increase implies that the ability of the atmosphere to diffuse the gaseous tracer, under low windspeed conditions, does not decrease toward zero as the atmosphere becomes strongly stable; instead, it tends to be bound by some minimum rate of dilution. Concentration measurements are provided in a data appendix.

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[1]Research jointly sponsored by the Energy Research and Development Administration (ERDA) Division of Reactor Development and Demonstration (RDD), under the Interagency Agreement AT(49-5)1289, and by the National Oceanic and Atmospheric Administration (NOAA).

1. INTRODUCTION

The continuing emphasis upon safety in the design and operation of nuclear power plants, and the necessity for realism in estimating the pollution potential to be found at these sites, point to the need for more actual field data describing atmospheric diffusion, especially under low windspeed situations.

Current calculation methods as described by the U.S. Nuclear Regulatory Commission (1972) make these limiting conditions (windspeeds less than 2 m s^{-1} coupled with an inversion) extremely significant to the estimation of pollutant concentration for a ground source at a proposed plant site. When the Gaussian diffusion equation (discussed in section 3) is used, calculated concentrations tend to approach infinity as the windspeed approaches zero. Accurate characterizations of diffusion under these "poor" atmospheric conditions therefore become necessary in evaluating the environmental impact of a proposed power-generating facility.

A three-phase program plan has been initiated by NRC and ERDA/RDD in cooperation with NOAA/ARL to determine microscale (up to 1 km) atmospheric dispersion characteristics under varied conditions. The first phase is to study terrain effects under low windspeeds with emphasis on inversion conditions. Sagendorf and Dickson (1974) reported on experiments performed over flat terrain (Part A). This report (Part B) deals with the effects of rougher terrain. Part C (channeling effects as in a canyon or river valley) has been dealt with by Start et al. (1973, 1975). Phase 2 of the three-phase program will study building wake effects. Vertical dispersion will be examined in phase 3.

1.1 Project Objectives

The planning and conduct of Part B of phase 1 were designed to provide results that would complement the work done in Part A, and also be useful to those planning and regulating power installations in similar heavily forested settings. The primary objective was to obtain actual field data of diffusion in rough terrain (e.g., a forest regime) under conditions of light winds (less than 2 m s^{-1}) and stable lapse rate. Attention was to be given to obtaining data useful for making model comparisons. Inasmuch as the meteorological constraints on the testing were very near the threshold of the standard wind instruments, the best available instrument technology was to be utilized, and sensor locations were to be selected in a manner that would enhance the sensors' usual capabilities. Thus, the study site, the sampling and analysis technology, the types and locations of the various meteorological sensors, and the weather constraints imposed on testing were all necessary considerations for the successful outcome of the project. These points are discussed in detail in the paragraphs following.

1.2 Siting

The field study site was on a peninsula of the Clinch River, approximately 16 miles south of downtown Oak Ridge, Tennessee, and approximately 2 miles upstream from the Oak Ridge Gaseous Diffusion Plan (see fig. 1). The land is managed by the Tennessee Valley Authority. The release point used in the diffusion study (and the geographical center of the sampling area) was near the center of one of the heavily forested small valleys or "hollers" that cross the peninsula. Past meteorological monitoring of the area indicated a high incidence of near calm winds.

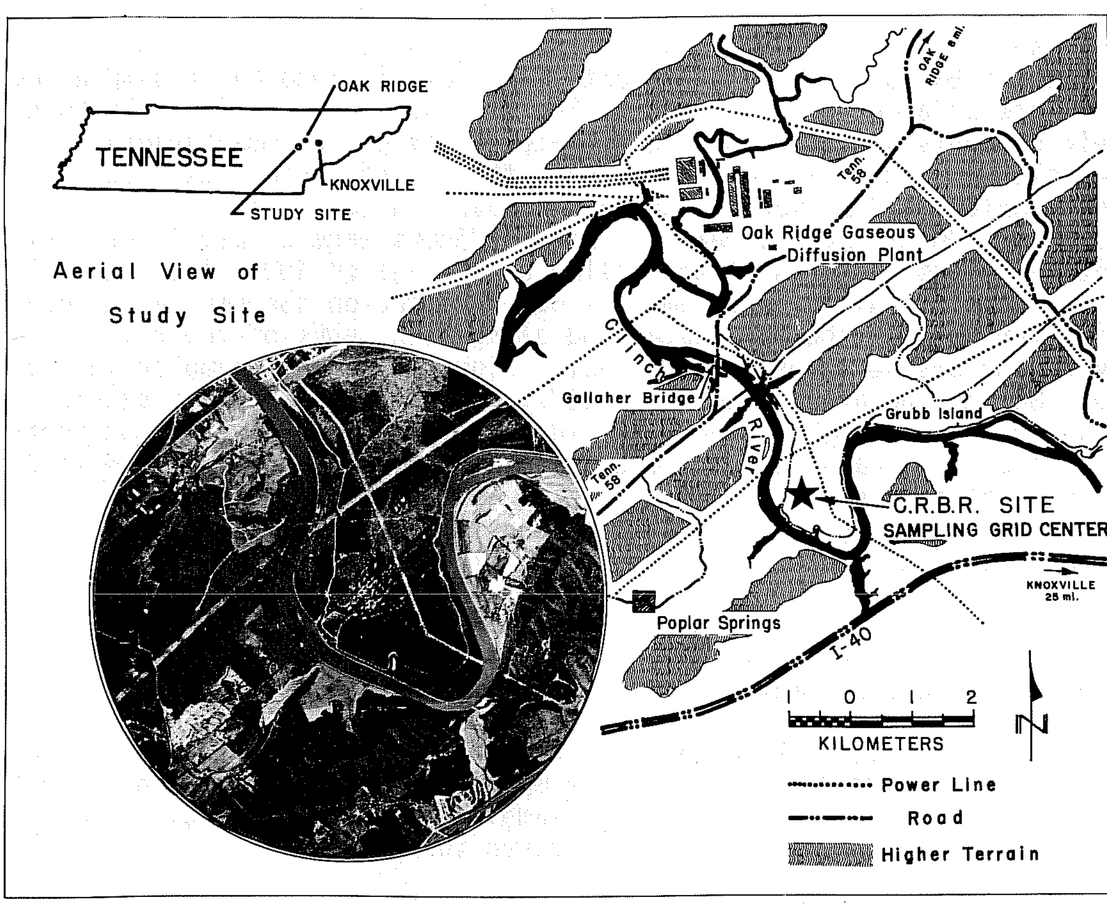

Figure 1. Location of field study site.

2. TEST PROCEDURES

2.1 Sampling Method

The testing program consisted of controlled releases of gaseous tracers that were sampled both on the surface and aloft at ranges to 4 km. The spacial relationships between the release point and the sampling locations are shown in figures 2a and 2b. The release point, located at the center of the array of samplers, was near the center of the shallow valley that cuts across the peninsula. Sulfur hexafluoride (SF_6) and dibromodifluoromethane (CBr_2F_2, more commonly called 12B2) were released from the apex of the sampling grid at heights of 1 m, except for the last two tests when SF_6 was released at 30.5 m. The release mechanisms are shown in figure 3. An oil fog plume was used to make visible the path and gross characteristics of the tracer gas plumes. The oil fog generator used to produce the visible plume was collocated at the release point.

The ground-level samplers consisted of battery-powered pumps within protective boxes. The pumps inserted ambient air into Mylar sample bags at a rate of about 2 liters hr^{-1}. The bags were removed from the boxes and their contents analyzed for tracer material by gas chromatography. The sampler inlet on each box was 0.76 m above the ground. Each test used 176 surface samplers. Some were placed 6 deg apart in concentric circular arcs at 100 m and 200 m from the release point. Others were placed in partial arcs centered about the axis of the valley at a range of 400 m from the release point. Additional surface samplers were located on the perimeter road near the river edge of the peninsula, and along both banks of the river (fig. 2a). River samplers were serviced by boat. Figure 4 shows a sampler in place along one of the arcs. The 100-, 200-, and 400-m arc surface samplers were remotely actuated by means of a solid state switching circuit and control wires that originated at the release point. By this means any desired combination of samplers could be turned on at the beginning of the tracer release, and sampling could be simultaneously terminated when the last of the plume cleared the outer arc.

Aerial samples, by contrast, were taken for a time period of approximately 1 min. A Bell H-47 helicopter was used as a sampling platform. Samples of the plume material were drawn into a Mylar sample bag by means of a small battery-operated pump. The sampled air was drawn toward the sample bag through a 28-m length of hose that hung below the helicopter (fig. 5), to avoid dilution of the sample by the rotor downwash (Hathcoat, 1975). The location of each aerial sample in terms of range, bearing from the release point, and altitude, is given in Appendix A.

2.2 Meteorological Instrumentation

The release point and primary sampling area were bracketed by four 30-m towers, on which were mounted wind velocity sensors at the 2- and 30-m levels. The wind sensors on these towers were manufactured by Weather Measure Corporation and had a low windspeed threshold of less than

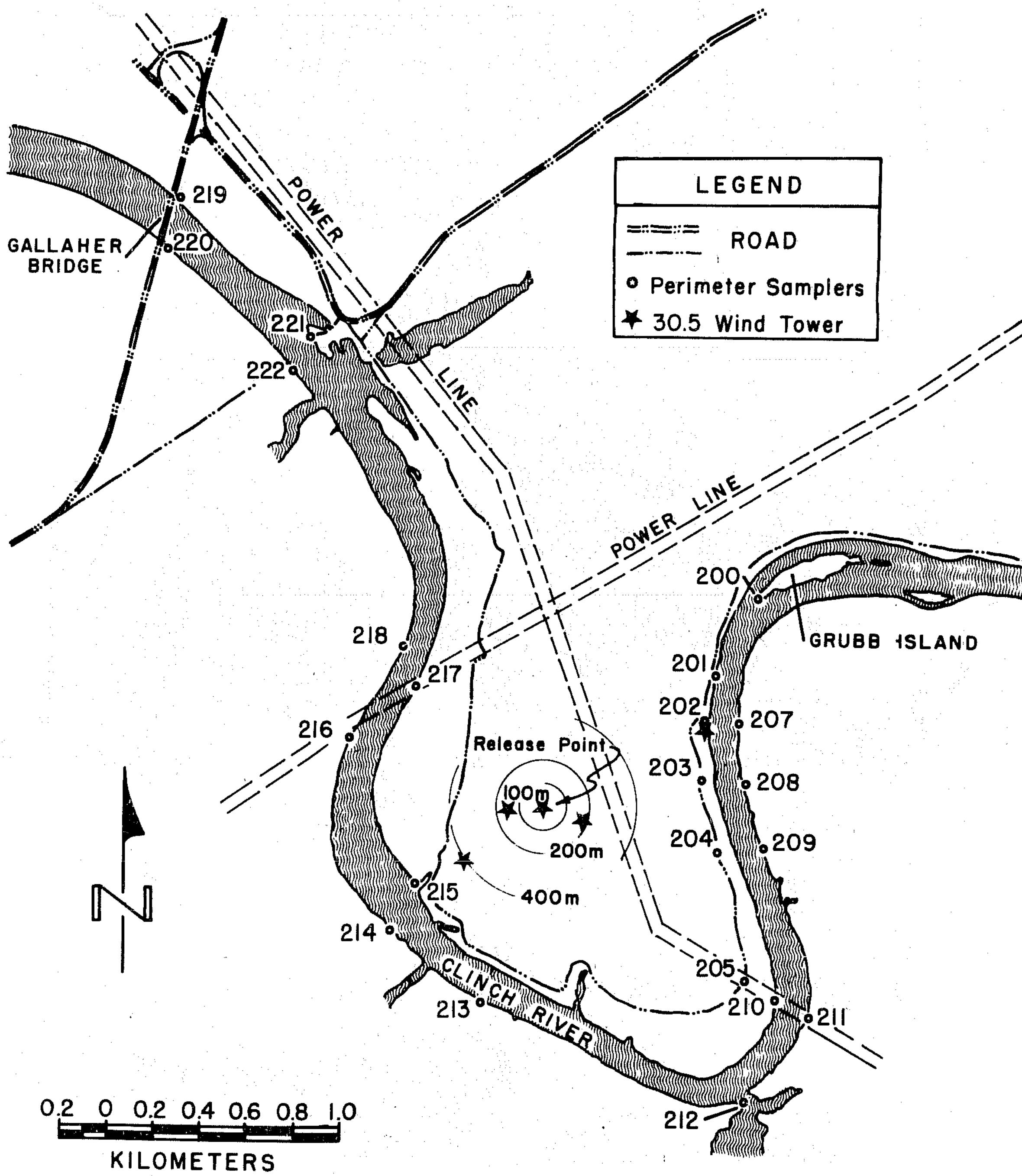

Figure 2a. Spatial relationship between the release point and the sampling locations.

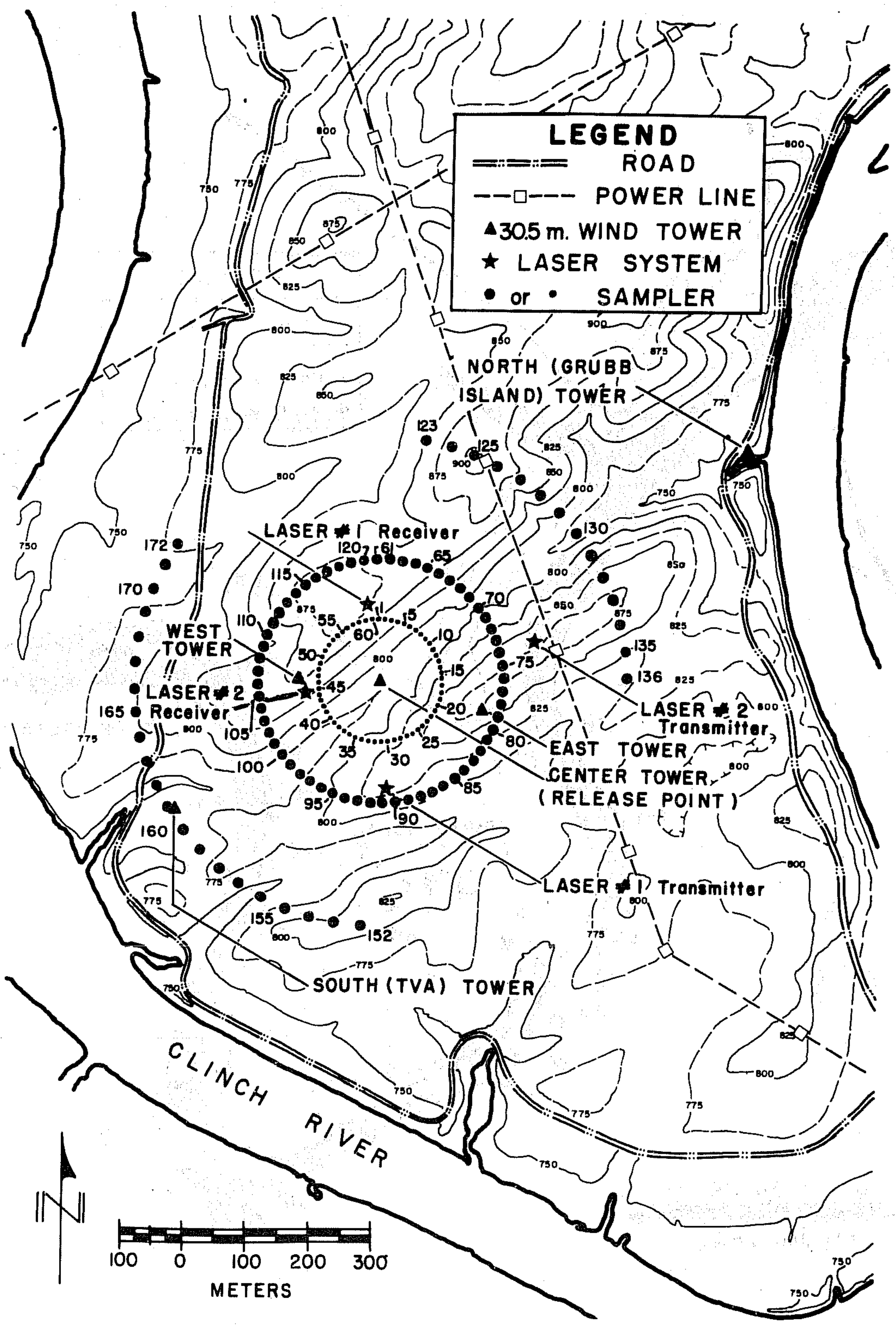

Figure 2b. Detail of inner sampling arcs showing location of meteorological towers and laser transmitters and receivers. (Contour heights are in feet above sea level).

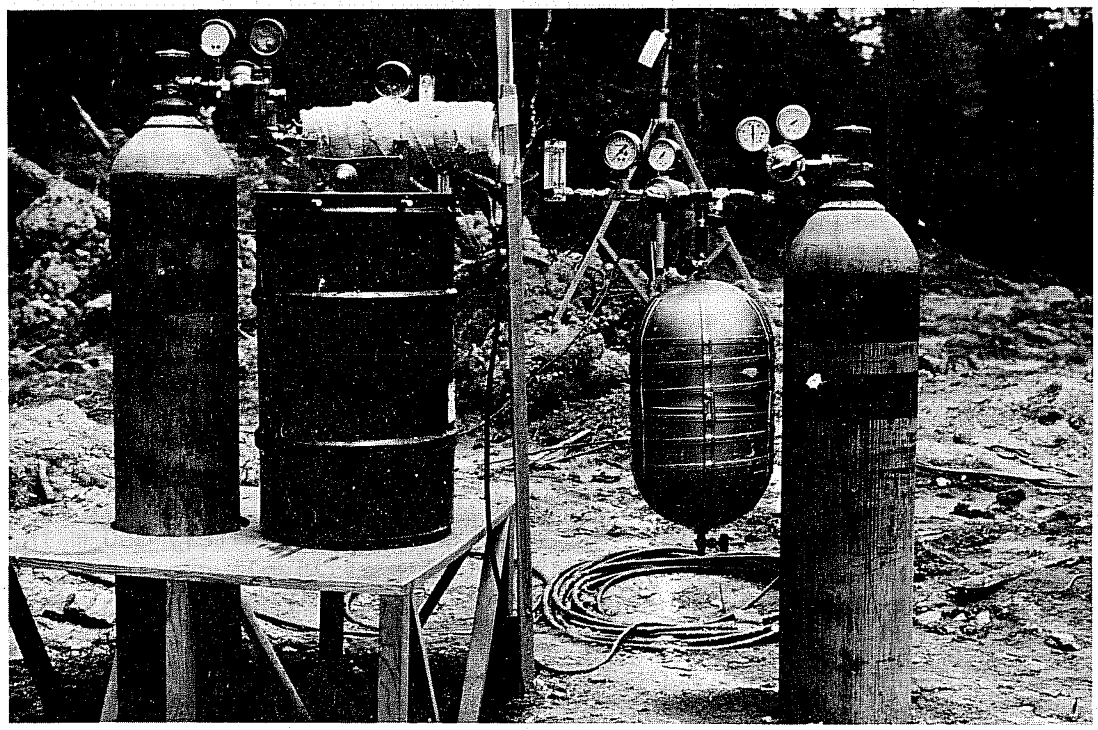

Figure 3. Gaseous tracer release mechanisms.

Figure 4. A sampler in position along a section of the 200-m arc.

Figure 5. Helicopter enroute to sampling position. Sampling inlet is at the bottom of the hose below the helicopter.

0.5 m s^{-1}. The signals from these outlying towers (fig. 2b) were carried by cable to the release point where they were digitized and recorded on magnetic tape for further processing.

A fifth 30.5-m tower was located near the release point at the center of the sampling area. Beckman-Whitley cup anemometers and quick response bi-directional vanes were mounted at levels of 2, 4, 8, 16, and 30.5 m. Temperature data were collected at the 61- and 23-m heights on the south (TVA) tower.

Because the test series involved working during very low windspeed conditions, it was necessary to measure air flows that were below the threshold of standard cup anemometers. Accurate measurements were accomplished by laser anemometry. The system used during the diffusion tests consisted of two lasers and two receivers, positioned approximately orthogonal to each other, as shown in figure 2. The beam paths were approximately 350 m in length. The transmitter (fig. 6a) consisted of a millivolt class laser having a beam approximately the diameter of a pencil. The receiver was built by Campbell Scientific (model CA-9), Logan, Utah (fig. 6b). The instrument is capable of measuring windspeeds in the range of centimeters per second.

These instruments were found to be very effective in measuring the mean air motion in the sampling area during the time of the tests. Their measured speeds compared well with the observed travel rates of the oil fog plumes. The winds during several of the test periods were below the sensing threshold of the cup anemometers. In these instances, the laser anemometers provided the only values of mean windspeed, $\overline{u}$, to be used in the calculations. Indeed, arrival at meaningful values of windspeeds in the plume-carrying layers of air would have been almost impossible without this type of equipment.

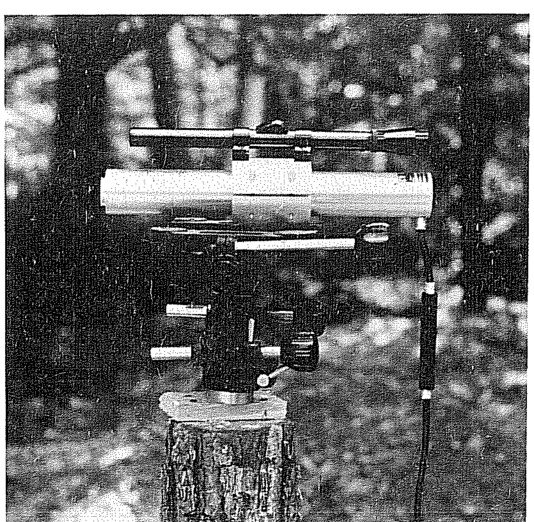

Figure 6a. Laser anemometer transmitter.

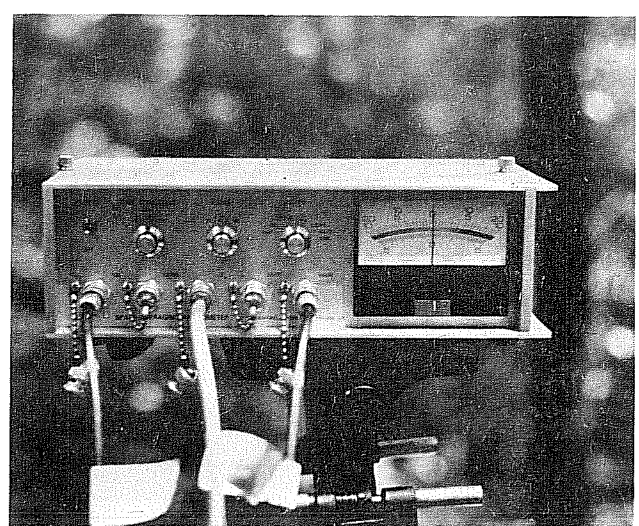

Figure 6b. Laser anemometer receiver.

2.3 Other Documentation

Each test of the series was documented by numerous 35-mm color slides which were taken from the aerial sampling helicopter. These slides, in combination with a detailed photographer's log, provide an additional means of verifying local flow characteristics and subtle flow patterns that occurred during the tests.

Observations of wind, temperature, sky cover, and general weather conditions were made and recorded to assist in the assignment of the atmospheric stability category during each gaseous tracer test.

2.4 Analysis

The gas collected by the samplers was analyzed with an electron capture gas chromatograph system (Lovelock et al., 1971). An arrangement of four parallel columns made possible the simultaneous analysis of each of the tracer gases. Trace gas chromatogram areas were computed with the aid of an Autolab System IV electronic integrator. For the SF_6 analysis two columns were packed with 5A molecular sieve, 80-100 mesh. The fluorocarbon 12B2 tracer analyses utilized two columns packed with Durapak low K/carbowax 400/Porosil F.

3. THE DIFFUSION EQUATION

The windspeed-normalized relative concentrations are given in the form $\chi\bar{u}/Q$ where χ is the concentration (gm m^{-3}), $\bar{u}$ is the mean windspeed through the effluent-carrying layer (m s^{-1}), and Q is the source strength (gm s^{-1}). These concentration values are related to the plume axis height above the ground (H) and spacial Cartesian coordinates (x,y,z) through the Gaussian diffusion equation

$$\chi[x,y,z;H] = \frac{Q}{2\pi\sigma_y\sigma_z\bar{u}} \exp\left[-\tfrac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]\left[\exp\left[-\tfrac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right] + \exp\left[-\tfrac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right]\right]. \quad (1)$$

Additional description of equation (1) may be found in the literature (e.g., Slade, 1968). Values for σ_y and σ_z, the standard deviations of effluent concentrations in the lateral and vertical coordinate directions have been determined for various stability categories (Pasquill, 1961; Gifford, 1961). By direct measurement of some of the variables (χ, $\bar{u}$, Q) and plume centerline sampling (y=0, z=0, H=0), equation (1) simplifies so that comparisons may be made with σ_y- and σ_z-values commonly accepted for a given stability.

If the receptors are at ground level, equation (1) may be expressed as

$$\chi(z,y,0;H) = \frac{Q}{\pi\sigma_y\sigma_z\bar{u}} \exp\left[-\left(\frac{y^2}{2\sigma_{y^2}} + \frac{H^2}{2\sigma_{z^2}}\right)\right] . \qquad (2)$$

The factor of 2 accounting for ground reflection of the plume is included as is customary. This reflection effect should be kept in mind when both aerial and ground level measured concentrations are discussed in following sections. Integration of equation (2) with respect to y yields the familiar expression for the crosswind integrated concentration from a continuous, elevated-point source.

$$CIC(x,H) = \frac{\sqrt{2}\ Q}{\sqrt{\pi}\sigma_z\bar{u}} \exp\left[-\frac{H^2}{2\sigma_{z^2}}\right] . \qquad (3)$$

Equations (1), (2), and (3) are widely known Gaussian plume formulas and available in numerous books and papers (e.g., Slade, 1968, or Pasquill, 1962).

If measurements of Q, $\bar{u}$, $\chi(x,y,H)$, and $\chi(x,y,0)$ are obtained, some additional forms of equations (1), (2), and (3) are desirable along with a formula for computing σ_y. With crosswind-oriented samples of ground-level concentrations $\chi(x,y,0)$, the second moment of the lateral effluent-concentration distribution is, for a fixed downwind-distance x,

$$\sigma_y^2 = \sum\left[\chi(Y)\cdot(Y-Y_0)^2\right] \Big/ \sum\chi(Y) \qquad (4)$$

where the position of the center or mass, Y_0, of the mean plume is

$$Y_0 = \sum\chi(Y)\cdot Y \Big/ \sum\chi(Y).$$

The Gaussian continuous point-source equation for the center of an elevated plume far from a reflecting boundary (no reflection effect) is, after solving for σ_z,

$$\sigma_z = \frac{Q}{2\pi\bar{u}\sigma_y\chi(x,0,H;H)} \qquad (5)$$

By using σ_y from equation (4) and the measured quantities Q, $\bar{u}$, and $\chi(x,0,H;H)$, an effective value of σ_z may be calculated from equation (5). By combining equations (2) and (5), the Gaussian plume formula becomes

$$\chi(x,0,0;H) = 2\chi(x,0,H;H) \exp \left[- \frac{H^2}{2\sigma_z{}^2}\right] \qquad (6)$$

where H is the mean plume axis height (at downwind distance x) over the entire sampling period. Solving for H^2,

$$H^2 = -2\sigma_z^2 \cdot \ln [\chi(x,0,0;H)/2\cdot\chi(x,0,H;H)] \ . \qquad (7)$$

One additional calculation may be made using CIC(x,H) calculated from the same $\chi(x,y,0)$ set of measurements utilized in equation (4). Equation (3) may be solved for σ_z, or alternately for H, and the results compared with σ_z or H from equations (5) or (7). Solving equation (3) for the plume axis height, and denoting the result as HC to distinguish it from the H in equation (7) yields

$$(HC)^2 = -2\cdot\sigma_z^2\cdot\ln [CIC(x,H)\cdot\sigma_z\cdot\bar{u}\cdot\sqrt{\pi}/Q\cdot\sqrt{2}] \ . \qquad (8)$$

Some rough estimate of the vertical gradient of effluent concentration may be inferred through a comparison of H and HC. From examination of equation (3), it is apparent that the CIC at the ground surface differs from a corresponding CIC through the elevated plume centerline by a constant whose value depends upon H and σ_z. If the height variation of plume concentration is Gaussian, then HC and H should be the same value (within experimental error). However, if HC is larger than H, the implication is that the concentrations sampled along the ground are less than would be expected were a Gaussian vertical concentration profile correct (i.e., more σ_z-increments may be fitted within HC than within the height interval H). Likewise, if HC is less than H, the ground-surface concentrations are more similar to the elevated concentrations than a Gaussian gradient would predict from $\exp [-(H^2)/2\sigma_z{}^2]$ (i.e., the vertical distribution is tending toward uniform).

If the lateral distribution of concentration were especially peaked or flattened in comparison with the Gaussian distribution (the Kurtosis type of statistic), the comparisons of HC and H could be affected. For example, from equations (5) and (7), it is evident that if the peak ground-level concentration were too small (a flattened horizontal distribution), the calculation of H would be a larger number than that determined from a Gaussian distribution (presuming the CIC in equation (3) is maintained constant). Likewise, if the ground-level concentration were especially peaked, the value of H would be smaller.

4. RESULTS

Twelve controlled releases and sampling tests of gaseous tracer were conducted at the Clinch River site during July and August of 1974. The initial test conducted on July 26 was a preliminary checkout of all systems and provided neither a sampling of the complete plume nor a documentation of the minimum amount of meteorological parameters. Analyses of the data from that test are not included in this memorandum. Following additional preparations and maintenance, full testing commenced on July 29. Table 1 summarizes the general conditions and times of testing. Tracer tests are numbered in sequence from 1 through 11, beginning with the test on July 29.

One-hour releases of gaseous tracers were made; approximately 275 gm of SF_6 and 400 gm of 12B2 were released per test. During tests 1 and 2, 12B2 and SF_6 tracers were released side-by-side. Only SF_6 was released during tests 3 through 9. During tests 10 and 11, SF_6 was released at the top of the apex tower (30.5 m) and 12B2 was released at a 1-m height at the apex. For tests 1 and 2, the mean of sample bag ratios of normalized concentration measurements of SF_6 to 12B2 was 1.04.

Most test days were characterized by cloudy skies. Fog with drizzle or rain occurred during almost half of the tests. Three tests (4, 8, and 11) did not include aerial samples; during tests 8 and 11 visibilities were far less than minimum for safe flying conditions.

Conditions for all tests were characterized by very light windspeeds. Frequently, windspeeds were below the response threshold of relatively sensitive cup anemometers and direction vanes. Average windspeeds were measured with a path-averaging laser anemometer of the type reported by Lawrence et al. (1972). Because of these light windspeeds, most customary wind and turbulence measurements are not available (since the conventional sensors were unresponsive much of the time).

In addition to being very low in speed, the wind during most of the tests was highly variable in direction. Figure 7 shows typical horizontal isopleths of concentration. Gaseous tracer was sampled by all positions on the 360° sampling arcs. Wide horizontal dispersion occurred during most of the tests.

In most cases, the plume was confined to the lowest 100 m of the atmosphere. Below the level of the ridgetops ($\sim$ 30 m above released point) the plume was often channeled along the axis of the valley. When the plume diffused vertically above the level of the ridgetops it was often subjected to the directional shear of the wind aloft.

Pasquill (1961) stability classes have been designated by two methods: 1) using the vertical temperature gradient ($\Delta T/\Delta z$) according to NRC Regulatory Guide 1.23, and 2) using the alternate guidelines of Pasquill (1961) and Turner (1964) according to insolation class and windspeed. By the first method, from temperature data measured at the 61- and 23-m levels of the south (TVA) meteorological tower, most tests were assigned to the E stability class. Tests 3 and 10 were during D stability and test 2 was during F sta-

Table 1. General Conditions and Times of Tracer Release

Test	Date 1974	Release Time[a]	Tracer released SF_6 (gm)	Tracer released 12B2 (gm)	Height of release (m)	Weather and Sky Condition	$\bar{U}^b$ ($m\ s^{-1}$)	Pasquill stability class $\Delta T/\Delta Z^d$	Pasquill stability class Pasquill[e] Turner
1	7-29	0905-1005	263.5	433.5	1.0	Overcast, Thundershower. Ceiling estimated at 6000 ft. Fog & light rain showers.	.49	E	D
2	7-30	0800-0900	277.5	394.5	1.0	Clear.	.42	F	B
3	8-5	0922-1022	282.5	-	1.0	Scattered high clouds. Visibility 20+mi.	.31	D	B
4	8-6	0736-0836	274.0	-	1.0	Scattered Clouds at 6000 ft. Broken high clouds. Visibility 10+mi.	.15	E	D
5	8-7	0715-0815	275.5	-	1.0	Scattered clouds at 4000 ft. Broken clouds at estimated 10,000 ft. Broken high overcast. Ground fog and haze. Visibility 5 mi.	.26	E	D
6	8-8	0645-0745	281.0	-	1.0	Overcast. Ceiling estimated at 6000 ft. Fog and haze. Occasional light drizzle or light rain. Visibility 5 mi. Rain showers in vicinity.	.23	E	D
7	8-9	0711-0811	283.0	-	1.0	Broken cloud layer at 6000 ft. Variable overcast with a few breaks. High overcast. Fog. Visibility 2 mi.	.32	E	F
8	8-10	0715-0815	267.0	-	1.0	Sky obscured. Fog. Occasional very light drizzle. Visibility ¼ mi.	.34	E	D
9	8-11	0625-0725	272.0	-	1.0	Overcast with a few breaks. Ceiling estimated at 4000 ft. Thin fog. Visibility 3 mi.	.23	E	F
10	8-12	1822-1922	284.0	381.0	SF_6 30.5 12B2 1.0	High thin overcast. Visibility 10+mi.	.75	D	D
11	8-13	0653-0753	297.0	385.0	SF_6 30.5 12B2 1.0	Overcast. Fog. Occasional very light drizzle. Indefinite ceiling at 200 ft. Visibility ¼ mi.	.29[c]	E	D

a - Eastern daylight time
b - Measured by laser anemometers
c - Measured by Beckman/Whitley cup anemometer at 30.5 m on apex tower
d - NRC Regulatory Guide 1.23
e - Pasquill (1961), Turner (1970)

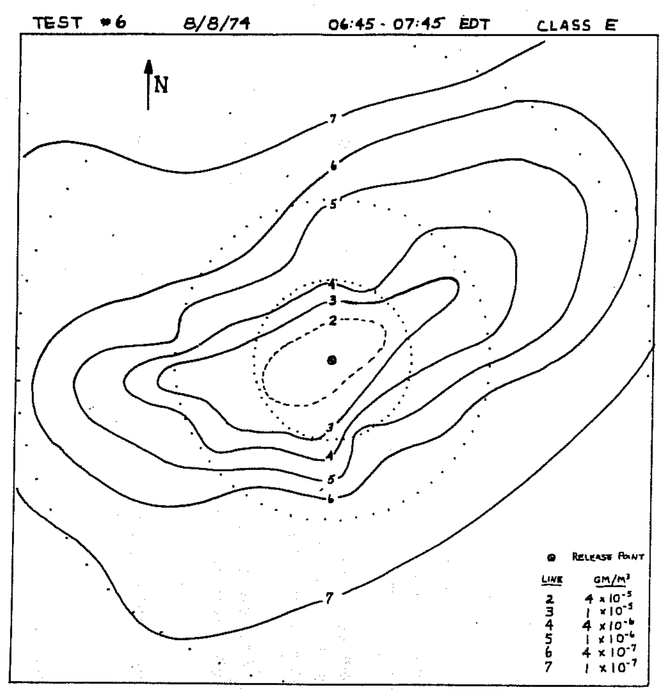

Figure 7. Horizontal isopleths of concentration for test 6 showing the typical 360° spread of gaseous tracer.

bility. On the basis of the second method, most tests were assigned to the D class (often because they occurred during foggy conditions with associated overcast, or because they were conducted during the hour after sunrise). Tests 2 and 3 were during E stability and tests 7 and 9 were during F stability (see table 1).

The first method ($\Delta T/\Delta z$) of assigning stability classes will be used as a basis for comparisons made in the text. In most cases it assigned more stable classes to the testing periods than the second method did. The behavior of the visible oil fog plume and other plumes in the vicinity and the apparent minimal amount of atmospheric turbulence (suggested by unresponsive low-threshold bi-directional vanes) indicated the more stable conditions. A presentation of the results obtained using stability classes as determined by the Pasquill-Turner criteria is contained in Appendix B.

4.1 Concentration Measurements and Diffusion Calculations

The normalized, near-axial concentration measurements for the ground-level released gaseous tracer (SF_6 except for tests and 10 and 11) are shown in figures 8a through 8k. The peak ground-level concentration for the 100-, 200-, and 400-m sampling arcs is denoted by the symbol G. Concentrations measured by samplers along the perimeter road or along the river banks are denoted by the symbol R. Because of the wide spacing between the "R" samplers it is difficult to determine with assurance that the peak ground-

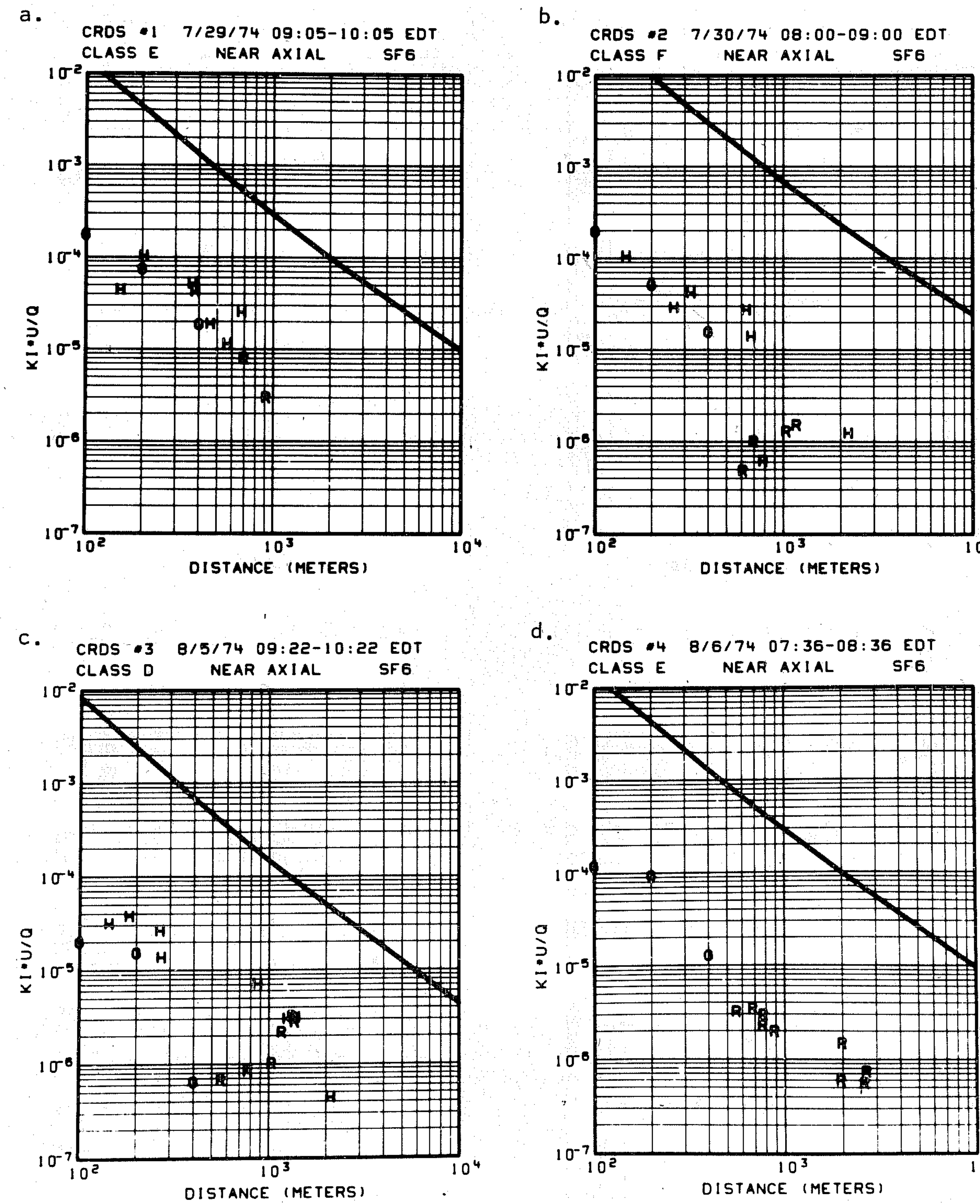

Figure 8(a - k). Normalized, near-axial concentration measurements for the ground-level released gaseous tracer. The symbol G denotes the peak ground-level concentration for each sampling arc. The symbol R denotes concentrations measured by samplers along the perimeter road or along the river banks. The symbol H denotes aerially sampled concentrations. The solid curve is the appropriate Pasquill-Gifford curve.

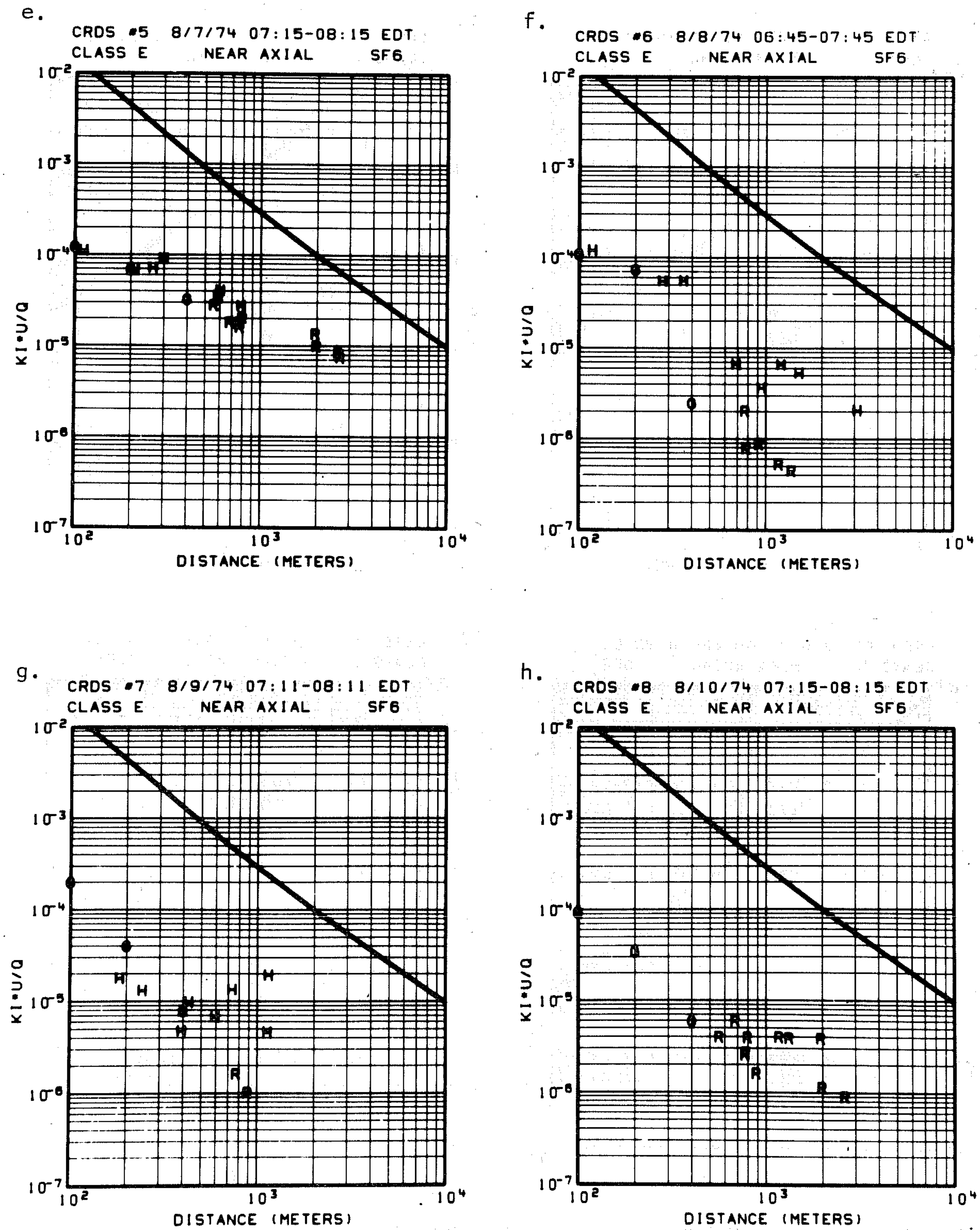

Figure 8. Continued

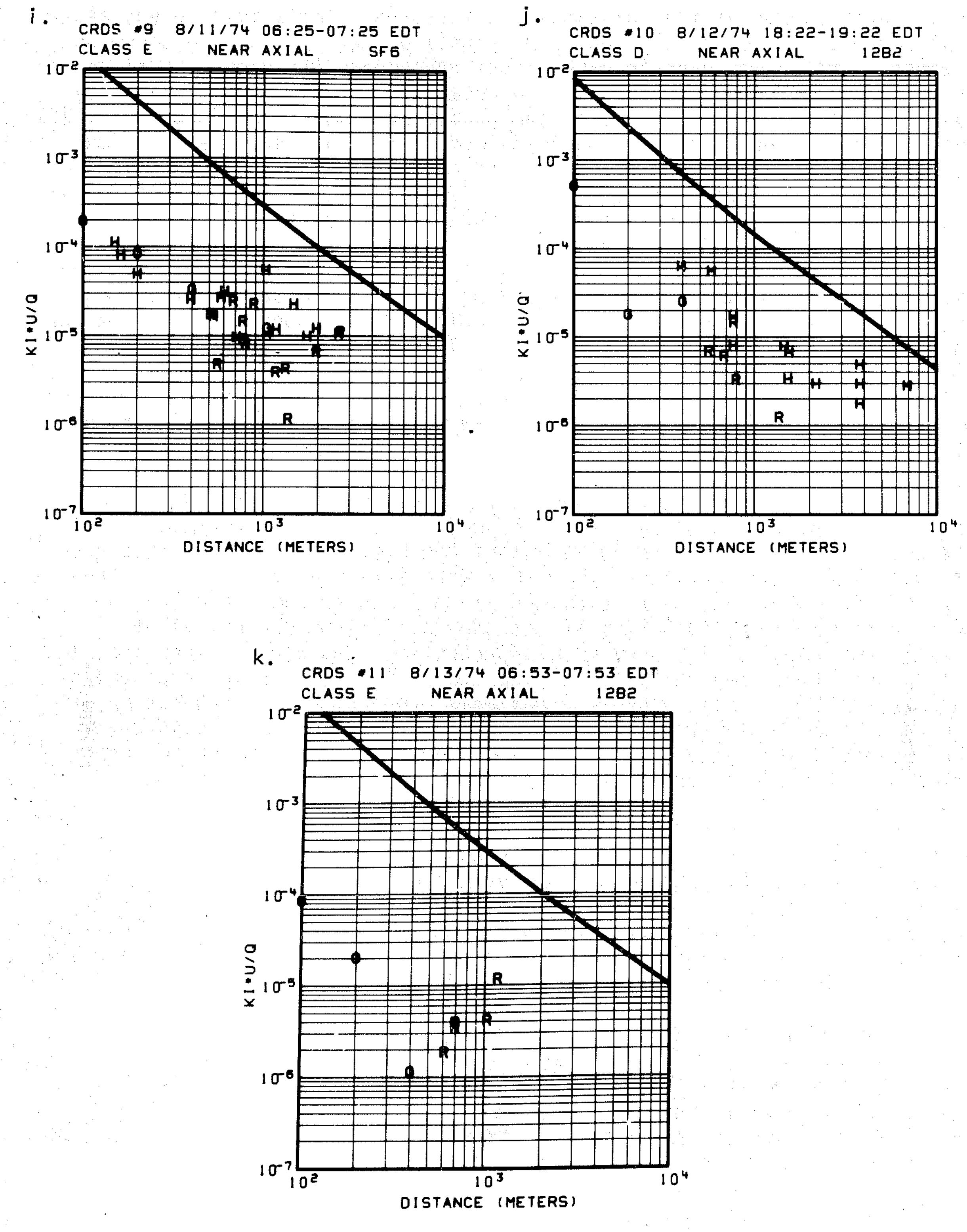

Figure 8. Continued

level concentration at that distance was measured. Aerially-sampled, near-axial concentrations are plotted as H symbols at the appropriate downwind distance. The solid curve in each figure represents the ground-level receptor solution of the Gaussian diffusion equation (eq. 2) for the stability class (as categorized by $\Delta T/\Delta z$) of the particular test [from Turner's (1970) presentation of the Pasquill (1961)-Gifford (1961) curves]. Table 2 contains the peak normalized ground-level measured concentration from each sampling arc along with the appropriate Pasquill-Gifford curve value. A listing by test of measurement concentrations is contained in Appendix A.

Ground-level sampled values represent a mean integrated concentration resulting from sampling times of 1 to 3 hr (tracer releases were 60 min). Most of the tracer present in a given sample bag was probably collected during a 1-hr period. Therefore, ground-level sample bag concentrations have been normalized through multiplication by the time of sample collection and division by the length of tracer release. Aerial concentration measurements were made over sampling times of less than 1 min and were not adjusted by any time ratios (Turner, 1970).

In all instances, the observed axial concentrations were less than those predicted by the Pasquill-Gifford curves for the appropriate stability classes. It should be borne in mind that the Pasquill-Gifford curves are very useful for the conditions that they were intended to describe. The very low windspeed conditions examined in this memorandum lie beyond the expected range of applicability of the curves. If the curves fail to directly represent (i.e., predict) concentrations and plume dispersion, in what manner(s) do they fail to describe the diffusion, and may some modest change(s) in their usage result in suitable predictions? The question of changes will be set aside for the present; some discussion of changes has been presented by Sagendorf (1974) based upon a similar test series conducted over the Idaho desert.

Figures 9a through 9c are plots of the normalized, near-axial data points grouped according to stability class as categorized by $\Delta T/\Delta z$ and separated into aerial- and ground-measured samples. (The first order, least-squares curve fit in these plots, and all other plots in this memorandum were calculated simply to see how they compare with the Pasquill-Gifford curves and to see their trend with distance. They are not, nor are they intended to be, any sort of predictive curve.)

To determine the lateral dispersion, estimates of σ_y were calculated using equation (4), the second moment of the lateral distribution of tracer mass about the center of gravity of the mass distribution. The results along with appropriate Pasquill-Gifford σ_y values are listed in table 3. Figures 10a through 10c are plots of the calculated σ_y values as a function of downwind distance, grouped by stability class.

By using the second moment values of σ_y [termed σ_y(SM) from table 3], along with the elevated near-axial concentrations [$\chi_H = \chi(x,0,H;H)$], equation (5) may be solved for σ_z. These σ_z values satisfy the Gaussian diffusion equation for the observed elevated centerline concentrations. For these calculations, the values of aerial concentration, χ_H, are the largest

Table 2. Measured Normalized Peak Ground-Level Concentration Values and Pasquill-Gifford (P/G) Normalized Peak Concentration Values [a,b]

Test	Stability class	100 m		200 m		400 m	
		P/G	Meas.	P/G	Meas.	P/G	Meas.
3	D	8500	20.4	2400	15.6	690	0.653
10[c]	D	8500	526	2400	18.4	690	26.0
1	E	15000	181	4400	76.1	1300	19.1
4	E	15000	121	4400	95.1	1300	13.0
5	E	15000	124	4400	69.4	1300	32.9
6	E	15000	110	4400	73.7	1300	2.50
7	E	15000	202	4400	40.5	1300	7.94
8	E	15000	94.2	4400	34.8	1300	6.01
9	E	15000	202	4400	86.5	1300	34.1
11[c]	E	15000	87.7	4400	20.8	1300	1.18
2	F	20000	198	4900	51.9	3000	16.0

a Based upon the ground-level released tracer
b All values $*10^{-6}\ m^{-2}$
c Based upon the 12B2 tracer

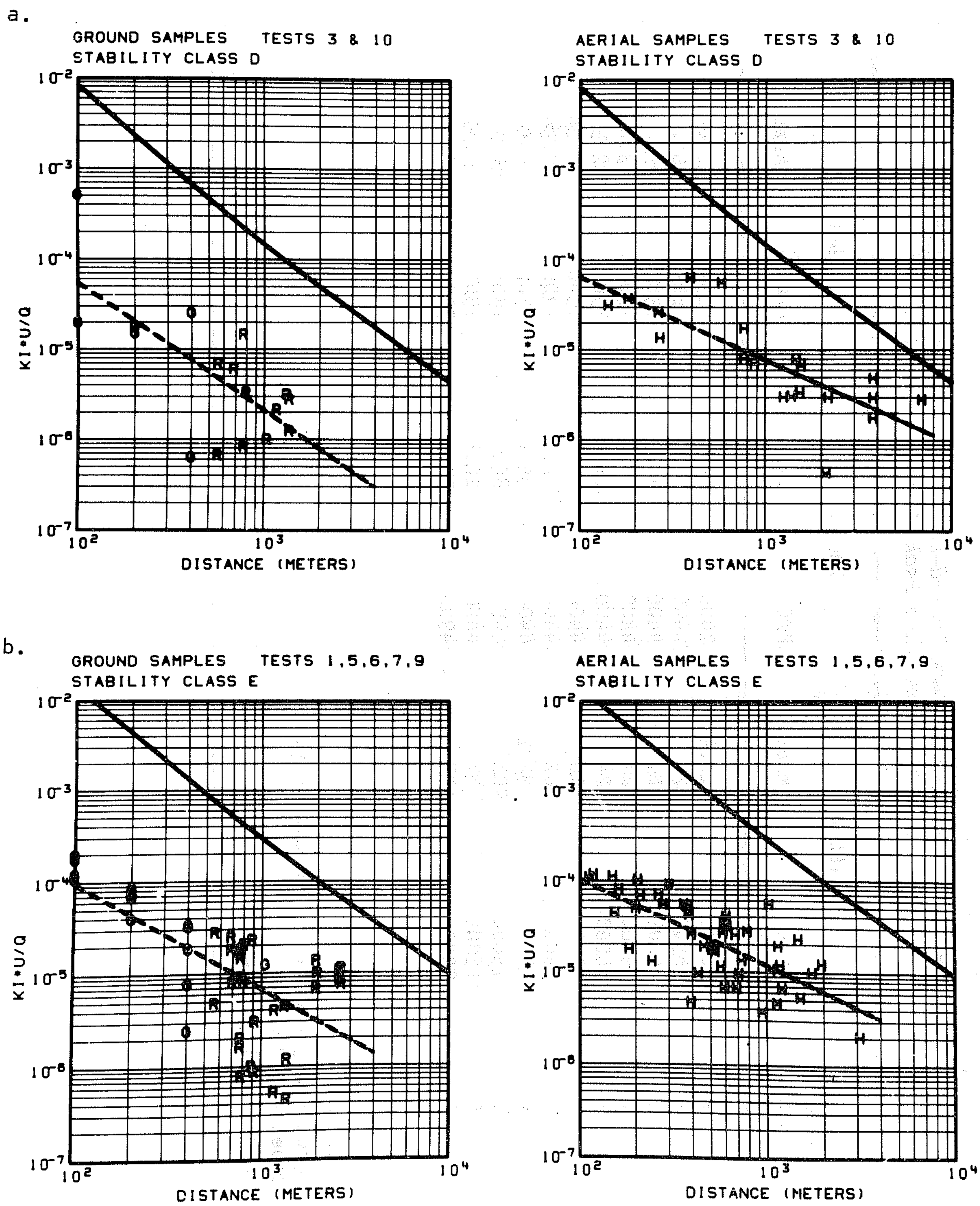

Figure 9 (a - c). Normalized, near-axial data points grouped according to stability class. The solid line is the appropriate Pasquill-Gifford curve. The dashed line is a first order, least-squares curve fit of the data points.

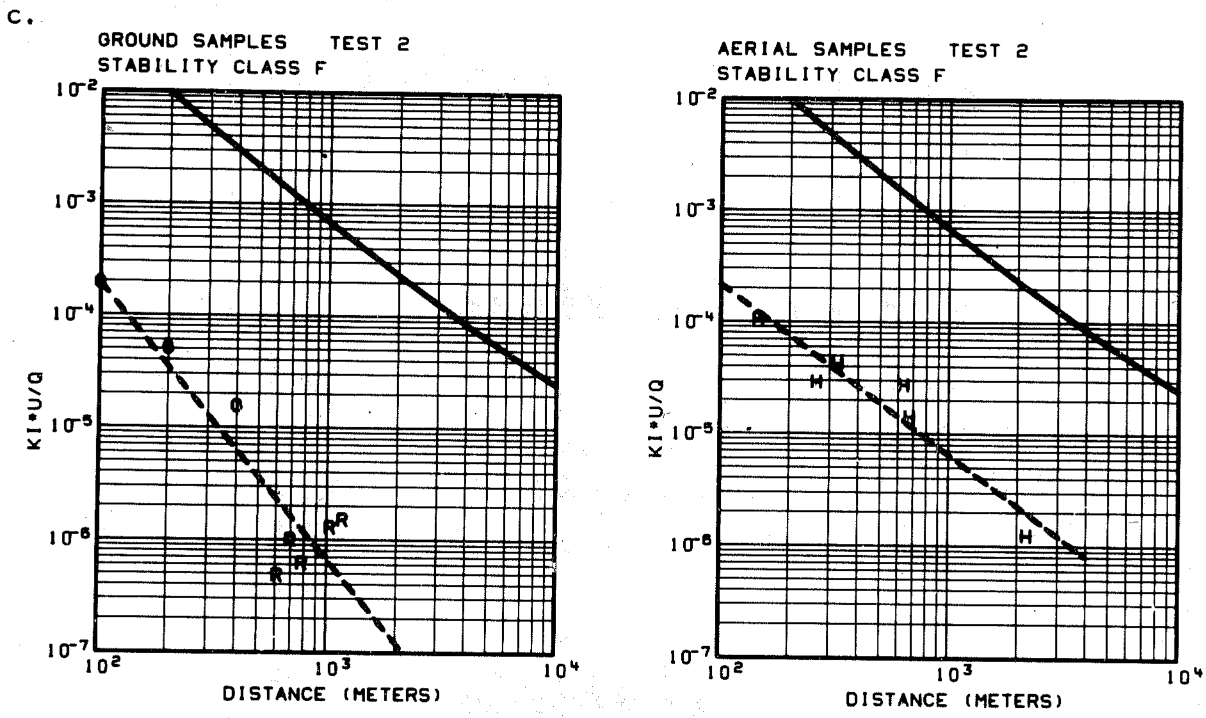

Figure 9. Continued

values observed (the upper envelope or boundary of the scattering of measured concentrations). The σ_z (eq. 5) values are plotted in figures 11a through 11c similarly to the plotting of σ_y(SM) values. By use of the ground-level axial concentration, $[\chi_G=\chi(x,o,o;H)]$ along with σ_z (eq.5), σ_y(SM) and χ_H, the test mean plume axis height, H, for a Gaussian vertical distribution may be derived from equation (7). Table 4 summarizes these calculations for all tests except 4, 8, and 11 during which no aerial samples were taken.

Solving equation (3) for σ_z yields a second estimate of σ_z based upon H and the crosswind integrated concentration (CIC). Two solutions for σ_z from equation (3) are possible since σ_z occurs both as a simple multiplier and as part of an argument of an exponential term. The two solutions represent cases in which the exponential term either is close to unity or is decidedly different from unity. When the exponential term differs substantially from one, a Gaussian profile is envisioned between the surface and the plume axis height at H. An appropriate number of σ_z increments span the height interval H. When the exponential term nears unity, the implied vertical profile is quasi-uniform, and the resultant σ_z (the larger of the two solutions) is more descriptive of the depth of vertical dispersion. Equation (3) may also be solved for an effective plume axis height, HC (eq. 8), which is based

Table 3. Calculated σ_y Values and Pasquill-Gifford σ_y Values[a,d]

Test	Stability class	P/G	Eq. 4	P/G	Eq. 4	P/G	Eq. 4
3	D	8.1	28.4	15.3	35.2	29.0	103.9
10[c]	D	8.1	22.2	15.3	37.3	29.0	74.4
1	E	6.0	29.6	11.3	63.4	21.7	89.0
4	E	6.0	40.3	11.3	69.2	21.7	168.8
5	E	6.0	42.6	11.3	67.6	21.7	113.6
6	E	6.0	33.8	11.3	90.4	21.7	196.3
7	E	6.0	42.4	11.3	60.8	21.7	168.7
8	E	6.0	43.7	11.3	73.9	21.7	126.8
9	E	6.0	51.8	11.3	107.7	21.7	117.4
11[c]	E	6.0	27.8	11.3	49.6	21.7	161.8
2	F	3.0	31.1	7.6	60.3	14.5	81.2

a Based upon the ground-level released tracer

b All values $*10^{-6}$ m^{-2}

c Based upon the 12B2 tracer

d All values in units of meters

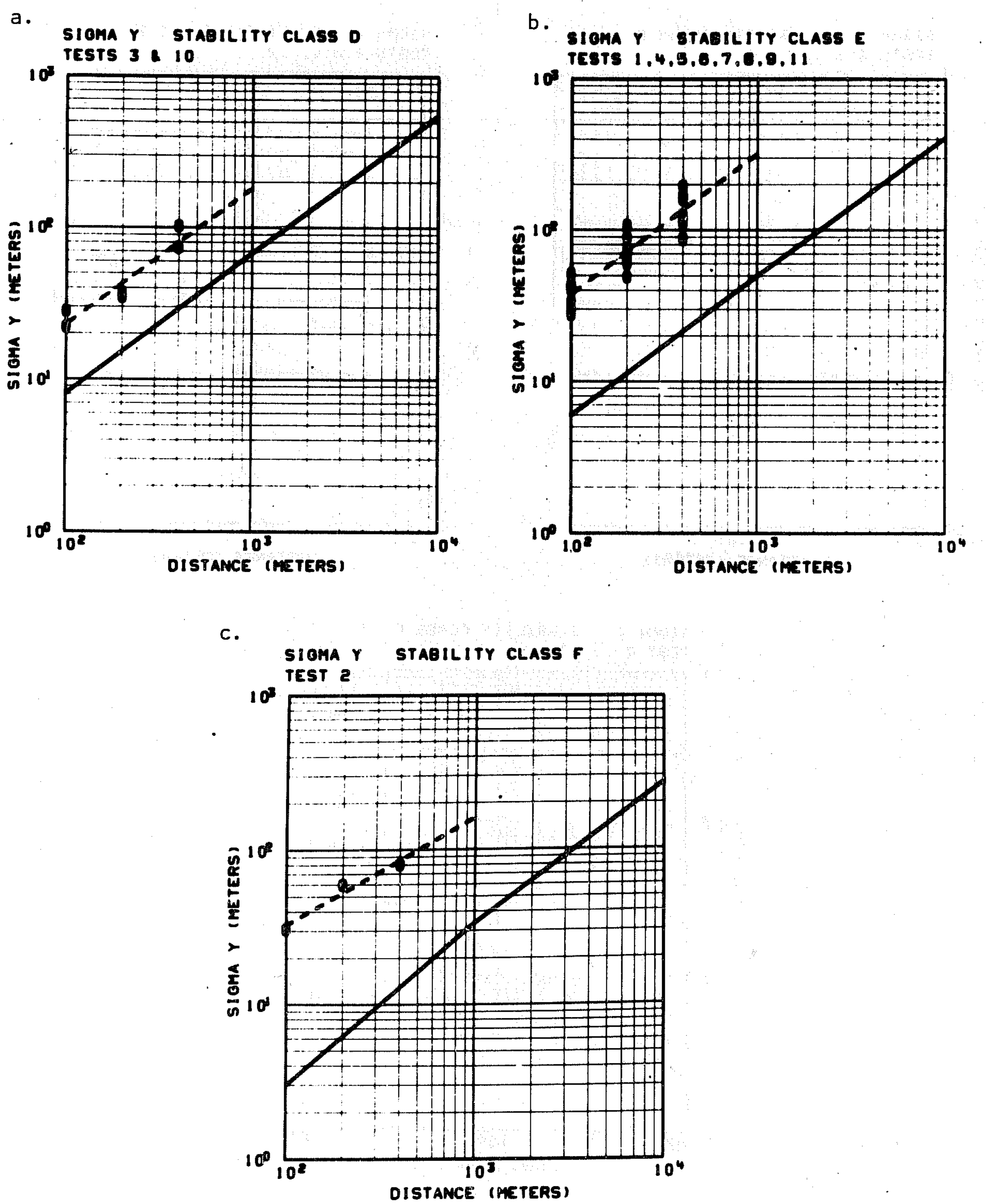

Figure 10(a - c). σ_y*(SM) data points grouped by stability class. The solid line is the appropriate Pasquill-Gifford curve. The dashed line is a first order, least-squares curve fit of the data points.*

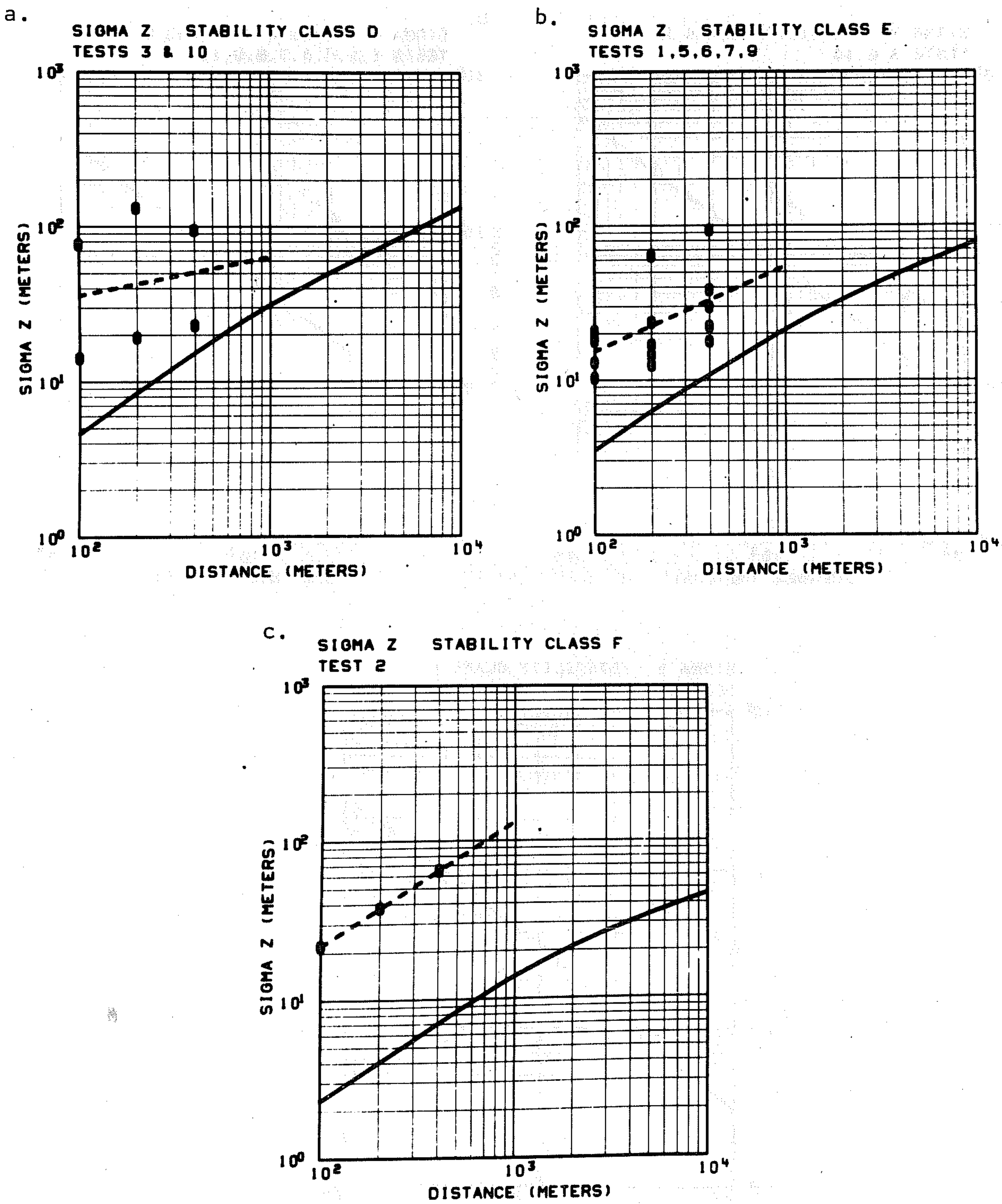

Figure 11(a - c). σ_z (eq. 5) data points grouped by stability class. The solid line is the appropriate Pasquill-Gifford curve. The dashed line is a first order, least-squares curve fit of the data points.

Table 4. Vertical Plume Spreading and Diffusion Parameters

Test	Stability class	Sampling arc	σ_z P/G	σ_z Eq. 5	H	σ_z CIC	CIC	HC	$\chi_H\bar{u}/Q$ [a]	$\chi_{GO}\bar{u}/Q$ [a]
		x 100 m	m	m	m	m	m	m	m^{-2}	m^{-2}
3	D	1	4.6	77.8	153.8	98.6	289.0	124.4	72	20.4
		2	8.5	133.0	228.5	164.2	349.1	188.4	34	15.6
		4	15.4	95.8	267.3	109.3	216.2	232.7	16	0.7
10 b	D	1	4.6	14.3	16.2	I	I	13.6	500	525.9
		2	8.5	19.4	48.9	20.0	396.1	47.7	220	18.4
		4	15.4	23.3	46.0	22.8	169.0	46.7	92	26.0
1	E	1	3.6	20.9	30.2	I	I	14.0	240	181.0
		2	6.4	23.9	34.0	I	I	24.6	105	76.1
		4	11.0	38.9	68.9	I	I	56.0	46	19.1
5	E	1	3.6	10.4	19.5	15.9	24.7	15.9	360	123.8
		2	6.4	14.7	25.7	18.3	39.6	22.8	160	69.8
		4	11.0	22.5	36.7	I	I	30.6	64	32.9
6	E	1	3.6	13.1	25.3	22.6	28.7	20.1	360	110.2
		2	6.4	12.6	20.6	9.6	91.1	25.2	140	73.7
		4	11.0	18.0	48.2	17.5	789.2	49.6	45	2.5
7	E	1c	3.6	18.6	0	I	I	0	29	201.6
		2c	6.4	64.5	0	30.7	49.4	0	17	40.5
		4	11.0	94.2	128.1	70.2	346.7	156.2	10	7.9
9	E	1	3.6	18.1	18.5	I	I	16.5	170	201.4
		2	6.4	17.0	20.1	I	I	19.0	87	86.5
		4	11.0	30.1	42.0	I	I	22.7	45	34.1
2	F	1	2.3	22.2	28.8	23.5	36.6	28.3	230	198.4
		2	4.1	38.3	53.5	I	I	37.4	69	51.9
		4	7.1	65.3	106.3	67.1	206.0	104.6	30	15.9

I means indeterminate computation.
P/G is the appropriate value given by the Pasquill-Gifford curves.
Eq. 5 is the σ_z value calculated using eq.(5) which assumes a Gaussian distribution of σ_y.
H is the height derived from eq.(7) using χ_H, χ_G, and σ_z (eq.5).
HC is the height derived from eq.(8) using the crosswind integrated concentration (CIC).
σ_z(CIC) are values computed from eq.(3), using H given above.
a - Normalized concentrations are x 10^{-6}.
b - Based upon the ground-released tracer.
c - $\chi_G > 2\chi_H$.

upon the CIC and σ_z (eq. 5). A comparison of HC and H supplies some coarse implications about the aerial-to-ground surface concentration profile. These implications will be discussed later in this section. The HC values are also listed in table 3, along with the CIC-derived σ_z values. For test 7 on the 100- and 200-m sampling arcs the peak ground level concentration was greater than twice the aerial concentration, implying that the plume was not yet elevated. In these two cases χ_G was used to compute σ_z (eq. 5) in place of χ_H.

Table 5 is a summary of diffusion parameter ratios resulting from a comparison of measured (or calculated from measured quantities) values with predicted Pasquill-Gifford values. A ratio was taken for each sampling arc distance for each test; the values were then grouped and averaged according to stability class and according to sampling arc distance. Finally, an average ratio was computed for all the values of each parameter.

Table 5. Summary of Diffusion Parameter Ratios

Stability class	100 m	200 m	400 m	All Distances
(a)		σ_y(SM) ÷ σ_y(P/G)		
D	3.1	2.4	3.1	2.9
E	6.5	6.4	6.6	6.5
F	10.4	7.9	5.6	8.0
Total	6.2	5.8	5.9	6.0
(b)		σ_z(Eq.5) ÷ σ_z(P/G)		
D	10.0	9.0	3.9	7.6
E*	4.6	4.2	3.7	4.2
F	9.6	9.5	9.2	9.4
Total	6.6	6.1	4.4	5.7
(c)		$\chi\bar{u}/Q$(P/G) ÷ $\chi_G\ \bar{u}/Q$		
D	216	142	546	301
E	115	91	161	122
F	100	94	191	129
Total	132	101	233	155

*No aerial samples to compute σ_z (Eq. 5) for tests 4, 8, 11 (class E).

For σ_y and σ_z (tables 5a and 5b) the calculated value was divided by the Pasquill-Gifford value. The σ_y(SM) values were an average of 6.0 times larger than the predicted values; σ_z values (eq. 5) were an average of 5.7 times larger.

In table 5c the predicted Pasquill-Gifford normalized centerline value was divided by the peak normalized ground-level measured concentration. The average of all the ratios is 155. This ratio assumes that the plume centerline did not elevate. But, because measured aerial concentrations were higher than the peak ground-level measured concentrations, and because the oil-fog plume centerline was observed over the top of the vegetation, it seems reasonable to assume that the tracer plume did, in fact, elevate.

In order to estimate more accurately the amount of dilution beyond what Pasquill-Gifford curves would predict, it is necessary to correct the measured ground-level values for being off centerline in the vertical. From equation (2) for normalized axial ground-level receptors

$$\frac{\chi_G(x,o,o;H)\bar{u}}{Q} = \frac{1}{\pi\sigma_y(SM)\sigma_z(eq.5)} \cdot \exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right] \quad . \qquad (9)$$

The normalized Pasquill-Gifford centerline value is

$$\frac{\chi(x,o,o;o)\bar{u}}{Q} = \frac{1}{\pi\sigma_y\sigma_z}$$

and the ratio more properly becomes

$$\frac{\chi\bar{u}/Q(P/G)}{\chi_G\bar{u}/Q} \cdot \exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right] = \frac{\sigma_y(SM)\ \sigma_z(eq.5)}{(\sigma_y\sigma_z)(P/G)} \quad . \qquad (10)$$

The left side of equation (10) is term (I) in table 6a; the right side is term (II).

Both equation (3) for CIC and equation (9) can be solved for $1/\sigma_z$ so that

$$[\chi_G\ \bar{u}/Q]\cdot\ \pi\sigma_y(SM)\cdot\exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right] = [CIC(x,H)\bar{u}/Q]_{Meas.}\cdot\ \left(\frac{\pi}{2}\right)^{\frac{1}{2}}\cdot\exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right].$$

Along the center line the Gaussian diffusion equations, with Pasquill-Gifford values, provide

$$(\chi\bar{u}/Q)_{P/G}\cdot\pi\sigma_y(P/G) = [CIC(x,o)\ \bar{u}/Q]_{P/G}\cdot\ \left(\frac{\pi}{2}\right)^{\frac{1}{2}}\quad .$$

Taking the ratio of Pasquill-Gifford expectations to measured or calculated values yields

$$\frac{\chi\bar{u}/Q(P/G)}{\chi_G\ \bar{u}/Q}\ .\ \exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right] = \frac{[CIC(x,o)\bar{u}/Q]_{P/G}\cdot\ \exp\left[-\tfrac{1}{2}\left(\frac{H}{\sigma_z(eq.5)}\right)^2\right]}{[CIC(x,h)\bar{u}/Q]\ Meas.}\ \cdot\ \frac{\sigma_y(SM)}{\sigma_y(P/G)}\ . \qquad (11)$$

The left side is again term (I) and the right side is term (III) in table 6a.

Terms (I), (II), and (III) in table 6a should be equal within experimental error for a given test and distance, and are an estimate of the amount of dilution beyond that which the Pasquill-Gifford curves would predict. Table 6b summarizes the ratios grouped by stability class and sampling arc distance. An average of all the data shows that the concentration measurements are about 29 times more dilute than would be predicted according to Pasquill-Gifford estimates.

Table 6. Estimates of Enhanced Dilution

(a) Values for Individual Tests

Stability Class	100 m (I)	100 m (II)	100 m (III)	200 m (I)	200 m (II)	200 m (III)	400 m (I)	400 m (II)	400 m (III)	TEST#
D	59.0	59.3	30.2	35.1	36.0	22.4	21.7	22.3	8.7	3
D	8.5	8.5	7.1	5.5	5.6	4.8	3.8	3.9	4.1	10
E	30.4	29.0	13.7	21.0	21.1	13.1	14.5	14.5	8.5	1
E	20.3	20.8	11.6	13.8	13.9	10.0	10.0	10.7	7.0	5
E	20.3	20.8	10.3	15.8	15.8	30.9	14.8	14.8	18.1	6
E	20.8	37.1	12.0	91.5	54.7	47.4	66.4	66.6	104.5	7
E	42.9	43.9	39.5	25.4	25.5	23.6	14.8	14.8	7.5	9
F	43.3	99.4	96.3	35.5	74.9	45.5	50.8	51.5	49.3	2

(b) Values Pooled by Stability Class

Stability Class	100 m (I)	100 m (II)	100 m (III)	200 m (I)	200 m (II)	200 m (III)	400 m (I)	400 m (II)	400 m (III)	All distances (I)	All distances (II)	All distances (III)
D	33.7	33.9	18.6	20.3	20.8	13.6	12.7	13.1	6.4	22.2	22.6	12.9
E	26.9	30.3	17.4	33.5	26.2	25.0	24.2	24.3	29.1	28.2	26.9	23.8
F	43.3	99.4	96.3	35.5	74.9	45.5	50.8	51.5	49.3	43.2	75.3	63.7
All Data	30.7	39.8	27.6	30.5	30.9	24.7	24.6	24.9	26.0	28.6	31.9	26.1

(I) is $(\chi\bar{u}/Q)P/G\cdot\exp(\frac{H^2}{2\sigma_z 2}) \div (\chi_G\bar{u}/Q)_{meas.}$

(II) is $[\sigma_y(SM)\cdot\sigma_z\ (Eq.5)] \div [\sigma_y\cdot\sigma_z]\cdot P/G$

(III) is $\left[(CIC\ \bar{u}/Q)P/G\cdot\exp(-\frac{H^2}{2\sigma_z 2}) \div (CIC\ \bar{u}/Q)_{meas.}\right] \cdot \frac{\sigma_y(SM)}{\sigma_y\ P/G}$

4.2 Discussion of Diffusion

4.2.1 Observed plume behavior.

The photographs in figures 12 through 15 were taken during a special smoke visualization test on 31 July 1974. Gaseous tracer was not released, nor were meteorological data recorded since repairs were still being made on electrical equipment damaged by lightning two days earlier. These aerial photographs show an oil fog plume during the 26-min time span from 0724 to 0750 EDT and are an aid to visualizing different aspects of the diffusion that took place during the various testing periods. The plume behaviors illustrated in these figures are typical for the entire test series. For the most part plumes for each test diffused within the volume of the valley below the ridge tops, becoming somewhat homogeneous in appearance. Winds near the height of the ridges tended to transport the upper portions of plumes at a different speed or, in the case of tests 2 and 3, along entirely different trajectories than valley axial flow.

In figure 12 the oil fog is drifting up the west ridge (to the left) while the upper plume is being sheared off and transported to the southeast. Figure 13, taken about 5 min later, shows a close-up view of that portion of the plume beginning to spill over the west ridge. The main part of the plume appears to be in a shallow, slab-like layer immediately above the tree tops with pockets of smoke between the taller oak tree crowns and within depressions in the top of the forest canopy. The south (TVA) tower is visible in the center background and the top of the west tower just to the left.

Figure 14 was taken at 0735 EDT from an elevation of about 750 ft AGL with the camera pointed east. (The early morning sun glint is visible down the center of the photograph.) A portion of the Clinch River is visible in the background. A volumetric type of dilution is taking place in the valley. Also, some of the plume continued to spill over the west ridge while another portion was sheared off to the southeast. The shallow, well-capped layer and the filaments along the leading edge of the sheared-off portion indicate stable atmospheric conditions.

The last photograph (fig. 15) was taken at 0750 EDT shortly after the release of oil fog had been terminated. The apex tower is at the lower right, and the view is again to the northeast towards Grubb Island. The plume, with the appearance of a homogenized, volumetric dilution, has been channeled to the northeast along the axis of the valley. The leading edge of the plume has reached a distance approximately 600 m from the source, with a pronounced pocket of smoke approximately 250 m from the source. The oil fog plume leakage to the northwest is through a slight low spot or "saddle" in the west ridge. Filaments of smoke are visible along the leading edge of this portion of the plume. The sheared-off portion of the plume has moved to the southeast out of the photograph.

4.2.2 Interpretation of diffusion data.

The average ratios of measured values to predicted values for σ_y and σ_z indicate that both the horizontal and the vertical diffusion were greater during this test series than would be predicted by Pasquill-Gifford curves.

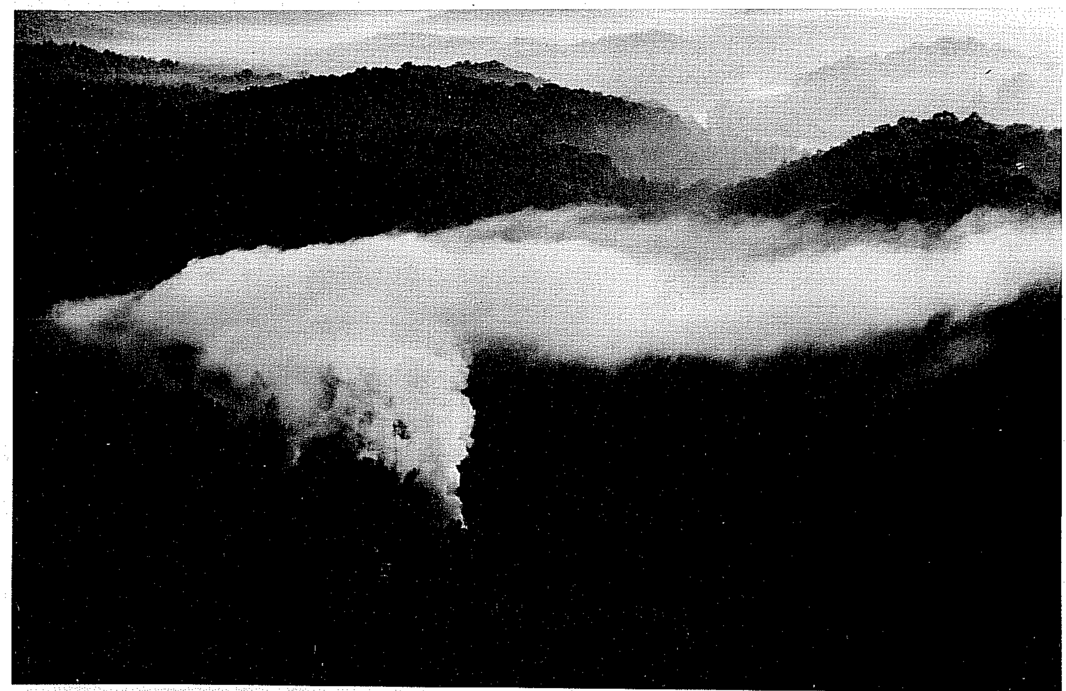

Figure 12. Oil fog plume released 0724 EDT, 31 July 1974. View is across the source point (near the bottom center) towards Grubb Island to the NE (top center).

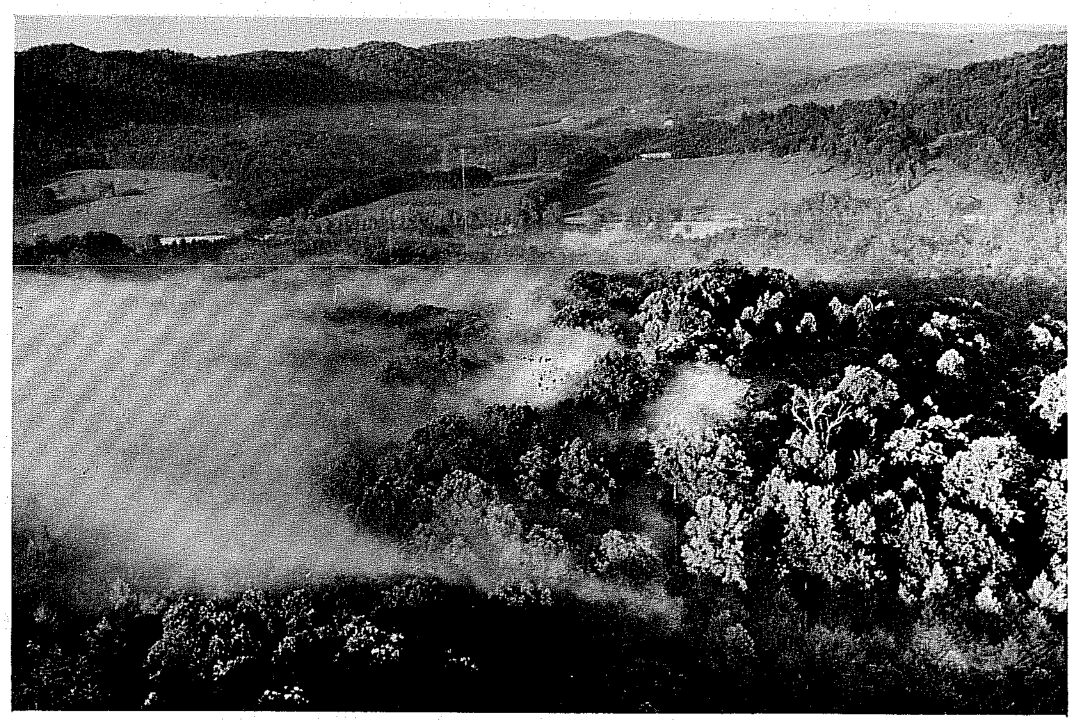

Figure 13. Oil fog plume at 0729 EDT, 31 July 1974. Close view of the portion of the plume beginning to spill over the west ridge.

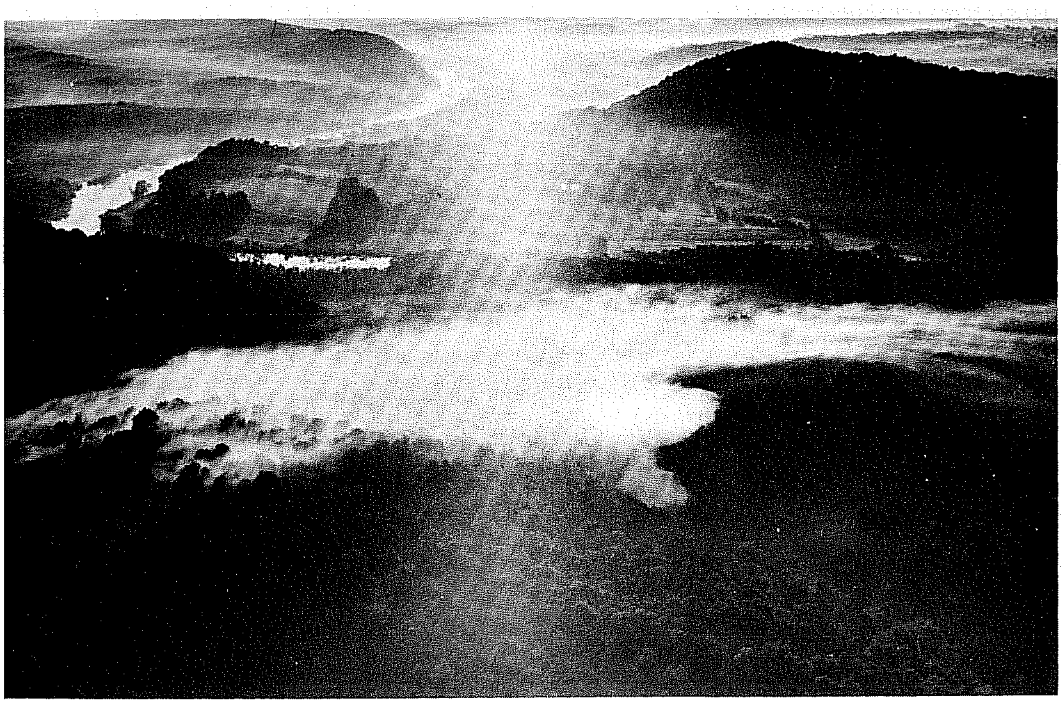

Figure 14. Oil fog plume at 0735 EDT, 31 July 1974. View is to the east. Valley axis (SW-NE) is from lower right to left of center.

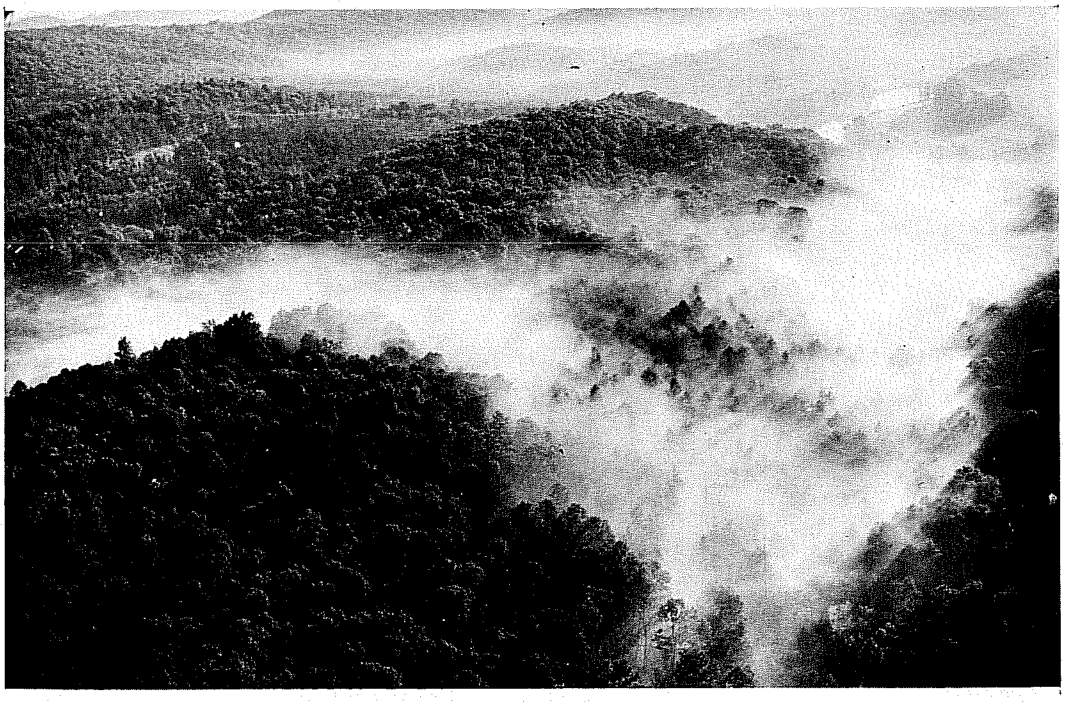

Figure 15. Oil fog plume at 0750 EDT, 31 July 1974. View is to the NE after termination of oil fog release.

for flat terrain. The enhanced horizontal diffusion is attributable mainly to the variability of wind direction, or meander, during low windspeed conditions, whereas the increased vertical diffusion is due to increased vertical mixing induced by surface roughness (in this case, a combination of vegetation and topography). By comparison, Sagendorf (1975) found that over flat terrain and under low windspeed conditions, horizontal diffusion was enhanced, again because of meander, but vertical diffusion was comparable with Pasquill-Gifford predicted values. The estimates of enhanced dilution shown in table 6 show much larger values for test 3 (compared with test 10) and somewhat larger values for test 2. The occurrence of wind direction shear during these tests suggests that these larger calculated dilutions may in part have resulted from shearing effects as well as the low wind-speed meander and topographic/vegetation influences common to the other tests. Until the role of shearing is better understood and documented, it may be advisable to place more credence in the smaller dilution estimates listed in table 6, since there are many more observations of their occurrence.

For all tests, the average ratio of estimated mean plume axis heights [determined from axial concentration measurements (H) and from crosswind integrated concentrations (HC)] is 1.21. This ratio implies that the ground concentrations are slightly closer in value to the elevated concentrations than a Gaussian gradient would predict. It is postulated that the portion of the elevated plume in the vegetation (estimated average tree height 20 m) became more uniformly mixed throughout the vegetative layer than would be expected over a flat, smooth surface. This greater uniformity would lead to a vertical distribution of concentration similar to the solid curve in figure 16.

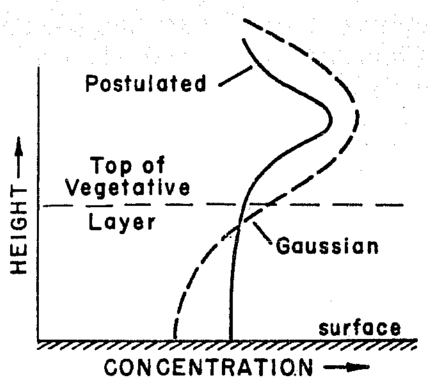

Figure 16. Hypothetical vertical distributions of concentration. Dashed line is Gaussian; solid line is postulated.

The excess amount of dilution was found to decrease with greater downwind distance. This behavior is indicated by the first-order least-squares curve fits of the near-axial data points in figures 9a and 9b which approach the Pasquill-Gifford curves at longer distances. This feature can also be seen in the plots of σ_z as a function of distance (figs. 11a and 11b). In table 6b, the values of enhanced dilution, terms (I), (II), and (III), decrease with increasing distance. Furthermore, the amount of enhanced dilution increased with increasing stability. In table 6b this increase with stability can be seen in the column labeled "All Distances". An important inference from these data is that under low windspeed conditions, the ability of the atmosphere to diffuse the gaseous tracer does not decrease unlimitedly as the atmosphere becomes more and more stable.

5. SUMMARY

In a series of gaseous tracer measurements, eleven 1-hr tracer releases were conducted in a hilly, wooded area near the Clinch River in eastern Tennessee. Aerial and ground-level concentrations were collected along with wind and temperature measurements. All test periods were characterized by very low windspeeds (mean windspeeds less than 1 m s^{-1}) and occurred during neutral to moderately stable atmospheric stability classes.

Concentration measurements and diffusion parameters were compared with those values that would be predicted by the standard Pasquill-Gifford curves for flat terrain. (It is understood that the conditions examined in this memorandum are beyond the range of applicability of the Pasquill-Gifford criteria.) The standard deviation of the horizontal plume spread, σ_y, averaged 6.0 times greater than predicted values. This large deviation is attributable mainly to wind meander under low windspeed conditions. The derived standard deviation of the vertical plume spread, σ_z, averaged 5.7 times greater than Pasquill-Gifford predicted values. Roughness of the surface (topography and vegetation) enhanced the vertical diffusion. The product of the σ_y and σ_z ratios, as an estimate of enhanced dilution, is about 34.

After a correction for elevation of the plume centerline, the overall average dilution derived from ground level axial concentrations was about 29 times greater than would be predicted by the appropriate Pasquill-Gifford curves for flat terrain. The amount of enhanced dilution was found to decrease at greater downwind distances. Also, the enhanced dilution was greater for the strongest inversions (most stable), implying that under low windspeed conditions, the ability of the atmosphere to diffuse the gaseous tracer does not decrease to zero as the atmosphere becomes more stable, but instead tends to be bound by some minimum rate of dilution.

6. ACKNOWLEDGMENTS

The Project Management Corporation, Knoxville, Tennessee, coordinated arrangements with Tennessee Valley Authority and granted access to the peninsula site over which the field study measurements were collected.

Appreciation is expressed to the Tennessee Valley Authority for providing recorded temperature data from its south tower to cover the period of testing.

This experiment was a cooperative venture involving the complete staff of the Air Resources Laboratories' Field Research Office. It could not have been successful without the unstinting help of all of the following staff personnel.

Mr. F. E. White set up the data acquisition for the many towers and sensors upon which the whole experiment depended, worked long hours in Tennessee modifying circuitry and implementing new and better techniques, and instructed our personnel in the field operation of electronic systems.

Mr. Thayne Thompson supervised the gas analysis laboratory and its associated experiments, calibrations, and operations.

Mr. Harold Boen was responsible for the initial programming of meteorological data reduction computations.

Mr. Douglas Forsyth provided pre-experiment liaison among various offices, established the radio communications, and also participated in all tests.

Messrs. Frank Mahoney, Steven Manning, Mark Rencher, and Lloyd Feltman were most helpful in accomplishing the many necessary day-to-day tasks.

Mrs. Lydia Thorngren assisted in tracer analyses and helped proof-read the manuscript.

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APPENDIX A. MEASURED TRACER CONCENTRATIONS

This appendix lists concentrations measured above background levels for individual tests. The column containing the sample position number is labeled "#". Distance is measured in meters horizontally from the release point, and bearing is the angle measured clockwise from the north. In the ground sample data, duration represents the length of time, in minutes, of sampler collection. Concentration is volume of tracer per volume of air at 25°C. The column on the right is the normalized concentration value. The heights listed for aerial samples are elevations in units of meters above sea level.

TEST #1   7/29/74   09:05-10:05 EDT   SF6
SOURCE STRENGTH (Q) WAS 0.0732 GM/SEC
WIND SPEED (U) WAS 0.49 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	60	3.37E-09	1.35E-04
2	100	6.0	60	2.50E-09	9.98E-05
3	100	12.0	60	3.20E-09	1.28E-04
4	100	18.0	60	4.24E-09	1.69E-04
5	100	24.0	60	3.67E-09	1.47E-04
6	100	30.0	60	3.36E-09	1.34E-04
8	100	42.0	60	3.47E-09	1.39E-04
9	100	48.0	60	3.79E-09	1.52E-04
10	100	54.0	60	4.53E-09	1.81E-04
11	100	60.0	60	3.78E-09	1.51E-04
12	100	66.0	60	2.60E-09	1.04E-04
13	100	72.0	60	3.79E-09	1.52E-04
14	100	78.0	60	2.83E-09	1.13E-04
15	100	84.0	60	2.98E-09	1.19E-04
16	100	90.0	60	3.32E-09	1.33E-04
18	100	102.0	60	3.03E-09	1.21E-04
19	100	108.0	60	1.33E-09	5.32E-05
20	100	114.0	60	9.64E-10	3.86E-05
21	100	120.0	60	2.54E-10	1.02E-05
22	100	126.0	60	2.28E-11	9.11E-07
23	100	132.0	60	2.47E-11	9.86E-07
56	100	330.0	60	1.14E-09	4.58E-05
57	100	336.0	60	1.82E-09	7.27E-05
58	100	342.0	60	1.48E-09	5.90E-05
60	100	354.0	60	2.56E-09	1.03E-04
62	200	6.0	60	1.07E-09	4.29E-05
63	200	12.0	60	8.19E-10	3.28E-05
64	200	18.0	60	9.71E-10	3.88E-05
65	200	24.0	60	8.12E-10	3.25E-05
66	200	30.0	60	8.65E-10	3.46E-05
67	200	36.0	60	8.12E-10	3.25E-05
68	200	42.0	60	8.55E-10	3.42E-05
69	200	48.0	60	8.54E-10	3.41E-05
70	200	54.0	60	1.12E-09	4.47E-05
71	200	60.0	60	1.14E-09	4.55E-05
72	200	66.0	60	1.40E-09	5.58E-05
73	200	72.0	60	1.38E-09	5.52E-05
74	200	78.0	60	1.45E-09	5.79E-05
76	200	90.0	60	1.54E-09	6.18E-05
77	200	96.0	60	1.32E-09	5.29E-05

TEST #1 7/29/74 09:05-10:05 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0732 GM/SEC
WIND SPEED (U) WAS 0.49 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
78	200	102.0	60	3.20E-10	1.28E-05
79	200	108.0	60	3.92E-10	1.57E-05
81	200	120.0	60	1.19E-10	4.74E-06
82	200	126.0	60	2.59E-11	1.04E-06
83	200	132.0	60	2.28E-11	9.11E-07
115	200	324.0	60	2.47E-11	9.87E-07
116	200	330.0	60	3.25E-11	1.30E-06
117	200	336.0	60	1.27E-10	5.08E-06
118	200	342.0	60	5.83E-10	2.33E-05
119	200	348.0	60	5.58E-10	2.23E-05
120	200	354.0	60	1.90E-09	7.61E-05
123	400	12.0	60	2.50E-10	9.99E-06
124	400	18.0	60	2.20E-10	8.79E-06
126	400	30.0	60	2.27E-10	9.07E-06
127	400	36.0	60	2.92E-10	1.17E-05
128	400	42.0	60	3.76E-10	1.50E-05
129	400	48.0	60	4.16E-10	1.66E-05
130	400	54.0	60	4.77E-10	1.91E-05
131	400	60.0	60	4.26E-10	1.70E-05
132	400	66.0	60	4.54E-10	1.82E-05
133	400	72.0	60	3.45E-10	1.38E-05
134	400	78.0	60	2.81E-10	1.13E-05
136	400	90.0	60	7.03E-11	2.81E-06
202	696	58.5	96	1.27E-10	8.19E-06
206	916	56.5	75	6.03E-11	3.06E-06
211	1324	128.0	105	1.03E-11	7.27E-07

TEST #1 7/29/74 09:05-10:05 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0732 GM/SEC
WIND SPEED (U) WAS 0.49 M/SEC

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
802	569	59.5	280	2.97E-10	1.19E-05
804	383	55.3	286	1.08E-09	4.33E-05
805	678	87.5	295	6.49E-10	2.60E-05
807	204	27.0	292	2.65E-09	1.06E-04
809	370	357.0	294	1.33E-09	5.32E-05
810	154	34.2	304	1.13E-09	4.53E-05
811	461	48.5	304	4.87E-10	1.95E-05

TEST #2 7/30/74 08:00-09:00 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0771 GM/SEC
WIND SPEED (U) WAS 0.42 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	80	3.37E-09	1.48E-04
2	100	6.0	80	4.52E-09	1.98E-04
3	100	12.0	80	3.32E-09	1.46E-04
5	100	24.0	80	9.56E-10	4.20E-05
8	100	42.0	80	1.12E-09	4.90E-05
10	100	54.0	80	1.63E-09	7.15E-05
11	100	60.0	80	1.30E-09	5.72E-05
12	100	66.0	80	8.52E-10	3.74E-05
14	100	78.0	80	1.06E-09	4.65E-05
15	100	84.0	80	1.08E-09	4.76E-05
17	100	96.0	80	1.21E-09	5.31E-05
18	100	102.0	80	9.26E-10	4.07E-05
20	100	114.0	80	8.04E-10	3.53E-05
22	100	126.0	80	7.09E-10	3.12E-05
23	100	132.0	80	4.42E-10	1.94E-05
24	100	138.0	80	3.61E-10	1.59E-05
25	100	144.0	60	1.47E-10	4.88E-06
26	100	150.0	60	2.89E-10	9.55E-06

TEST #2 7/30/74 08:00-09:00 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0771 GM/SEC
WIND SPEED (U) WAS 0.42 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
27	100	156.0	60	1.56E-10	5.17E-06
28	100	162.0	60	8.36E-11	2.77E-06
29	100	168.0	60	1.01E-10	3.34E-06
30	100	174.0	60	3.32E-11	1.10E-06
31	100	180.0	60	4.64E-11	1.53E-06
33	100	192.0	60	3.66E-11	1.21E-06
35	100	204.0	60	1.01E-11	3.36E-07
37	100	216.0	60	1.28E-11	4.22E-07
40	100	234.0	65	2.44E-11	8.73E-07
42	100	246.0	65	7.14E-12	2.56E-07
44	100	258.0	65	2.06E-11	7.37E-07
46	100	270.0	65	7.40E-12	2.65E-07
50	100	294.0	65	9.37E-12	3.35E-07
52	100	306.0	65	8.96E-12	3.21E-07
56	100	330.0	80	2.13E-11	9.38E-07
58	100	342.0	80	5.01E-11	2.20E-06
59	100	348.0	80	3.41E-10	1.50E-05
60	100	354.0	80	8.28E-10	3.64E-05
62	200	6.0	80	2.36E-11	1.04E-06
65	200	24.0	80	8.61E-12	3.78E-07
66	200	30.0	80	6.69E-10	2.94E-05
67	200	36.0	80	6.53E-10	2.87E-05
68	200	42.0	80	5.91E-10	2.60E-05
69	200	48.0	80	2.30E-10	1.01E-05
70	200	54.0	80	3.00E-10	1.32E-05
71	200	60.0	80	3.92E-10	1.72E-05
72	200	66.0	80	5.70E-10	2.50E-05
73	200	72.0	80	7.34E-10	3.22E-05
75	200	84.0	80	5.71E-10	2.51E-05
76	200	90.0	80	7.84E-10	3.45E-05
77	200	96.0	80	9.96E-10	4.38E-05
78	200	102.0	80	7.88E-10	3.46E-05
79	200	108.0	80	1.18E-09	5.19E-05
83	200	132.0	80	7.66E-10	3.37E-05
84	200	138.0	80	6.45E-10	2.84E-05
85	200	144.0	60	4.83E-10	1.60E-05
86	200	150.0	60	9.35E-11	3.09E-06
87	200	156.0	60	3.04E-11	1.01E-06
89	200	168.0	60	1.98E-11	6.54E-07
91	200	180.0	60	1.52E-11	5.03E-07

TEST #2 7/30/74 C8:00-09:00 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0771 GM/SEC
WIND SPEED (U) WAS 0.42 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
97	200	216.0	60	9.16E-12	3.03E-07
99	200	228.0	60	1.79E-11	5.94E-07
103	200	252.0	65	1.49E-11	5.32E-07
119	200	348.0	80	1.13E-11	4.95E-07
125	400	24.0	80	1.07E-11	4.69E-07
127	400	36.0	80	1.30E-11	5.72E-07
129	400	48.0	80	2.33E-11	1.03E-06
130	400	54.0	80	3.63E-10	1.60E-05
131	400	60.0	80	3.10E-10	1.36E-05
132	400	66.0	80	2.47E-10	1.09E-05
133	400	72.0	80	2.25E-10	9.89E-06
134	400	78.0	80	2.02E-10	8.86E-06
135	400	84.0	80	2.32E-10	1.02E-05
136	400	90.0	80	3.82E-11	1.68E-06
154	400	198.0	65	6.99E-12	2.50E-07
157	400	216.0	65	1.00E-11	3.59E-07
158	400	222.0	65	1.94E-11	6.96E-07
160	400	234.0	65	8.95E-12	3.20E-07
164	400	258.0	65	6.57E-12	2.35E-07
169	400	288.0	65	1.04E-11	3.72E-07
202	696	58.5	52	3.59E-11	1.03E-06
203	611	78.0	53	1.70E-11	4.97E-07
205	1036	130.0	56	4.29E-11	1.33E-06
208	782	78.0	97	1.19E-11	6.32E-07
210	1170	129.0	56	5.01E-11	1.55E-06

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
804	324	140.6	298	1.30E-09	4.22E-05
806	146	174.8	304	3.24E-09	1.06E-04
807	637	134.0	313	8.66E-10	2.82E-05

TEST #2 7/30/74 08:00-09:00 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0771 GM/SEC
WIND SPEED (U) WAS 0.42 M/SEC

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
809	2195	131.9	320	3.91E-11	1.27E-06
811	263	173.2	329	9.15E-10	2.98E-05
812	675	120.7	329	4.33E-10	1.41E-05

TEST #3 8/5/74 09:22-10:22 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0785 GM/SEC
WIND SPEED (U) WAS 0.31 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
10	100	54.0	69	6.88E-10	1.89E-05
11	100	60.0	69	3.06E-10	8.42E-06
12	100	66.0	69	3.57E-10	9.84E-06
13	100	72.0	69	2.10E-10	5.80E-06
14	100	78.0	69	2.76E-10	7.59E-06
15	100	84.0	69	2.39E-10	6.57E-06
16	100	90.0	69	3.06E-10	8.42E-06
18	100	102.0	69	4.64E-10	1.28E-05
19	100	108.0	69	4.67E-10	1.29E-05
20	100	114.0	69	6.86E-10	1.89E-05
21	100	120.0	69	6.52E-10	1.79E-05
22	100	126.0	69	7.42E-10	2.04E-05
23	100	132.0	69	6.29E-10	1.73E-05
24	100	138.0	69	5.33E-10	1.47E-05
25	100	144.0	70	4.39E-10	1.23E-05
26	100	150.0	70	3.64E-10	1.02E-05
27	100	156.0	70	3.91E-10	1.09E-05
28	100	162.0	70	3.64E-10	1.02E-05
29	100	168.0	70	3.46E-10	9.67E-06
30	100	174.0	70	3.11E-10	8.69E-06
32	100	186.0	70	2.35E-10	6.55E-06
33	100	192.0	70	2.18E-10	6.10E-06

TEST #3   8/5/74 09:22-10:22 EDT   SF6
SOURCE STRENGTH (Q) WAS 0.0785 GM/SEC
WIND SPEED (U) WAS 0.31 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
34	100	198.0	70	1.38E-10	3.86E-06
35	100	204.0	70	7.50E-11	2.09E-06
78	200	102.0	69	9.72E-11	2.68E-06
79	200	108.0	69	1.37E-10	3.78E-06
80	200	114.0	69	2.75E-10	7.57E-06
81	200	120.0	69	5.08E-10	1.40E-05
82	200	126.0	69	5.47E-10	1.51E-05
83	200	132.0	69	3.01E-10	8.29E-06
84	200	138.0	69	5.65E-10	1.56E-05
85	200	144.0	70	3.47E-10	9.70E-06
86	200	150.0	70	2.61E-10	7.29E-06
87	200	156.0	70	1.75E-10	4.89E-06
89	200	168.0	70	1.35E-10	3.78E-06
90	200	174.0	70	4.28E-11	1.19E-06
91	200	180.0	70	7.55E-11	2.11E-06
92	200	186.0	70	3.00E-11	8.38E-07
93	200	192.0	70	3.72E-11	1.04E-06
94	200	198.0	70	1.76E-11	4.92E-07
97	200	216.0	70	2.62E-11	7.30E-07
98	200	222.0	70	1.24E-11	3.48E-07
99	200	228.0	70	7.92E-12	2.21E-07
152	400	186.0	70	2.13E-11	5.94E-07
154	400	198.0	70	2.34E-11	6.53E-07
155	400	204.0	70	1.56E-11	4.37E-07
156	400	210.0	70	1.40E-11	3.91E-07
157	400	216.0	70	6.67E-12	1.86E-07
158	400	222.0	70	2.06E-11	5.74E-07
159	400	228.0	70	1.24E-11	3.45E-07
160	400	234.0	70	1.27E-11	3.55E-07
161	400	240.0	70	8.84E-12	2.47E-07
162	400	246.0	70	1.16E-11	3.23E-07
166	400	270.0	70	2.26E-11	6.32E-07
168	400	282.0	70	1.13E-11	3.16E-07
169	400	288.0	70	5.86E-12	1.64E-07
170	400	294.0	70	1.01E-11	2.81E-07
171	400	300.0	70	6.06E-12	1.69E-07
172	400	306.0	70	1.01E-11	2.83E-07
204	697	104.0	45	6.61E-12	1.20E-07
205	1036	130.0	48	5.35E-11	1.03E-06
208	782	78.0	46	1.65E-11	3.05E-07

TEST #3   8/5/74 09:22-10:22 EDT   SF6
SOURCE STRENGTH (Q) WAS 0.0785 GM/SEC
WIND SPEED (U) WAS 0.31 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
209	878	100.5	45	1.62E-11	2.93E-07
210	1170	129.0	112	4.96E-11	2.20E-06
211	1324	128.0	115	7.11E-11	3.24E-06
212	1373	146.0	120	6.01E-11	2.84E-06
213	775	205.0	117	1.85E-11	8.57E-07
215	559	241.0	136	1.27E-11	6.86E-07

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
801	183	157.8	283	1.68E-09	3.96E-05
802	143	145.1	304	1.40E-09	3.31E-05
804	266	135.9	301	1.14E-09	2.69E-05
805	871	152.5	341	3.18E-10	7.51E-06
806	1381	142.2	380	1.35E-10	3.19E-06
808	2114	154.2	396	1.90E-11	4.49E-07
809	1254	144.7	380	1.31E-10	3.09E-06
810	270	163.0	301	6.12E-10	1.44E-05

TEST #4   8/6/74   07:36-08:36 EDT   SF6
SOURCE STRENGTH (Q) WAS 0.0761 GM/SEC
WIND SPEED (U) WAS 0.15 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	86	1.48E-09	2.53E-05
2	100	6.0	86	8.81E-10	1.50E-05
3	100	12.0	86	1.64E-09	2.79E-05
4	100	18.0	86	4.82E-09	8.23E-05
5	100	24.0	86	5.73E-09	9.79E-05
6	100	30.0	86	5.26E-09	8.99E-05
7	100	36.0	86	5.14E-09	8.78E-05
8	100	42.0	86	7.11E-09	1.21E-04
9	100	48.0	86	6.01E-09	1.03E-04
10	100	54.0	90	5.49E-09	9.80E-05
11	100	60.0	90	5.47E-09	9.77E-05
12	100	66.0	90	6.75E-09	1.21E-04
13	100	72.0	90	4.68E-09	8.36E-05
14	100	78.0	90	3.56E-09	6.36E-05
15	100	84.0	90	4.51E-09	8.05E-05
16	100	90.0	90	3.78E-09	6.76E-05
17	100	96.0	90	3.22E-09	5.76E-05
18	100	102.0	90	3.87E-09	6.92E-05
19	100	108.0	90	3.65E-09	6.52E-05
20	100	114.0	90	3.59E-09	6.41E-05
21	100	120.0	90	4.02E-09	7.17E-05
22	100	126.0	90	2.75E-09	4.91E-05
23	100	132.0	90	2.60E-09	4.65E-05
24	100	138.0	90	2.65E-09	4.73E-05
25	100	144.0	90	3.06E-09	5.40E-05
26	100	150.0	90	2.41E-09	4.26E-05
27	100	156.0	90	1.82E-09	3.21E-05
28	100	162.0	90	1.59E-09	2.80E-05
30	100	174.0	90	1.07E-09	1.88E-05
31	100	180.0	90	9.28E-10	1.64E-05
32	100	186.0	90	8.18E-10	1.45E-05
33	100	192.0	90	8.10E-10	1.43E-05
34	100	198.0	90	7.76E-10	1.37E-05
35	100	204.0	90	8.72E-10	1.54E-05
36	100	210.0	90	6.56E-10	1.16E-05
37	100	216.0	90	6.64E-10	1.17E-05
38	100	222.0	90	6.21E-10	1.10E-05
39	100	228.0	90	3.96E-10	7.00E-06
42	100	246.0	86	2.81E-10	4.79E-06
43	100	252.0	86	2.70E-10	4.61E-06

TEST #4 8/6/74 07:36-08:36 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0761 GM/SEC
WIND SPEED (U) WAS 0.15 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
44	100	258.0	86	2.77E-10	4.73E-06
45	100	264.0	86	1.42E-10	2.43E-06
46	100	270.0	86	2.27E-10	3.87E-06
47	100	276.0	86	2.55E-10	4.36E-06
48	100	282.0	86	3.42E-10	5.83E-06
49	100	288.0	86	2.46E-10	4.20E-06
50	100	294.0	86	4.32E-10	7.38E-06
51	100	300.0	86	5.86E-10	1.00E-05
53	100	312.0	86	4.47E-10	7.64E-06
55	100	324.0	86	1.26E-09	2.16E-05
56	100	330.0	86	1.95E-09	3.33E-05
57	100	336.0	86	2.58E-09	4.40E-05
58	100	342.0	86	3.10E-09	5.30E-05
59	100	348.0	86	3.38E-09	5.78E-05
61	200	0.0	83	8.16E-10	1.35E-05
62	200	6.0	83	9.28E-10	1.53E-05
63	200	12.0	83	9.75E-10	1.61E-05
64	200	18.0	83	1.14E-09	1.88E-05
65	200	24.0	83	1.52E-09	2.50E-05
66	200	30.0	83	1.89E-09	3.11E-05
67	200	36.0	83	3.56E-09	5.87E-05
68	200	42.0	83	3.22E-09	5.30E-05
69	200	48.0	83	5.77E-09	9.51E-05
70	200	54.0	85	3.74E-09	6.32E-05
71	200	60.0	85	2.93E-09	4.94E-05
72	200	66.0	85	2.71E-09	4.57E-05
73	200	72.0	85	3.52E-09	5.95E-05
74	200	78.0	85	2.40E-09	4.04E-05
75	200	84.0	85	2.19E-09	3.70E-05
76	200	90.0	85	1.75E-09	2.94E-05
78	200	102.0	85	2.36E-09	3.98E-05
79	200	108.0	85	2.81E-09	4.74E-05
80	200	114.0	85	2.90E-09	4.90E-05
81	200	120.0	85	2.04E-09	3.44E-05
82	200	126.0	85	3.16E-09	5.34E-05
83	200	132.0	85	2.05E-09	3.47E-05
84	200	138.0	85	2.25E-09	3.79E-05
85	200	144.0	85	4.20E-10	7.08E-06
86	200	150.0	85	5.28E-10	8.91E-06
87	200	156.0	85	7.49E-10	1.26E-05

TEST #4 8/6/74 07:36-08:36 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0761 GM/SEC
WIND SPEED (U) WAS 0.15 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
88	200	162.0	85	8.52E-10	1.44E-05
89	200	168.0	85	1.20E-09	2.02E-05
90	200	174.0	85	1.39E-09	2.35E-05
91	200	180.0	85	1.10E-09	1.85E-05
92	200	186.0	85	1.22E-09	2.06E-05
93	200	192.0	85	8.98E-10	1.52E-05
94	200	198.0	85	9.43E-10	1.59E-05
95	200	204.0	85	6.56E-10	1.11E-05
96	200	210.0	85	7.04E-10	1.19E-05
97	200	216.0	85	6.17E-10	1.04E-05
98	200	222.0	85	6.20E-10	1.05E-05
99	200	228.0	85	4.92E-10	8.31E-06
115	200	324.0	83	1.57E-10	2.59E-06
116	200	330.0	83	1.85E-10	3.06E-06
117	200	336.0	83	1.97E-10	3.25E-06
118	200	342.0	83	6.02E-10	9.92E-06
119	200	348.0	83	3.84E-10	6.33E-06
120	200	354.0	83	5.27E-10	8.68E-06
123	400	12.0	60	1.26E-10	1.48E-06
124	400	18.0	60	1.80E-10	2.12E-06
125	400	24.0	60	2.54E-10	2.99E-06
126	400	30.0	60	2.16E-10	2.55E-06
127	400	36.0	60	1.93E-10	2.27E-06
128	400	42.0	60	2.88E-10	3.39E-06
129	400	48.0	60	9.85E-10	1.16E-05
130	400	54.0	60	1.11E-09	1.30E-05
131	400	60.0	60	6.81E-10	8.02E-06
132	400	66.0	60	5.97E-10	7.03E-06
133	400	72.0	60	5.97E-10	7.03E-06
134	400	78.0	60	5.64E-10	6.64E-06
135	400	84.0	60	4.47E-10	5.27E-06
136	400	90.0	60	1.90E-10	2.24E-06
152	400	186.0	73	9.29E-11	1.35E-06
153	400	192.0	73	3.39E-10	4.92E-06
154	400	198.0	73	4.19E-10	6.08E-06
155	400	204.0	73	4.56E-10	6.62E-06
156	400	210.0	73	4.15E-10	6.02E-06
157	400	216.0	73	3.31E-10	4.81E-06
158	400	222.0	73	3.71E-10	5.38E-06
159	400	228.0	73	3.40E-10	4.93E-06

TEST #4 8/6/74 07:36-08:36 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0761 GM/SEC
WIND SPEED (U) WAS 0.15 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
160	400	234.0	73	3.37E-10	4.89E-06
161	400	240.0	73	4.20E-10	6.11E-06
162	400	246.0	73	2.76E-10	4.01E-06
163	400	252.0	73	2.17E-10	3.15E-06
165	400	264.0	73	2.33E-10	3.38E-06
166	400	270.0	73	2.55E-10	3.71E-06
167	400	276.0	73	1.65E-10	2.39E-06
168	400	282.0	73	1.78E-10	2.59E-06
169	400	288.0	73	1.45E-10	2.11E-06
170	400	294.0	73	1.45E-10	2.10E-06
171	400	300.0	73	1.51E-10	2.19E-06
172	400	306.0	73	1.34E-10	1.94E-06

TEST #5 8/7/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0765 GM/SEC
WIND SPEED (U) WAS 0.26 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	15	8.31E-10	4.22E-06
4	100	18.0	15	9.89E-10	5.02E-06
5	100	24.0	15	7.51E-10	3.81E-06
6	100	30.0	15	8.23E-10	4.18E-06
7	100	36.0	15	5.00E-10	2.54E-06
8	100	42.0	15	5.84E-10	2.97E-06
9	100	48.0	15	5.61E-10	2.85E-06
10	100	54.0	69	2.64E-10	6.25E-06
11	100	60.0	69	3.75E-10	8.87E-06
13	100	72.0	69	3.26E-10	7.72E-06
15	100	84.0	69	3.44E-10	8.14E-06
16	100	90.0	69	3.68E-10	8.73E-06
17	100	96.0	69	2.85E-10	6.74E-06

TEST #5 8/7/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0765 GM/SEC
WIND SPEED (U) WAS 0.26 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
18	100	102.0	69	3.70E-10	8.76E-06
19	100	108.0	69	2.66E-10	6.31E-06
20	100	114.0	69	3.58E-10	8.47E-06
21	100	120.0	69	3.17E-10	7.51E-06
22	100	126.0	69	3.83E-10	9.06E-06
23	100	132.0	69	6.18E-10	1.46E-05
25	100	144.0	85	1.00E-09	2.92E-05
26	100	150.0	85	1.04E-09	3.02E-05
27	100	156.0	85	9.59E-10	2.79E-05
28	100	162.0	85	1.31E-09	3.80E-05
29	100	168.0	85	2.04E-09	5.93E-05
30	100	174.0	85	2.27E-09	6.61E-05
31	100	180.0	85	2.31E-09	6.72E-05
32	100	186.0	85	3.02E-09	8.77E-05
33	100	192.0	85	3.10E-09	9.01E-05
34	100	198.0	85	3.18E-09	9.26E-05
35	100	204.0	85	3.25E-09	9.47E-05
37	100	216.0	85	3.32E-09	9.66E-05
38	100	222.0	85	2.70E-09	7.87E-05
41	100	240.0	85	3.79E-09	1.10E-04
42	100	246.0	85	4.15E-09	1.21E-04
43	100	252.0	85	4.25E-09	1.24E-04
44	100	258.0	85	3.52E-09	1.02E-04
45	100	264.0	85	3.15E-09	9.15E-05
46	100	270.0	85	2.85E-09	8.28E-05
47	100	276.0	85	2.26E-09	6.58E-05
48	100	282.0	85	2.17E-09	6.33E-05
49	100	288.0	85	1.53E-09	4.45E-05
50	100	294.0	85	1.08E-09	3.14E-05
51	100	300.0	85	6.89E-10	2.00E-05
52	100	306.0	85	6.77E-10	1.97E-05
53	100	312.0	85	7.55E-10	2.20E-05
55	100	324.0	15	3.92E-10	1.99E-06
56	100	330.0	15	1.17E-09	5.93E-06
57	100	336.0	15	1.90E-09	9.66E-06
58	100	342.0	15	2.49E-09	1.26E-05
85	200	144.0	86	1.72E-10	5.07E-06
87	200	156.0	86	3.23E-10	9.51E-06
88	200	162.0	86	2.71E-10	7.97E-06
89	200	168.0	86	3.38E-10	9.94E-06

TEST #5   8/7/74   07:15-08:15 EDT   SF6
SOURCE STRENGTH (Q) WAS 0.0765 GM/SEC
WIND SPEED (U) WAS 0.26 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
90	200	174.0	86	4.64E-10	1.36E-05
91	200	180.0	86	4.53E-10	1.33E-05
92	200	186.0	86	5.68E-10	1.67E-05
93	200	192.0	86	1.04E-09	3.07E-05
94	200	198.0	86	9.04E-10	2.66E-05
95	200	204.0	86	7.81E-10	2.30E-05
96	200	210.0	86	1.27E-09	3.73E-05
97	200	216.0	86	8.63E-10	2.54E-05
98	200	222.0	86	1.92E-09	5.65E-05
99	200	228.0	86	1.65E-09	4.85E-05
100	200	234.0	86	1.80E-09	5.28E-05
101	200	240.0	86	1.61E-09	4.73E-05
102	200	246.0	86	2.37E-09	6.97E-05
103	200	252.0	86	1.60E-09	4.71E-05
104	200	258.0	86	1.21E-09	3.57E-05
105	200	264.0	86	1.02E-09	3.01E-05
106	200	270.0	86	1.05E-09	3.10E-05
107	200	276.0	86	1.04E-09	3.06E-05
108	200	282.0	86	7.30E-10	2.15E-05
109	200	288.0	86	7.45E-10	2.19E-05
111	200	300.0	86	4.99E-10	1.47E-05
112	200	306.0	86	6.28E-10	1.85E-05
113	200	312.0	86	4.03E-10	1.19E-05
114	200	318.0	86	5.59E-10	1.65E-05
153	400	192.0	86	1.46E-10	4.30E-06
154	400	198.0	86	1.88E-10	5.53E-06
155	400	204.0	86	2.36E-10	6.95E-06
156	400	210.0	86	2.42E-10	7.12E-06
157	400	216.0	86	4.69E-10	1.38E-05
158	400	222.0	86	4.69E-10	1.38E-05
159	400	228.0	86	7.21E-10	2.12E-05
160	400	234.0	86	1.12E-09	3.29E-05
161	400	240.0	86	7.32E-10	2.16E-05
162	400	246.0	86	4.92E-10	1.45E-05
163	400	252.0	86	7.05E-10	2.07E-05
164	400	258.0	86	8.54E-10	2.51E-05
165	400	264.0	86	7.82E-10	2.30E-05
166	400	270.0	86	7.29E-10	2.15E-05
167	400	276.0	86	7.30E-10	2.15E-05
168	400	282.0	86	7.75E-10	2.28E-05

TEST #5 8/7/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0765 GM/SEC
WIND SPEED (U) WAS 0.26 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
169	400	288.0	86	7.59E-10	2.23E-05
170	400	294.0	86	7.55E-10	2.22E-05
172	400	306.0	86	1.39E-10	4.10E-06
212	1373	146.0	103	5.45E-11	1.92E-06
213	775	205.0	116	4.67E-10	1.85E-05
214	770	236.0	98	4.49E-10	1.50E-05
215	559	241.0	99	8.36E-10	2.83E-05
216	797	292.5	101	5.63E-10	1.94E-05
217	683	317.0	99	5.40E-10	1.83E-05
219	2663	331.0	120	1.74E-10	7.06E-06
220	2599	327.0	120	2.10E-10	8.52E-06
221	1987	336.0	120	2.32E-10	9.42E-06
222	1962	332.0	120	3.39E-10	1.38E-05

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
801	210	231.1	265	3.50E-09	7.11E-05
802	589	247.4	274	1.71E-09	3.48E-05
803	112	216.8	295	5.59E-09	1.13E-04
806	605	248.8	280	2.05E-09	4.16E-05
807	263	169.1	289	3.61E-09	7.33E-05
809	786	204.8	277	1.39E-09	2.82E-05
810	300	231.4	268	4.62E-09	9.37E-05

TEST #6 8/8/74 06:45-07:45 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0781 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	55	5.47E-10	8.99E-06
2	100	6.0	55	4.12E-10	6.77E-06
3	100	12.0	55	5.56E-10	9.13E-06
4	100	18.0	55	5.20E-10	8.54E-06
5	100	24.0	55	6.04E-10	9.93E-06
6	100	30.0	55	8.98E-10	1.48E-05
7	100	36.0	55	1.57E-09	2.58E-05
10	100	54.0	61	2.71E-09	4.92E-05
11	100	60.0	61	2.14E-09	3.89E-05
12	100	66.0	61	1.76E-09	3.20E-05
14	100	78.0	61	7.02E-10	1.28E-05
15	100	84.0	61	9.79E-10	1.78E-05
18	100	102.0	61	6.49E-10	1.18E-05
19	100	108.0	61	1.78E-10	3.23E-06
20	100	114.0	61	5.17E-10	9.41E-06
21	100	120.0	61	2.97E-10	5.41E-06
22	100	126.0	61	1.95E-10	3.55E-06
23	100	132.0	61	2.25E-10	4.09E-06
24	100	138.0	61	2.56E-10	4.66E-06
25	100	144.0	73	1.17E-10	2.54E-06
26	100	150.0	73	1.20E-10	2.62E-06
27	100	156.0	73	8.84E-11	1.92E-06
28	100	162.0	73	2.42E-10	5.25E-06
29	100	168.0	73	7.17E-10	1.56E-05
31	100	180.0	73	1.78E-09	3.87E-05
32	100	186.0	73	1.92E-09	4.16E-05
33	100	192.0	73	1.98E-09	4.31E-05
34	100	198.0	73	1.87E-09	4.06E-05
35	100	204.0	73	1.60E-09	3.48E-05
36	100	210.0	73	2.25E-09	4.88E-05
37	100	216.0	73	2.63E-09	5.71E-05
38	100	222.0	73	4.46E-09	9.68E-05
39	100	228.0	73	4.75E-09	1.03E-04
42	100	246.0	73	5.08E-09	1.10E-04
43	100	252.0	73	3.96E-09	8.60E-05
44	100	258.0	73	3.29E-09	7.15E-05
45	100	264.0	73	3.90E-09	8.46E-05
46	100	270.0	73	4.40E-09	9.55E-05
47	100	276.0	73	2.21E-09	4.79E-05
48	100	282.0	73	1.75E-09	3.80E-05

TEST #6 8/8/74 06:45-07:45 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0781 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
49	100	288.0	73	8.14E-10	1.77E-05
50	100	294.0	73	5.70E-10	1.24E-05
51	100	300.0	73	5.71E-10	1.24E-05
53	100	312.0	73	4.15E-10	9.02E-06
55	100	324.0	55	2.14E-10	3.51E-06
56	100	330.0	55	4.21E-10	6.91E-06
57	100	336.0	55	3.88E-10	6.38E-06
58	100	342.0	55	5.09E-10	8.36E-06
59	100	348.0	55	7.83E-10	1.29E-05
61	200	0.0	55	2.00E-10	3.28E-06
62	200	6.0	55	2.64E-10	4.34E-06
63	200	12.0	55	2.63E-10	4.32E-06
64	200	18.0	55	3.02E-10	4.97E-06
65	200	24.0	55	4.09E-10	6.72E-06
66	200	30.0	55	5.66E-10	9.29E-06
67	200	36.0	55	1.11E-09	1.83E-05
68	200	42.0	55	8.49E-10	1.39E-05
70	200	54.0	61	1.80E-09	3.27E-05
71	200	60.0	61	1.12E-09	2.03E-05
74	200	78.0	61	7.91E-10	1.44E-05
76	200	90.0	61	1.05E-10	1.90E-06
77	200	96.0	61	7.71E-11	1.40E-06
79	200	108.0	61	4.86E-11	8.83E-07
81	200	120.0	61	4.21E-11	7.65E-07
83	200	132.0	61	2.09E-11	3.80E-07
88	200	162.0	71	3.28E-11	6.92E-07
92	200	186.0	71	2.13E-11	4.50E-07
94	200	198.0	71	1.50E-11	3.18E-07
95	200	204.0	71	2.90E-11	6.13E-07
96	200	210.0	71	3.72E-11	7.86E-07
98	200	222.0	71	1.72E-10	3.64E-06
99	200	228.0	71	6.13E-10	1.30E-05
100	200	234.0	71	4.52E-10	9.54E-06
101	200	240.0	71	6.29E-10	1.33E-05
102	200	246.0	71	5.05E-10	1.07E-05
104	200	258.0	71	3.49E-09	7.37E-05
105	200	264.0	71	1.51E-09	3.18E-05
106	200	270.0	71	1.64E-10	3.46E-06
107	200	276.0	71	9.81E-11	2.07E-06
108	200	282.0	71	1.76E-10	3.72E-06

TEST #6 8/8/74 06:45-07:45 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0781 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
111	200	300.0	71	3.34E-11	7.05E-07
113	200	312.0	71	2.93E-11	6.18E-07
116	200	330.0	55	3.25E-11	5.34E-07
118	200	342.0	55	1.22E-10	2.00E-06
120	200	354.0	55	1.54E-10	2.53E-06
126	400	30.0	55	6.59E-11	1.08E-06
127	400	36.0	55	9.50E-11	1.56E-06
130	400	54.0	55	1.52E-10	2.50E-06
131	400	60.0	55	1.03E-10	1.69E-06
132	400	66.0	55	7.50E-11	1.23E-06
133	400	72.0	55	4.48E-11	7.36E-07
134	400	78.0	55	4.06E-11	6.68E-07
152	400	186.0	70	1.37E-11	2.86E-07
154	400	198.0	70	8.04E-12	1.68E-07
156	400	210.0	70	2.50E-11	5.20E-07
158	400	222.0	70	9.36E-12	1.95E-07
160	400	234.0	70	9.55E-12	1.99E-07
162	400	246.0	70	3.30E-11	6.87E-07
164	400	258.0	70	3.74E-11	7.78E-07
166	400	270.0	70	2.88E-11	6.00E-07
167	400	276.0	70	1.77E-11	3.69E-07
170	400	294.0	70	2.90E-11	6.04E-07
172	400	306.0	70	2.95E-11	6.15E-07
206	916	56.5	121	2.49E-11	8.91E-07
208	782	78.0	110	2.44E-11	7.96E-07
210	1170	129.0	105	1.71E-11	5.31E-07
212	1373	146.0	103	1.48E-11	4.51E-07
214	770	236.0	97	7.18E-11	2.06E-06

TEST #6 8/8/74 06:45-07:45 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0781 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
802	118	51.7	301	8.10E-09	1.43E-04
803	690	60.8	292	3.87E-10	6.82E-06
804	360	52.4	335	3.74E-09	6.59E-05
805	1202	52.3	365	3.85E-10	6.78E-06
806	945	55.4	280	2.49E-10	4.39E-06
807	278	50.8	316	3.20E-09	5.63E-05
808	1506	55.9	323	3.62E-10	6.37E-06
809	3100	45.8	323	1.20E-10	2.12E-06

TEST #7 8/9/74 07:11-08:11 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0786 GM/SEC
WIND SPEED (U) WAS 0.32 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	76	4.04E-09	1.26E-04
2	100	6.0	76	5.57E-09	1.74E-04
3	100	12.0	76	4.43E-09	1.38E-04
4	100	18.0	76	4.06E-09	1.27E-04
5	100	24.0	76	3.65E-09	1.14E-04
6	100	30.0	76	4.06E-09	1.27E-04
7	100	36.0	76	3.15E-09	9.83E-05
9	100	48.0	76	2.76E-09	8.62E-05
10	100	54.0	77	4.74E-09	1.50E-04
11	100	60.0	77	2.98E-09	9.43E-05
12	100	66.0	77	2.98E-09	9.42E-05
13	100	72.0	77	2.11E-09	6.68E-05
14	100	78.0	77	2.38E-09	7.53E-05
15	100	84.0	77	2.53E-09	7.99E-05
16	100	90.0	77	8.21E-10	2.60E-05
17	100	96.0	77	3.00E-10	9.49E-06
18	100	102.0	77	1.32E-10	4.17E-06

TEST #7 8/9/74 07:11-08:11 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0786 GM/SEC
WIND SPEED (U) WAS 0.32 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
19	100	108.0	77	4.91E-11	1.55E-06
20	100	114.0	77	2.24E-11	7.09E-07
21	100	120.0	77	5.24E-11	1.66E-06
22	100	126.0	77	9.12E-11	2.88E-06
23	100	132.0	77	8.90E-11	2.81E-06
24	100	138.0	77	7.16E-11	2.26E-06
25	100	144.0	79	5.28E-11	1.71E-06
26	100	150.0	79	2.69E-11	8.73E-07
28	100	162.0	79	3.39E-11	1.10E-06
29	100	168.0	79	1.81E-11	5.86E-07
30	100	174.0	79	2.35E-11	7.63E-07
31	100	180.0	79	2.29E-11	7.44E-07
32	100	186.0	79	4.57E-11	1.48E-06
38	100	222.0	79	1.71E-10	5.53E-06
39	100	228.0	79	9.72E-11	3.15E-06
41	100	240.0	79	7.61E-10	2.47E-05
42	100	246.0	79	1.06E-09	3.44E-05
44	100	258.0	79	1.54E-09	4.99E-05
45	100	264.0	79	2.61E-09	8.47E-05
46	100	270.0	79	3.32E-09	1.08E-04
47	100	276.0	79	4.04E-09	1.31E-04
48	100	282.0	79	6.22E-09	2.02E-04
49	100	288.0	79	5.37E-09	1.74E-04
50	100	294.0	79	4.63E-09	1.50E-04
51	100	300.0	79	2.76E-09	8.94E-05
55	100	324.0	76	3.92E-09	1.22E-04
57	100	336.0	76	2.76E-09	8.60E-05
59	100	348.0	76	2.32E-09	7.23E-05
60	100	354.0	76	3.19E-09	9.97E-05
61	200	0.0	76	7.04E-10	2.20E-05
62	200	6.0	76	7.40E-10	2.31E-05
63	200	12.0	76	6.71E-10	2.09E-05
64	200	18.0	76	8.74E-10	2.73E-05
65	200	24.0	76	6.98E-10	2.18E-05
66	200	30.0	76	6.23E-10	1.94E-05
67	200	36.0	76	7.21E-10	2.25E-05
68	200	42.0	76	5.97E-10	1.86E-05
69	200	48.0	76	4.79E-10	1.49E-05
72	200	66.0	77	4.10E-10	1.29E-05
73	200	72.0	77	1.96E-10	6.20E-06

TEST #7 8/9/74 07:11-08:11 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0786 GM/SEC
WIND SPEED (U) WAS 0.32 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
74	200	78.0	77	8.32E-11	2.63E-06
75	200	84.0	77	9.15E-11	2.89E-06
77	200	96.0	77	2.02E-11	6.39E-07
90	200	174.0	79	7.87E-12	2.55E-07
102	200	246.0	79	8.57E-12	2.78E-07
103	200	252.0	79	1.97E-11	6.39E-07
105	200	264.0	79	2.52E-11	8.18E-07
106	200	270.0	79	1.43E-10	4.63E-06
107	200	276.0	79	2.54E-10	8.25E-06
108	200	282.0	79	2.22E-10	7.21E-06
109	200	288.0	79	1.31E-10	4.25E-06
111	200	300.0	79	3.88E-10	1.26E-05
112	200	306.0	79	1.17E-09	3.79E-05
113	200	312.0	79	6.83E-10	2.21E-05
114	200	318.0	79	6.44E-10	2.09E-05
116	200	330.0	76	1.18E-09	3.68E-05
118	200	342.0	76	1.30E-09	4.05E-05
120	200	354.0	76	9.69E-10	3.02E-05
123	400	12.0	71	1.17E-10	3.42E-06
124	400	18.0	71	2.25E-10	6.56E-06
125	400	24.0	71	2.66E-10	7.75E-06
126	400	30.0	71	2.56E-10	7.46E-06
127	400	36.0	71	2.72E-10	7.94E-06
128	400	42.0	71	1.93E-10	5.62E-06
129	400	48.0	71	5.39E-11	1.57E-06
130	400	54.0	71	2.91E-11	8.50E-07
131	400	60.0	71	5.08E-11	1.48E-06
135	400	84.0	71	6.98E-12	2.04E-07
163	400	252.0	77	2.47E-11	7.82E-07
165	400	264.0	77	7.92E-12	2.50E-07
167	400	276.0	77	1.57E-11	4.96E-07
169	400	288.0	77	1.04E-11	3.30E-07
214	770	236.0	121	3.30E-11	1.63E-06
215	559	241.0	129	9.08E-12	4.79E-07
218	885	324.0	154	1.63E-11	1.02E-06

TEST #7 8/9/74 07:11-08:11 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0786 GM/SEC
WIND SPEED (U) WAS 0.32 M/SEC

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
802	394	34.3	313	2.22E-10	5.39E-06
805	733	58.0	304	6.32E-10	1.54E-05
806	594	58.7	310	2.83E-10	6.89E-06
807	430	26.2	316	4.56E-10	1.11E-05
808	1145	45.0	298	8.12E-10	1.98E-05
809	1131	31.5	298	2.16E-10	5.25E-06
810	243	27.7	301	5.52E-10	1.34E-05
811	184	356.7	316	8.32E-10	2.02E-05

TEST #8 8/10/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0742 GM/SEC
WIND SPEED (U) WAS 0.34 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	71	2.44E-09	8.02E-05
2	100	6.0	71	1.97E-09	6.48E-05
3	100	12.0	71	1.88E-09	6.18E-05
4	100	18.0	71	1.91E-09	6.28E-05
5	100	24.0	71	1.79E-09	5.87E-05
6	100	30.0	71	1.83E-09	6.03E-05
7	100	36.0	71	1.84E-09	6.05E-05
8	100	42.0	71	1.37E-09	4.51E-05
9	100	48.0	71	2.14E-09	7.02E-05
10	100	54.0	70	1.66E-09	5.39E-05
11	100	60.0	70	1.25E-09	4.04E-05
12	100	66.0	70	1.73E-09	5.59E-05
13	100	72.0	70	1.07E-09	3.47E-05
14	100	78.0	70	1.00E-09	3.24E-05
15	100	84.0	70	1.63E-09	5.27E-05
16	100	90.0	70	1.11E-09	3.61E-05
17	100	96.0	70	1.03E-09	3.34E-05

TEST #8 8/10/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0742 GM/SEC
WIND SPEED (U) WAS 0.34 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
18	100	102.0	70	1.74E-09	5.64E-05
19	100	108.0	70	1.54E-09	5.01E-05
20	100	114.0	70	1.66E-09	5.37E-05
21	100	120.0	70	1.34E-09	4.33E-05
23	100	132.0	70	1.15E-09	3.73E-05
25	100	144.0	60	1.42E-09	3.96E-05
26	100	150.0	60	3.03E-09	8.43E-05
28	100	162.0	60	1.51E-09	4.20E-05
29	100	168.0	60	1.88E-09	5.22E-05
30	100	174.0	60	2.45E-09	6.83E-05
31	100	180.0	60	3.38E-09	9.42E-05
33	100	192.0	60	2.03E-09	5.64E-05
35	100	204.0	60	1.64E-09	4.58E-05
36	100	210.0	60	2.11E-09	5.89E-05
37	100	216.0	60	2.15E-09	5.99E-05
38	100	222.0	60	1.52E-09	4.24E-05
39	100	228.0	60	1.68E-09	4.67E-05
41	100	240.0	58	1.61E-09	4.33E-05
42	100	246.0	58	1.47E-09	3.95E-05
44	100	258.0	58	1.47E-09	3.95E-05
45	100	264.0	58	1.02E-09	2.74E-05
46	100	270.0	58	1.31E-09	3.54E-05
47	100	276.0	58	1.64E-09	4.42E-05
48	100	282.0	58	1.14E-09	3.07E-05
50	100	294.0	58	6.78E-10	1.83E-05
51	100	300.0	58	6.20E-10	1.67E-05
53	100	312.0	58	3.29E-10	8.86E-06
55	100	324.0	71	2.98E-10	9.80E-06
56	100	330.0	71	3.10E-10	1.02E-05
57	100	336.0	71	2.82E-10	9.27E-06
58	100	342.0	71	3.22E-10	1.06E-05
59	100	348.0	71	3.37E-10	1.11E-05
60	100	354.0	71	2.24E-09	7.35E-05
61	200	0.0	71	7.01E-11	2.30E-06
62	200	6.0	71	2.15E-10	7.07E-06
63	200	12.0	71	2.06E-10	6.78E-06
64	200	18.0	71	3.92E-10	1.29E-05
65	200	24.0	71	3.63E-10	1.19E-05
66	200	30.0	71	4.90E-10	1.61E-05
67	200	36.0	71	7.06E-10	2.32E-05

TEST #8 8/10/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0742 GM/SEC
WIND SPEED (U) WAS 0.34 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
68	200	42.0	71	5.34E-10	1.75E-05
70	200	54.0	71	4.45E-10	1.46E-05
72	200	66.0	71	8.15E-10	2.68E-05
73	200	72.0	71	1.05E-09	3.46E-05
74	200	78.0	71	1.06E-09	3.48E-05
75	200	84.0	71	6.62E-10	2.17E-05
76	200	90.0	71	7.58E-10	2.49E-05
82	200	126.0	71	2.31E-10	7.59E-06
84	200	138.0	71	1.66E-10	5.44E-06
86	200	150.0	45	1.45E-10	2.98E-06
87	200	156.0	45	7.95E-11	1.63E-06
88	200	162.0	45	1.01E-10	2.07E-06
89	200	168.0	45	8.75E-11	1.80E-06
90	200	174.0	45	1.61E-10	3.30E-06
91	200	180.0	45	9.72E-11	2.00E-06
92	200	186.0	45	1.16E-10	2.37E-06
93	200	192.0	45	1.49E-10	3.06E-06
94	200	198.0	45	5.16E-11	1.06E-06
95	200	204.0	45	5.64E-11	1.16E-06
97	200	216.0	45	3.12E-10	6.41E-06
98	200	222.0	45	4.00E-10	8.22E-06
99	200	228.0	45	1.48E-10	3.04E-06
100	200	234.0	67	1.91E-10	5.93E-06
101	200	240.0	67	8.01E-11	2.49E-06
102	200	246.0	67	5.45E-11	1.69E-06
103	200	252.0	67	7.53E-11	2.34E-06
104	200	258.0	67	1.83E-10	5.67E-06
106	200	270.0	67	3.39E-10	1.05E-05
107	200	276.0	67	2.60E-10	8.06E-06
108	200	282.0	67	1.27E-10	3.93E-06
110	200	294.0	67	2.02E-10	6.26E-06
111	200	300.0	67	1.07E-10	3.32E-06
115	200	324.0	71	5.08E-11	1.67E-06
116	200	330.0	71	1.21E-10	3.97E-06
117	200	336.0	71	9.48E-11	3.12E-06
118	200	342.0	71	1.17E-10	3.84E-06
119	200	348.0	71	8.04E-11	2.64E-06
120	200	354.0	71	2.28E-10	7.49E-06
152	400	186.0	70	2.72E-11	8.82E-07
154	400	198.0	70	4.25E-11	1.38E-06

TEST #8 8/10/74 07:15-08:15 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0742 GM/SEC
WIND SPEED (U) WAS 0.34 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
155	400	204.0	70	6.73E-11	2.18E-06
156	400	210.0	70	6.00E-11	1.94E-06
157	400	216.0	70	5.48E-11	1.77E-06
159	400	228.0	70	1.48E-10	4.78E-06
160	400	234.0	70	1.21E-10	3.93E-06
161	400	240.0	70	7.89E-11	2.56E-06
162	400	246.0	70	1.00E-10	3.26E-06
163	400	252.0	70	1.17E-10	3.78E-06
164	400	258.0	70	1.06E-10	3.43E-06
165	400	264.0	70	8.22E-11	2.66E-06
166	400	270.0	70	1.46E-10	4.74E-06
167	400	276.0	70	1.85E-10	6.01E-06
168	400	282.0	70	1.82E-10	5.88E-06
169	400	288.0	70	1.29E-10	4.18E-06
170	400	294.0	70	1.46E-10	4.75E-06
171	400	300.0	70	1.39E-10	4.52E-06
172	400	306.0	70	1.11E-10	3.60E-06

TEST #9 8/11/74 06:25-07:25 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0756 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
10	100	54.0	53	3.78E-10	6.18E-06
11	100	60.0	53	3.53E-10	5.78E-06
12	100	66.0	53	3.69E-10	6.04E-06
13	100	72.0	53	2.90E-10	4.74E-06
14	100	78.0	53	3.73E-10	6.11E-06
15	100	84.0	53	3.96E-10	6.48E-06
16	100	90.0	53	3.34E-10	5.47E-06
17	100	96.0	53	3.41E-10	5.58E-06

TEST #9 8/11/74 06:25-07:25 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0756 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
19	100	108.0	53	3.30E-10	5.40E-06
20	100	114.0	53	3.25E-10	5.31E-06
21	100	120.0	53	3.34E-10	5.47E-06
22	100	126.0	53	3.11E-10	5.10E-06
23	100	132.0	53	3.06E-10	5.02E-06
24	100	138.0	53	3.53E-10	5.78E-06
25	100	144.0	73	3.43E-10	7.70E-06
26	100	150.0	73	5.04E-10	1.13E-05
29	100	168.0	73	1.10E-09	2.47E-05
31	100	180.0	73	1.80E-09	4.04E-05
32	100	186.0	73	1.75E-09	3.93E-05
33	100	192.0	73	2.21E-09	4.95E-05
34	100	198.0	73	2.11E-09	4.74E-05
35	100	204.0	73	4.02E-09	9.01E-05
36	100	210.0	73	4.19E-09	9.40E-05
37	100	216.0	73	5.78E-09	1.30E-04
38	100	222.0	73	5.74E-09	1.29E-04
39	100	228.0	73	8.55E-09	1.92E-04
41	100	240.0	73	5.84E-09	1.31E-04
42	100	246.0	73	5.77E-09	1.29E-04
44	100	258.0	73	5.92E-09	1.33E-04
45	100	264.0	73	6.46E-09	1.45E-04
46	100	270.0	73	6.07E-09	1.36E-04
47	100	276.0	73	8.98E-09	2.02E-04
48	100	282.0	73	6.34E-09	1.42E-04
50	100	294.0	73	5.49E-09	1.23E-04
51	100	300.0	73	3.33E-09	7.48E-05
52	100	306.0	73	2.77E-09	6.22E-05
53	100	312.0	73	1.37E-09	3.08E-05
70	200	54.0	33	3.60E-10	3.71E-06
71	200	60.0	33	3.17E-10	3.27E-06
72	200	66.0	33	3.64E-10	3.75E-06
73	200	72.0	33	3.16E-10	3.26E-06
74	200	78.0	33	3.37E-10	3.48E-06
76	200	90.0	33	2.49E-10	2.57E-06
77	200	96.0	33	2.93E-10	3.02E-06
79	200	108.0	33	3.25E-10	3.35E-06
81	200	120.0	33	2.80E-10	2.89E-06
84	200	138.0	33	2.58E-10	2.66E-06
86	200	150.0	97	2.62E-10	7.78E-06

TEST #9 8/11/74 06:25-07:25 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0756 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
87	200	156.0	97	4.10E-10	1.22E-05
88	200	162.0	97	4.97E-10	1.48E-05
89	200	168.0	97	4.96E-10	1.47E-05
90	200	174.0	97	3.43E-10	1.02E-05
91	200	180.0	97	6.52E-10	1.94E-05
92	200	186.0	97	3.99E-10	1.19E-05
94	200	198.0	97	7.13E-10	2.12E-05
96	200	210.0	97	1.29E-09	3.83E-05
97	200	216.0	97	1.32E-09	3.92E-05
99	200	228.0	97	1.24E-09	3.67E-05
101	200	240.0	98	1.25E-09	3.75E-05
102	200	246.0	98	1.14E-09	3.43E-05
104	200	258.0	98	1.72E-09	5.15E-05
107	200	276.0	98	2.88E-09	8.65E-05
108	200	282.0	98	2.12E-09	6.37E-05
111	200	300.0	98	2.77E-09	8.32E-05
112	200	306.0	98	2.25E-09	6.75E-05
113	200	312.0	98	1.06E-09	3.20E-05
114	200	318.0	98	9.08E-10	2.72E-05
152	400	186.0	135	2.56E-10	1.05E-05
153	400	192.0	135	2.55E-10	1.04E-05
154	400	198.0	135	3.07E-10	1.26E-05
155	400	204.0	135	4.35E-10	1.78E-05
156	400	210.0	135	5.30E-10	2.17E-05
157	400	216.0	135	4.88E-10	2.00E-05
158	400	222.0	135	4.89E-10	2.00E-05
159	400	228.0	135	8.34E-10	3.41E-05
160	400	234.0	135	7.20E-10	2.95E-05
161	400	240.0	135	7.20E-10	2.94E-05
162	400	246.0	135	6.36E-10	2.60E-05
163	400	252.0	135	5.81E-10	2.38E-05
164	400	258.0	135	7.33E-10	3.00E-05
165	400	264.0	135	6.42E-10	2.63E-05
166	400	270.0	135	6.50E-10	2.66E-05
167	400	276.0	135	5.76E-10	2.36E-05
168	400	282.0	135	5.00E-10	2.04E-05
169	400	288.0	135	6.36E-10	2.60E-05
170	400	294.0	135	5.55E-10	2.27E-05
171	400	300.0	135	5.26E-10	2.15E-05
172	400	306.0	135	6.19E-10	2.53E-05

TEST #9 8/11/74 06:25-07:25 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0756 GM/SEC
WIND SPEED (U) WAS 0.23 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
210	1170	129.0	54	2.41E-10	4.02E-06
211	1324	128.0	60	2.50E-10	4.55E-06
212	1373	146.0	65	5.99E-11	1.20E-06
213	775	205.0	120	2.60E-10	9.53E-06
214	770	236.0	150	3.27E-10	1.48E-05
215	559	241.0	133	1.21E-10	4.90E-06
216	797	292.5	176	1.56E-10	8.38E-06
217	683	317.0	165	5.15E-10	2.59E-05
218	885	324.0	165	4.65E-10	2.34E-05
219	2663	331.0	125	3.10E-10	1.18E-05
220	2599	327.0	123	2.90E-10	1.09E-05
222	1962	332.0	126	1.76E-10	6.78E-06

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
801	200	228.0	283	2.80E-09	5.09E-05
802	150	240.0	289	6.60E-09	1.20E-04
803	582	245.4	280	1.51E-09	2.74E-05
804	162	273.6	292	4.76E-09	8.65E-05
805	1028	350.8	298	3.13E-09	5.69E-05
806	610	292.2	292	1.84E-09	3.35E-05
807	1471	260.5	304	1.30E-09	2.36E-05
808	1962	333.8	256	7.16E-10	1.30E-05
809	1174	341.7	256	6.74E-10	1.23E-05
810	708	318.7	256	5.59E-10	1.02E-05
811	395	217.7	268	1.45E-09	2.64E-05
812	509	241.7	265	1.01E-09	1.84E-05
813	529	299.8	274	9.41E-10	1.71E-05
814	1739	338.5	254	5.79E-10	1.05E-05
815	1044	345.2	259	6.08E-10	1.10E-05
816	1043	351.0	240	6.90E-10	1.26E-05

TEST #10 8/12/74 18:22-19:22 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0789 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
25	100	144.0	67	1.05E-10	6.73E-06
26	100	150.0	67	1.26E-10	8.08E-06
27	100	156.0	67	1.49E-10	9.57E-06
28	100	162.0	67	1.10E-10	7.11E-06
29	100	168.0	67	1.24E-10	7.98E-06
30	100	174.0	67	2.77E-10	1.78E-05
31	100	180.0	67	6.56E-10	4.22E-05
32	100	186.0	67	1.03E-09	6.63E-05
33	100	192.0	67	2.63E-09	1.70E-04
34	100	198.0	67	2.94E-09	1.89E-04
35	100	204.0	67	2.72E-09	1.75E-04
36	100	210.0	67	4.11E-09	2.65E-04
37	100	216.0	67	3.10E-09	1.99E-04
38	100	222.0	67	2.30E-09	1.48E-04
39	100	228.0	67	1.71E-09	1.10E-04
41	100	240.0	67	1.10E-09	7.09E-05
42	100	246.0	67	9.19E-10	5.92E-05
44	100	258.0	67	2.96E-10	1.91E-05
45	100	264.0	67	1.99E-10	1.28E-05
46	100	270.0	67	1.50E-10	9.67E-06
47	100	276.0	67	1.31E-10	8.40E-06
48	100	282.0	67	9.98E-11	6.42E-06
49	100	288.0	67	9.65E-11	6.21E-06
50	100	294.0	67	1.29E-10	8.29E-06
51	100	300.0	67	7.89E-11	5.08E-06
52	100	306.0	67	2.75E-10	1.77E-05
53	100	312.0	67	9.34E-11	6.01E-06
85	200	144.0	70	6.71E-11	4.51E-06
86	200	150.0	70	9.64E-11	6.48E-06
87	200	156.0	70	6.27E-11	4.21E-06
88	200	162.0	70	9.15E-11	6.15E-06
89	200	168.0	70	1.19E-10	8.01E-06
90	200	174.0	70	8.99E-11	6.04E-06
91	200	180.0	70	4.27E-11	2.87E-06
92	200	186.0	70	9.09E-11	6.11E-06
93	200	192.0	70	1.84E-10	1.24E-05
95	200	204.0	70	1.43E-09	9.58E-05
96	200	210.0	70	1.52E-09	1.02E-04
97	200	216.0	70	4.06E-10	2.73E-05
98	200	222.0	70	2.63E-10	1.77E-05

TEST #10 8/12/74 18:22-19:22 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0789 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
99	200	228.0	70	1.39E-10	9.35E-06
100	200	234.0	70	8.33E-11	5.60E-06
101	200	240.0	70	1.21E-10	8.16E-06
102	200	246.0	70	1.02E-10	6.87E-06
103	200	252.0	70	7.75E-11	5.21E-06
105	200	264.0	70	1.06E-10	7.15E-06
106	200	270.0	70	1.30E-10	8.73E-06
107	200	276.0	70	1.02E-10	6.85E-06
108	200	282.0	70	8.85E-11	5.95E-06
110	200	294.0	70	1.16E-10	7.80E-06
111	200	300.0	70	1.11E-10	7.45E-06
112	200	306.0	70	3.87E-10	2.60E-05
113	200	312.0	70	9.19E-11	6.18E-06
114	200	318.0	70	9.07E-11	6.09E-06
152	400	186.0	73	8.54E-11	5.98E-06
153	400	192.0	73	8.65E-11	6.06E-06
154	400	198.0	73	1.09E-10	7.64E-06
155	400	204.0	73	9.40E-11	6.58E-06
156	400	210.0	73	8.77E-11	6.14E-06
157	400	216.0	73	5.14E-10	3.60E-05
159	400	228.0	73	7.96E-10	5.57E-05
160	400	234.0	73	6.17E-10	4.32E-05
161	400	240.0	73	3.20E-10	2.24E-05
162	400	246.0	73	1.43E-10	1.00E-05
163	400	252.0	73	9.23E-11	6.46E-06
164	400	258.0	73	4.67E-11	3.27E-06
165	400	264.0	73	6.97E-11	4.88E-06
166	400	270.0	73	2.95E-10	2.07E-05
167	400	276.0	73	8.99E-11	6.30E-06
168	400	282.0	73	7.56E-11	5.30E-06
169	400	288.0	73	8.63E-11	6.05E-06
170	400	294.0	73	1.04E-10	7.27E-06
171	400	300.0	73	9.20E-11	6.45E-06
172	400	306.0	73	7.65E-11	5.36E-06
212	1373	146.0	57	6.93E-11	3.81E-06
213	775	205.0	94	9.99E-11	8.99E-06
214	770	236.0	96	1.95E-10	1.79E-05
215	559	241.0	110	2.29E-10	2.41E-05
216	797	292.5	127	1.12E-10	1.36E-05
217	683	317.0	152	1.05E-10	1.53E-05

TEST #10 8/12/74 18:22-19:22 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0789 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
218	885	324.0	172	6.21E-11	1.02E-05

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
801	394	226.7	301	8.93E-10	5.07E-05
802	766	221.7	298	4.34E-10	2.47E-05
803	766	221.7	335	2.74E-10	1.55E-05
804	2175	231.8	329	5.97E-11	3.39E-06
805	1552	221.9	341	6.80E-11	3.86E-06
806	3782	235.7	396	6.60E-11	3.75E-06
807	3782	235.7	292	3.93E-11	2.23E-06
808	3782	235.7	542	4.01E-11	2.28E-06
809	579	214.2	326	1.64E-09	9.32E-05
810	1532	223.7	396	7.69E-11	4.37E-06
812	1460	231.3	323	1.78E-10	1.01E-05
814	6900	234.0	411	1.14E-10	6.48E-06

TEST #11 8/13/74 06:53-07:53 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0825 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	63	1.71E-10	3.82E-06
2	100	6.0	63	4.43E-10	9.91E-06
3	100	12.0	63	1.32E-09	2.95E-05
4	100	18.0	63	1.71E-09	3.83E-05
5	100	24.0	63	1.14E-09	2.56E-05
6	100	30.0	63	1.50E-09	3.35E-05
7	100	36.0	63	1.10E-09	2.47E-05
8	100	42.0	63	8.83E-10	1.98E-05
9	100	48.0	63	9.42E-10	2.11E-05
10	100	54.0	63	1.04E-09	2.32E-05
11	100	60.0	63	1.14E-09	2.56E-05
12	100	66.0	63	1.12E-09	2.50E-05
13	100	72.0	63	5.44E-10	1.22E-05
14	100	78.0	63	1.14E-09	2.55E-05
15	100	84.0	63	1.17E-09	2.63E-05
16	100	90.0	63	6.67E-10	1.49E-05
17	100	96.0	63	5.71E-10	1.28E-05
18	100	102.0	63	1.09E-09	2.44E-05
19	100	108.0	63	9.04E-10	2.02E-05
20	100	114.0	63	2.88E-09	6.44E-05
21	100	120.0	63	2.20E-09	4.93E-05
22	100	126.0	63	2.50E-09	5.60E-05
23	100	132.0	63	1.14E-09	2.56E-05
24	100	138.0	63	1.40E-09	3.15E-05
25	100	144.0	73	1.39E-09	3.60E-05
26	100	150.0	73	9.78E-10	2.53E-05
28	100	162.0	73	9.36E-10	2.43E-05
29	100	168.0	73	8.54E-10	2.21E-05
30	100	174.0	73	7.06E-10	1.83E-05
31	100	180.0	73	9.82E-10	2.54E-05
32	100	186.0	73	5.76E-10	1.49E-05
33	100	192.0	73	7.59E-10	1.97E-05
34	100	198.0	73	5.84E-10	1.51E-05
35	100	204.0	73	8.08E-10	2.09E-05
36	100	210.0	73	4.70E-10	1.22E-05
37	100	216.0	73	6.91E-10	1.79E-05
39	100	228.0	73	4.61E-10	1.20E-05
41	100	240.0	73	1.97E-10	5.10E-06
42	100	246.0	73	1.26E-10	3.28E-06
44	100	258.0	73	9.62E-11	2.49E-06

TEST #11 8/13/74 06:53-07:53 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0825 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
45	100	264.0	73	1.27E-10	3.30E-06
46	100	270.0	73	9.76E-11	2.53E-06
47	100	276.0	73	1.05E-10	2.72E-06
48	100	282.0	73	1.10E-10	2.85E-06
49	100	288.0	73	1.13E-10	2.92E-06
50	100	294.0	73	1.13E-10	2.94E-06
53	100	312.0	73	1.02E-10	2.64E-06
55	100	324.0	63	8.86E-11	1.99E-06
56	100	330.0	63	5.70E-11	1.28E-06
57	100	336.0	63	8.42E-11	1.89E-06
58	100	342.0	63	7.07E-11	1.58E-06
59	100	348.0	63	9.71E-11	2.18E-06
60	100	354.0	63	7.70E-11	1.73E-06
63	200	12.0	56	7.10E-11	1.42E-06
64	200	18.0	56	5.56E-11	1.11E-06
65	200	24.0	56	4.29E-11	8.55E-07
66	200	30.0	56	3.70E-11	7.37E-07
68	200	42.0	56	1.48E-10	2.95E-06
69	200	48.0	56	1.09E-10	2.18E-06
70	200	54.0	60	1.01E-10	2.16E-06
71	200	60.0	60	1.06E-10	2.25E-06
73	200	72.0	60	1.11E-10	2.36E-06
74	200	78.0	60	1.26E-10	2.69E-06
75	200	84.0	60	1.80E-10	3.85E-06
76	200	90.0	60	2.15E-10	4.60E-06
77	200	96.0	60	2.66E-10	5.67E-06
79	200	108.0	60	8.11E-10	1.73E-05
81	200	120.0	60	1.11E-09	2.36E-05
82	200	126.0	60	1.00E-09	2.14E-05
83	200	132.0	60	7.58E-10	1.62E-05
84	200	138.0	60	6.78E-10	1.45E-05
85	200	144.0	80	5.80E-10	1.64E-05
86	200	150.0	80	3.88E-10	1.10E-05
89	200	168.0	80	1.82E-10	5.17E-06
90	200	174.0	80	1.72E-10	4.88E-06
91	200	180.0	80	1.67E-10	4.73E-06
93	200	192.0	80	2.27E-10	6.43E-06
95	200	204.0	80	3.46E-10	9.81E-06
96	200	210.0	80	2.79E-10	7.92E-06
99	200	228.0	80	1.14E-10	3.22E-06

TEST #11 8/13/74 06:53-07:53 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0825 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
100	200	234.0	80	8.40E-11	2.38E-06
102	200	246.0	80	1.03E-10	2.91E-06
103	200	252.0	80	9.09E-11	2.58E-06
104	200	258.0	80	9.74E-11	2.76E-06
105	200	264.0	80	8.83E-11	2.50E-06
106	200	270.0	80	1.23E-10	3.48E-06
107	200	276.0	80	9.61E-11	2.72E-06
108	200	282.0	80	1.02E-10	2.90E-06
109	200	288.0	80	5.90E-11	1.67E-06
110	200	294.0	80	1.36E-10	3.85E-06
111	200	300.0	80	1.05E-10	2.98E-06
112	200	306.0	80	9.22E-11	2.61E-06
113	200	312.0	80	6.92E-11	1.96E-06
114	200	318.0	80	9.25E-11	2.62E-06
115	200	324.0	56	6.97E-11	1.39E-06
116	200	330.0	56	9.52E-11	1.90E-06
117	200	336.0	56	3.24E-11	6.47E-07
118	200	342.0	56	5.14E-11	1.02E-06
119	200	348.0	56	5.57E-11	1.11E-06
120	200	354.0	56	9.21E-11	1.84E-06
123	400	12.0	56	3.57E-11	7.12E-07
124	400	18.0	56	1.45E-11	2.90E-07
126	400	30.0	56	4.81E-11	9.59E-07
127	400	36.0	56	3.80E-11	7.58E-07
128	400	42.0	56	5.88E-11	1.17E-06
129	400	48.0	56	2.51E-11	5.00E-07
131	400	60.0	56	6.24E-11	1.24E-06
132	400	66.0	56	6.08E-11	1.21E-06
133	400	72.0	56	3.78E-11	7.54E-07
134	400	78.0	56	8.07E-11	1.61E-06
135	400	84.0	56	7.82E-11	1.56E-06
136	400	90.0	56	7.89E-11	1.57E-06
152	400	186.0	88	7.47E-11	2.33E-06
153	400	192.0	88	1.06E-10	3.31E-06
154	400	198.0	88	1.22E-10	3.81E-06
155	400	204.0	88	1.18E-10	3.67E-06
156	400	210.0	88	7.98E-11	2.48E-06
157	400	216.0	88	1.13E-10	3.50E-06
158	400	222.0	88	1.55E-10	4.83E-06
159	400	228.0	88	1.25E-10	3.90E-06

TEST #11 8/13/74 06:53-07:53 EDT SF6
SOURCE STRENGTH (Q) WAS 0.0825 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
160	400	234.0	88	8.09E-11	2.52E-06
161	400	240.0	88	1.06E-10	3.31E-06
162	400	246.0	88	9.05E-11	2.82E-06
163	400	252.0	88	7.46E-11	2.32E-06
164	400	258.0	88	7.91E-11	2.46E-06
165	400	264.0	88	9.86E-11	3.07E-06
166	400	270.0	88	1.08E-10	3.37E-06
167	400	276.0	88	5.09E-11	1.59E-06
168	400	282.0	88	5.95E-11	1.85E-06
170	400	294.0	88	6.90E-11	2.15E-06
171	400	300.0	88	3.09E-11	9.64E-07
172	400	306.0	88	7.10E-11	2.21E-06

TEST #10 8/12/74 18:22-19:22 EDT 12B2
SOURCE STRENGTH (Q) WAS 0.1058 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
25	100	144.0	67	5.08E-11	5.64E-06
26	100	150.0	67	2.31E-10	2.56E-05
28	100	162.0	67	1.16E-09	1.29E-04
29	100	168.0	67	1.54E-09	1.71E-04
31	100	180.0	67	4.74E-09	5.26E-04
32	100	186.0	67	2.95E-09	3.27E-04
33	100	192.0	67	3.37E-09	3.74E-04
35	100	204.0	67	2.45E-09	2.71E-04
36	100	210.0	67	2.64E-09	2.93E-04
37	100	216.0	67	1.96E-09	2.18E-04
39	100	228.0	67	5.94E-10	6.59E-05
42	100	246.0	67	2.63E-10	2.92E-05
44	100	258.0	67	1.16E-11	1.29E-06

TEST #10 8/12/74 18:22-19:22 EDT 1282
SOURCE STRENGTH (Q) WAS 0.1058 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
92	200	186.0	70	1.41E-11	1.63E-06
93	200	192.0	70	1.59E-10	1.84E-05
97	200	216.0	70	6.08E-11	7.04E-06
99	200	228.0	70	2.06E-11	2.39E-06
101	200	240.0	70	1.33E-11	1.54E-06
110	200	294.0	70	1.73E-11	2.00E-06
154	400	198.0	73	1.71E-11	2.06E-06
155	400	204.0	73	3.52E-11	4.25E-06
159	400	228.0	73	2.16E-10	2.60E-05
160	400	234.0	73	1.03E-10	1.24E-05
161	400	240.0	73	4.15E-11	5.02E-06
162	400	246.0	73	2.71E-11	3.27E-06
166	400	270.0	73	1.68E-11	2.03E-06
168	400	282.0	73	1.84E-11	2.22E-06
212	1373	146.0	57	1.34E-11	1.27E-06
214	770	236.0	96	9.46E-11	1.50E-05
215	559	241.0	110	3.92E-11	7.09E-06
216	797	292.5	127	1.62E-11	3.38E-06
217	683	317.0	152	2.51E-11	6.26E-06

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
801	394	226.7	301	6.68E-10	6.54E-05
802	766	221.7	298	8.49E-11	8.32E-06
803	766	221.7	335	1.83E-10	1.79E-05
804	2175	231.8	329	3.13E-11	3.06E-06
805	1552	221.9	341	7.07E-11	6.92E-06
806	3782	235.7	396	1.85E-11	1.81E-06
807	3782	235.7	292	5.11E-11	5.00E-06
808	3782	235.7	542	3.10E-11	3.03E-06
809	579	214.2	326	5.89E-10	5.77E-05

TEST #10 8/12/74 18:22-19:22 EDT 12B2
SOURCE STRENGTH (Q) WAS 0.1058 GM/SEC
WIND SPEED (U) WAS 0.75 M/SEC

AERIAL SAMPLES

#	DISTANCE METERS	BEARING DEGREES	HEIGHT METERS	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
810	1532	223.7	396	3.56E-11	3.48E-06
812	1460	231.3	323	8.30E-11	8.13E-06
814	6900	234.0	411	2.95E-11	2.89E-06

TEST #11 8/13/74 06:53-07:53 EDT 12B2
SOURCE STRENGTH (Q) WAS 0.1069 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
1	100	0.0	63	7.53E-11	3.01E-06
2	100	6.0	63	1.04E-09	4.16E-05
3	100	12.0	63	2.19E-09	8.77E-05
4	100	18.0	63	1.26E-09	5.03E-05
5	100	24.0	63	1.28E-09	5.13E-05
6	100	30.0	63	1.08E-09	4.32E-05
7	100	36.0	63	8.44E-10	3.37E-05
8	100	42.0	63	6.17E-10	2.47E-05
9	100	48.0	63	3.04E-10	1.22E-05
10	100	54.0	63	8.46E-10	3.38E-05
11	100	60.0	63	6.84E-10	2.74E-05
12	100	66.0	63	6.51E-10	2.60E-05
13	100	72.0	63	3.58E-10	1.43E-05
14	100	78.0	63	5.34E-10	2.13E-05
15	100	84.0	63	8.18E-10	3.27E-05
18	100	102.0	63	1.31E-09	5.25E-05
20	100	114.0	63	1.45E-09	5.78E-05
21	100	120.0	63	1.10E-09	4.41E-05
22	100	126.0	63	9.43E-10	3.77E-05
23	100	132.0	63	5.19E-10	2.07E-05
24	100	138.0	63	4.39E-10	1.75E-05
25	100	144.0	73	3.43E-10	1.59E-05

TEST #11 8/13/74 06:53-07:53 EDT 12B2
SOURCE STRENGTH (Q) WAS 0.1069 GM/SEC
WIND SPEED (U) WAS 0.29 M/SEC

GROUND SAMPLES

#	DISTANCE METERS	BEARING DEGREES	DURATION MINUTES	CONCENTRATION AT 25 DEG C CC/CC	CHI*U/Q M**-2
28	100	162.0	73	2.98E-10	1.38E-05
29	100	168.0	73	1.93E-10	8.92E-06
30	100	174.0	73	1.96E-10	9.07E-06
31	100	180.0	73	2.13E-10	9.83E-06
32	100	186.0	73	1.68E-10	7.76E-06
33	100	192.0	73	1.86E-10	8.59E-06
34	100	198.0	73	1.53E-10	7.06E-06
35	100	204.0	73	1.41E-10	6.50E-06
36	100	210.0	73	7.48E-11	3.46E-06
37	100	216.0	73	8.72E-11	4.03E-06
39	100	228.0	73	2.72E-11	1.26E-06
41	100	240.0	73	9.63E-12	4.45E-07
68	200	42.0	56	5.43E-11	1.93E-06
69	200	48.0	56	5.85E-11	2.08E-06
70	200	54.0	60	4.47E-11	1.70E-06
71	200	60.0	60	3.22E-11	1.23E-06
75	200	84.0	60	1.18E-10	4.49E-06
76	200	90.0	60	1.34E-10	5.10E-06
77	200	96.0	60	1.61E-10	6.13E-06
79	200	108.0	60	4.32E-10	1.64E-05
81	200	120.0	60	5.46E-10	2.08E-05
82	200	126.0	60	4.45E-10	1.69E-05
83	200	132.0	60	2.08E-10	7.92E-06
84	200	138.0	60	2.31E-10	8.82E-06
85	200	144.0	80	1.16E-10	5.88E-06
86	200	150.0	80	1.04E-10	5.25E-06
89	200	168.0	80	2.78E-11	1.41E-06
90	200	174.0	80	3.86E-11	1.95E-06
91	200	180.0	80	1.79E-11	9.06E-07
93	200	192.0	80	3.08E-11	1.56E-06
95	200	204.0	80	7.03E-11	3.56E-06
96	200	210.0	80	3.46E-11	1.75E-06
110	200	294.0	80	1.53E-11	7.76E-07
135	400	84.0	56	2.63E-11	9.37E-07
169	400	288.0	88	2.11E-11	1.18E-06

APPENDIX B. DIFFUSION STATISTICS ACCORDING TO PASQUILL-TURNER STABILITY CLASSES

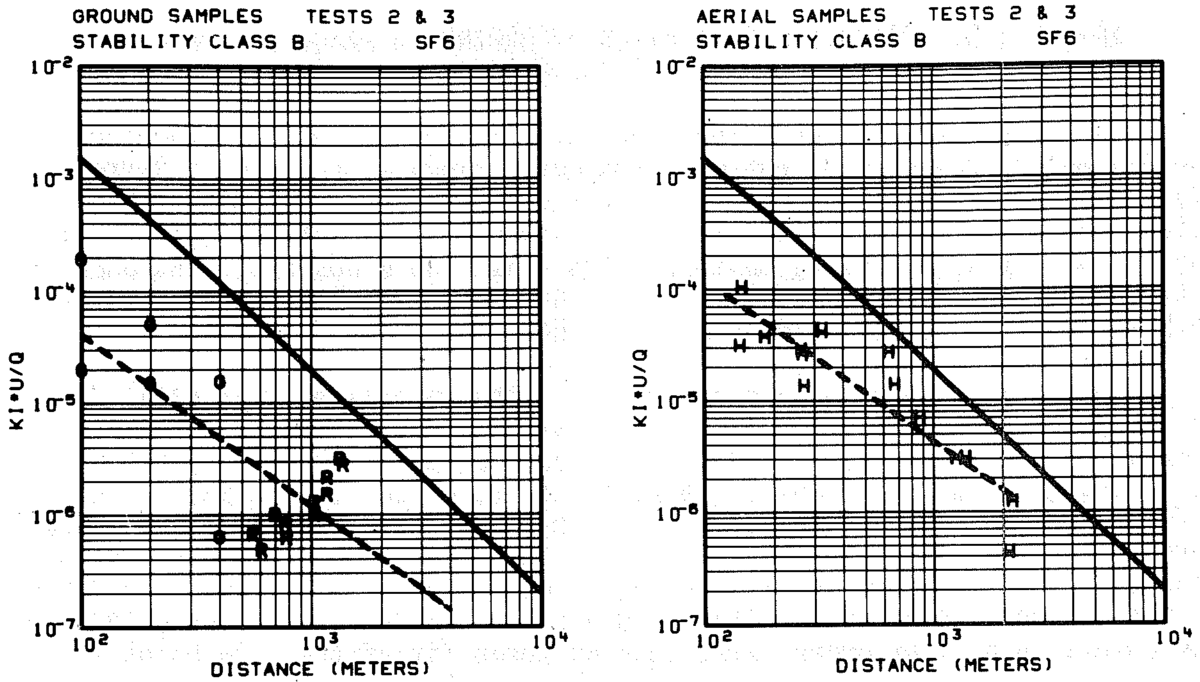
This appendix contains comparisons of measured diffusion parameters (or parameters calculated from measured quantities) with Pasquill-Gifford flat terrain values. The stability for each test period was classified using the second method, i.e., the alternate guidelines of Pasquill (1961) and Turner (1964) according to insolation class and windspeed, mentioned in section 4 of the text. A comparison of the stability classes assigned by both methods can be found in table 1 of the text.

Figures B-1a through B-1c are plots of the normalized near-axial data points grouped according to stability class and separated into aerial- and ground-measured samples. These figures correspond to figures 9a through 9c. Figures B-2a through B-2c are plots of the calculated σ_y(SM) values as a function of downwind distance, grouped by stability class. Figures B-3a through B-3c are similar plots of σ_z (eq. 5) values. These correspond to figures 10a through 10c and 11a through 11c, respectively. The solid curve is the appropriate Pasquill-Gifford curve. The dashed line running through the points is a first order least-squares curve fit of the data points.

Tables B-1a through B-1c contain a summary of the diffusion parameter ratios corresponding to those in tables 5a through 5c. Table B-2a lists estimates of the amount of dilution beyond what Pasquill-Gifford criteria would predict, and table B-2b summarizes the averages thereof; these tables correspond respectively to tables 6a and 6b.

Since the stability classifications according to $\Delta T/\Delta z$ corresponded better with the observed visual plume behavior, those comparisons and statistics are utilized in the text. The comparisons in this appendix are included for completeness and for consistency with earlier work by Start et al. (1975), and Sagendorf and Dickson (1974). The choice of stability classification scheme does not alter the fundamental findings and conclusions; rather it alters slightly the magnitude of the comparison statistics and designates them for different categories.

a.



b.

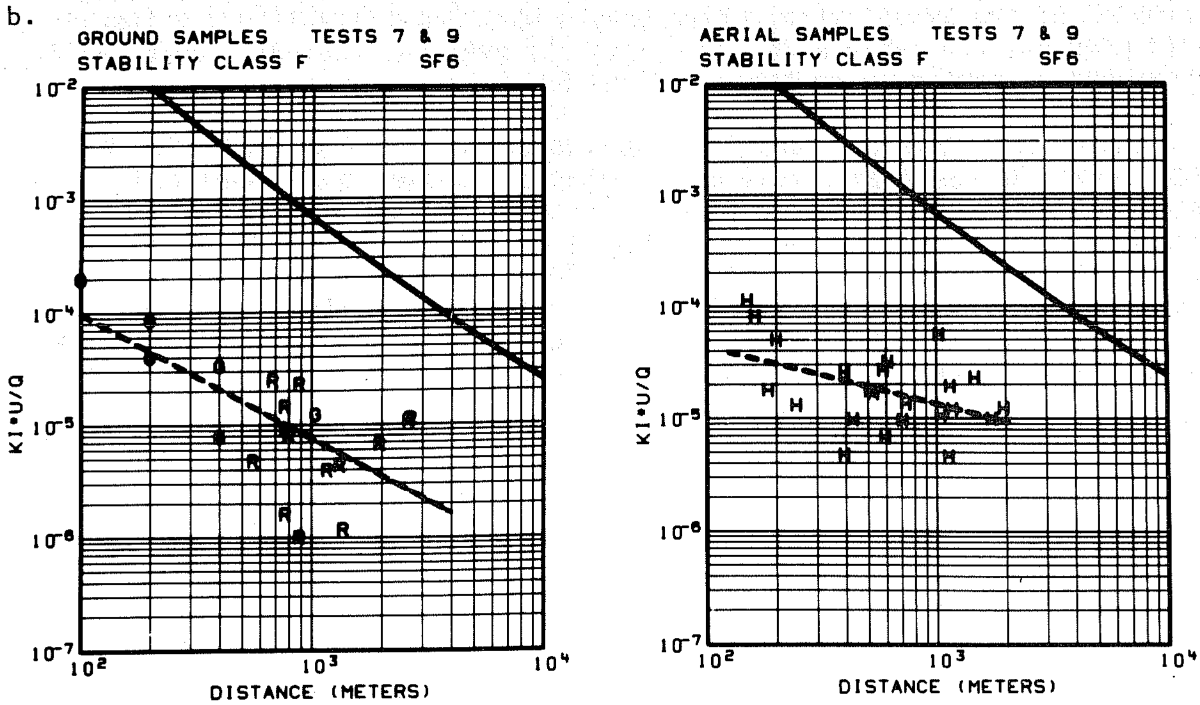


Figure B-1(a - c). Diffusion statistics separated into aerial- and ground-measured samples.

c.

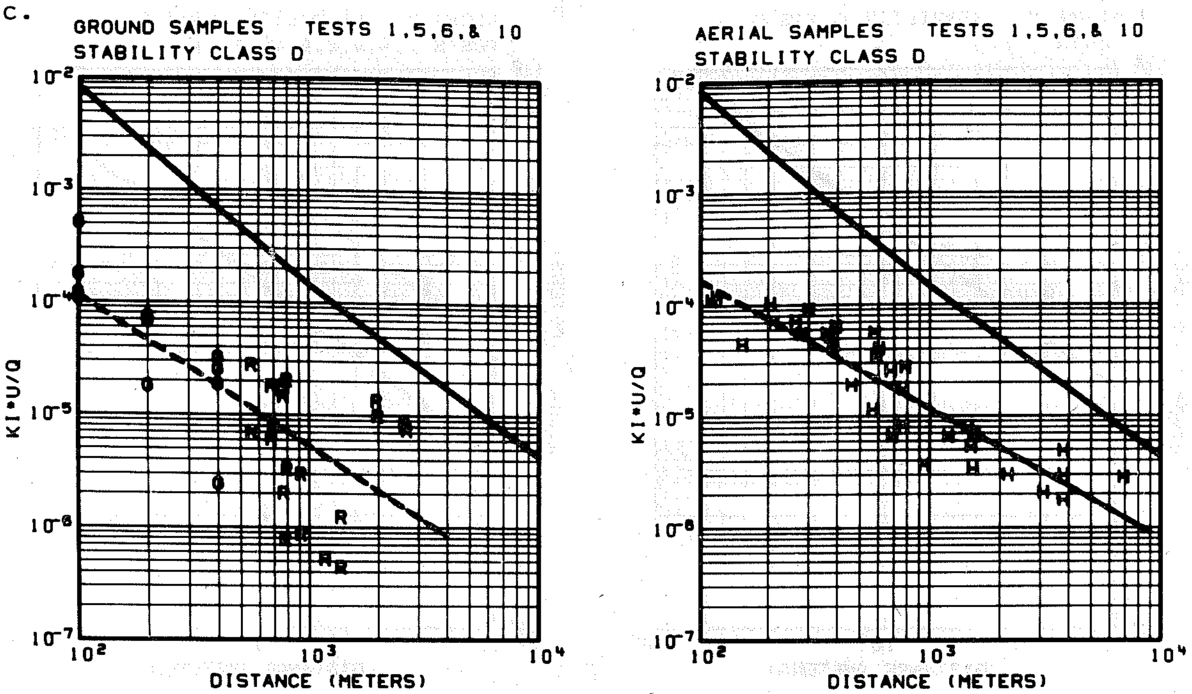


Figure B-1. Continued

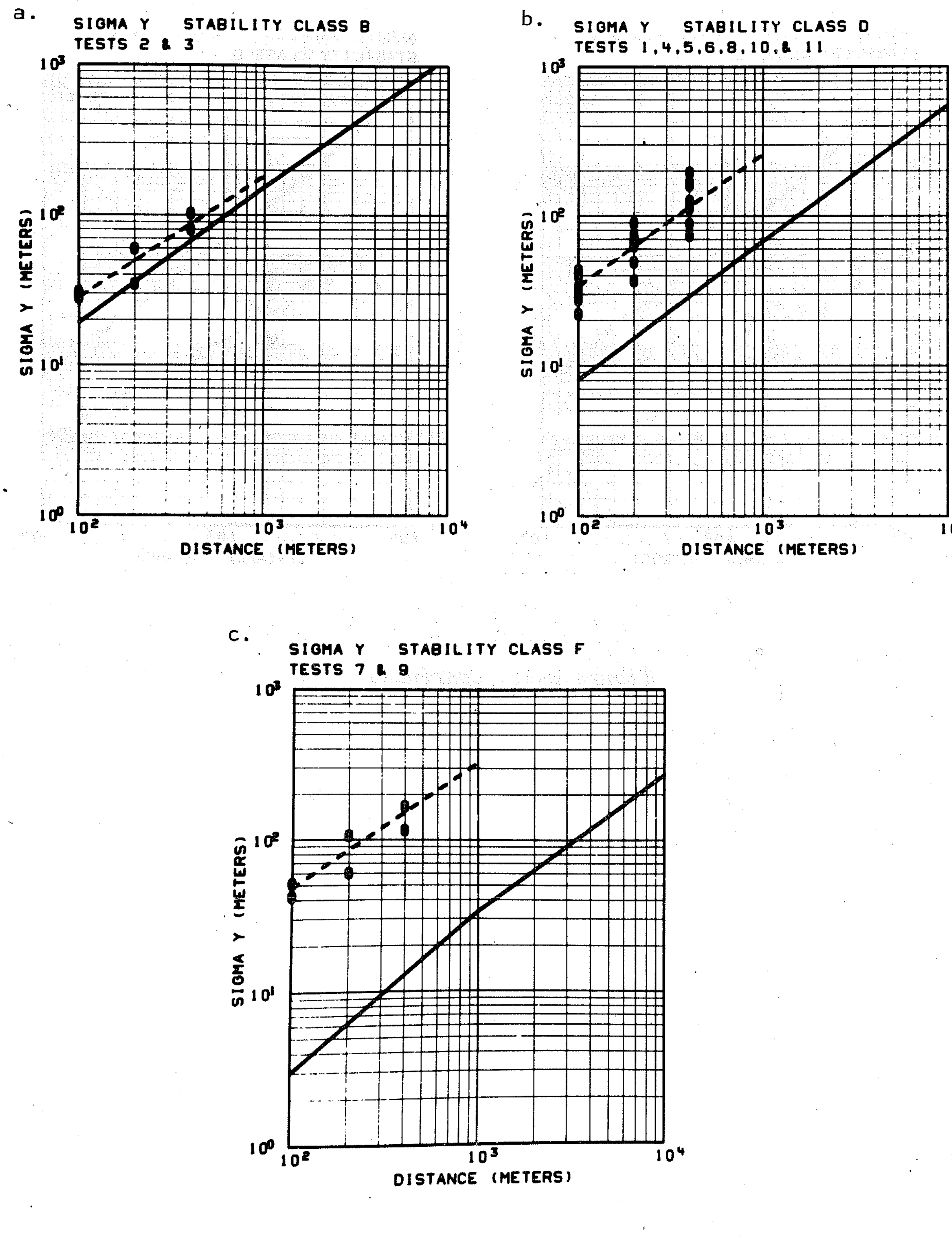


Figure B-2(a - c). Calculated σ_y(SM) values as a function of downwind distance.

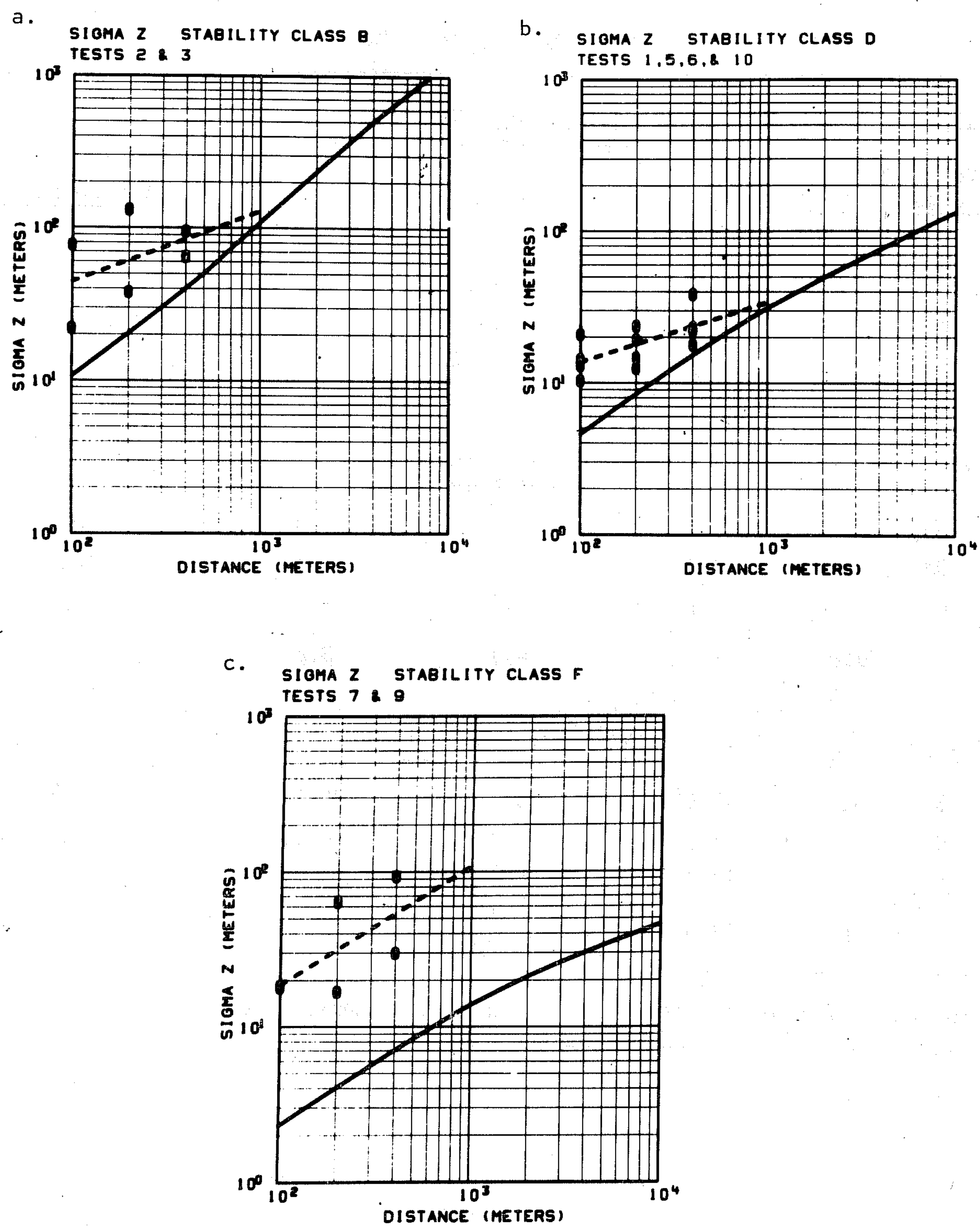


Figure B-3(a - c). Calculated σ_z values as a function of downwind distance.

Table B-1. Summary of Diffusion Parameter Ratios

Stability Class	100 m	200 m	400 m	All Distances
(a)	$\sigma_y(SM) \div \sigma_y(P/G)$			
B	1.6	1.3	1.3	1.4
D	4.2	4.2	4.6	4.3
F	15.7	11.9	7.9	11.8
Total	5.8	5.1	4.6	5.2
(b)	$\sigma_z(eq.5) \div \sigma_z(P/G)$			
B	4.7	4.2	2.0	3.6
D*	3.2	2.1	1.7	2.3
F	7.9	8.7	7.2	7.9
Total	4.8	4.3	3.2	4.1
(c)	$\chi\bar{u}/Q(P/G) \div \chi_G\ \bar{u}/Q$			
B	41.8	18.2	95.7	51.9
D	58.0	62.7	160.31	93.7
F	98.7	88.8	236.7	141.4
Total	62.5	59.4	162.5	94.8

*No aerial samples for tests 4, 8, and 11 to compute σ_z(eq.5)

Table B-2. Estimates of Enhanced Dilution

(a)

Stability Class	100 m (I)	100 m (II)	100 m (III)	200 m (I)	200 m (II)	200 m (III)	400 m (I)	400 m (II)	400 m (III)	Test
B	3.4	3.4	3.3	3.2	3.2	1.9	2.0	1.9	1.8	2
B	10.8	10.8	5.5	6.4	6.4	4.0	3.8	3.6	1.4	3
D	17.7	16.6	7.8	11.4	11.7	7.2	7.6	7.8	4.6	1
D	11.8	11.9	6.6	7.5	7.7	5.5	5.4	5.7	3.7	5
D	11.8	11.9	5.9	8.6	8.7	17.1	7.7	7.9	9.7	6
D	8.5	8.5	7.1	5.5	5.6	4.8	3.8	3.9	4.1	10
F	28.4	113.5	36.7	101.5	127.5	110.5	152.3	154.4	242.3	7
F	58.5	134.5	120.9	28.1	59.4	55.0	33.9	34.4	17.3	9

(b)

Stability Class	100 m (I)	100 m (II)	100 m (III)	200 m (I)	200 m (II)	200 m (III)	400 m (I)	400 m (II)	400 m (III)	All Distances (I)	All Distances (II)	All Distances (III)
B	7.1	7.1	4.4	4.8	4.8	3.0	2.9	2.8	1.6	4.9	4.9	3.0
D	12.5	12.2	6.9	8.2	8.4	8.7	6.1	6.3	5.5	8.9	9.0	7.0
F	43.5	124.0	78.8	64.8	93.5	82.7	93.1	94.4	129.8	67.1	104.0	97.1
All Data	18.9	38.9	24.3	21.5	28.8	25.8	27.1	27.6	35.6	22.5	31.7	28.5

(I) is $\left[(\chi\bar{u}/Q)P/G\cdot\exp\left(\frac{H^2}{2\sigma_z{}^2}\right)\right] \div (\chi_G\bar{u}/Q)_{meas.}$

(II) is $\left[\sigma_y(SM)\cdot\sigma_z\ (Eq.5)\right] \div \left[\sigma_y\cdot\sigma_z\right]\cdot P/G$

(III) is $\left[(CIC\ u/Q)P/G\cdot\exp\left(-\frac{H^2}{2\sigma_z{}^2}\right) \div (CIC\ \bar{u}/Q)_{meas.}\right]\cdot \frac{\sigma_y(SM)}{\sigma_y\ P/G}$

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